Attrition Rates and Performance of ChalleNGe Participants Over Time
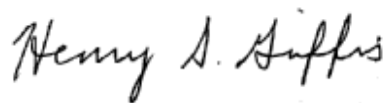
Jennie W. Wenger • Cathleen M. McHugh
with
Lynda G. Houck

Approved for distribution: April 2006

Henry S. Griffis, Director
Workforce, Education and Training Team
Resource Analysis Division

This document represents the best opinion of CNA at the time of issue.
It does not necessarily represent the opinion of the Department of the Navy.

Contents

Executive summary

The National Guard Youth Challenge (ChalleNGe) program is a unique residential program for youth age 16 to 18 who have dropped out of high school. ChalleNGe programs currently exist in 25 states (several states have multiple sites). The 5.5-month-long program combines a quasi-military environment with classroom instruction. The program includes marching, drilling, and other physical fitness activities with classroom instruction focused on General Educational Development (GED) material as well as practical life skills, such as health and anger management.

This analysis uses detailed ChalleNGe program data from each site for 1999 through 2004. Program data include information on three groups: those who enter and graduate from ChalleNGe, those who enter but do not complete the program, and those who express an interest in but do not enter ChalleNGe. Our analysis focuses on five separate outcomes:

- Acceptance into a ChalleNGe program

- Graduation from a ChalleNGe program (for those accepted)

- Attaining a GED (for those who graduate from ChalleNGe)

- Joining the military (for all ChalleNGe participants)

- Military success (for those who join the military).

When looking at military success, we use data on all enlisted accessions (across the four Services). To produce this sample, the Defense Manpower Data Center (DMDC) matched the Social Security Numbers (SSNs) of all ChalleNGe participants against complete accession files over a 10-year period; we focus on the FY99-FY04 period.

Our data indicate that most of the youth served by the ChalleNGe program are quite disadvantaged. On average, those who enter the

program scored around the 7th grade level on standardized tests. During the 5.5-month-long program, the average participant gains more than two grade levels; most also earn GEDs while enrolled in ChalleNGe.

Our analysis of the first three outcomes listed on page 1 uses only the ChalleNGe program data. We do find that African-American applicants are less likely than white applicants to be accepted into the program, but the difference is very small.[1] In terms of graduation and GED recipiency, we find that individual characteristics do matter; those from more advantaged backgrounds perform better. Women are more likely than men to complete ChalleNGe—holding other factors constant—but men are more likely to attain GEDs while in the program. There are substantial differences in average rates of graduation and GED recipiency across programs.

We examine closely which ChalleNGe participants join the military. Graduation from ChalleNGe and earning a GED are both strong predictors of military enlistment. Cadets who both graduate from ChalleNGe and earn GEDs are much more likely to join the military than cadets who only graduate from ChalleNGe or only earn GEDs. This is consistent with the fact that both of these conditions were necessary to enter the military with a Tier 1 credential during much of the period included in our analysis. Scoring above the 75th percentile on the Test of Adult Basic Education (TABE) pretest is a strong predictor of military enlistment. Older cadets, as well as more physically fit cadets, are also more likely to enlist. In addition, there are racial differences in military enlistment: white cadets more likely to enlist than either African-American or Hispanic cadets.

Finally, we examine the military performance of those ChalleNGe participants who enlist. Our main measure of military success is attrition. Our first result is that those who complete ChalleNGe have significantly, substantively lower attrition rates than those who drop out of ChalleNGe. While we have no true random control group, we believe that ChalleNGe dropouts serve as a good comparison.

---

1.   The probability of being accepted into ChalleNGe is 82 percent for white applicants and 80 percent for African-American applicants.

In terms of attrition, we find large differences across the Services. The attrition rate of women is higher than that of men; this difference, however, disappears after the first year. We do find that elements of the ChalleNGe program are important predictors of early attrition; in particular, cadets who have more contact with a mentor have lower bootcamp attrition. In general, ChalleNGe graduates have higher attrition rates than high school diploma graduates, but there are large program-specific effects. Graduates of some ChalleNGe programs have consistently lower attrition than graduates of other programs and indeed have attrition rates below those of typical high school diploma graduates. Our results suggest that program differences are quite important. However, we strongly caution against interpreting program effects as simple measures of program quality because some portion of the effects most likely stems from unobserved differences in state populations, school quality, admissions procedures, and/or program policies.

Missing ChalleNGe program data pose a problem. In particular, we know that more people completed ChalleNGe and enlisted in the military than our records indicate. This stems from the prevalence of "bad" data on SSNs. Overall, data quality has improved over time, but we recommend that ChalleNGe program staff focus on continuing to improve the quality of the program data. High-quality program data are absolutely vital for measuring the effects of the ChalleNGe program.

Taken together, our results suggest that the ChalleNGe program has substantial, positive effects on participants.

Introduction and background

In addition to presenting background information on the ChalleNGe program, this section summarizes the extensive literature on the relationship between education credentials and attrition from the military. This literature review focuses on first-term attrition among those in the enlisted ranks.

The ChalleNGe program

The National Guard Youth ChalleNGe program was first authorized by Congress in FY93. The program is operated jointly by the states and the state National Guard units, with federal funding to cover a portion of the program's costs.

The program targets "at risk" youth between the ages of 16 and 18. Participants must be (a) high school dropouts or expellees, (b) unemployed, and (c) drug free. Those on probation or parole, as well as those awaiting sentencing or indictment, are not eligible.

The ChalleNGe program is residential and 22 weeks in length. The environment is perhaps best described as "quasi-military"; participants (referred to as "cadets") form platoons, drill and march, and engage in intensive physical training. The program also includes classroom instruction on both academic topics and such "life skills" as financial management, drug avoidance, and health and sexual education. The academic focus of the program is designed to help cadets attain GED (General Educational Development) credentials. Participants also perform volunteer work in the communities where the programs are located.

The ChalleNGe program has grown over time. In 1993, 10 states established ChalleNGe programs; by 2005, 25 states (plus Puerto Rico) had programs, and several states have expanded the program to multiple campuses. Note that Missouri and New York established

5

but eventually discontinued ChalleNGe programs; we do not include these in our analysis.

The ChalleNGe programs include an important mentoring aspect. Cadets are matched with volunteer mentors; the mentoring relationship is designed to last beyond the end of the ChalleNGe program.

Overall, the ChalleNGe programs graduate roughly 7,000 cadets per year; according to a recent report, 70 percent of graduates receive GED credentials [1].[2] As of the end of FY03, the total number of graduates was approximately 50,500 [1]. Programs vary in size, graduating anywhere from 140 to 950 cadets per year (70 to 475 per class).

Although nearly 40 percent of graduates did not report what they were doing after graduation, the vast majority of those who did report on their activities were employed, in the military, or enrolled in school [1].

The ChalleNGe program has not been studied extensively, but there is evidence that, from a societal viewpoint, it is quite cost-effective [1].

Military attrition and education credentials

The relationship between first-term enlisted attrition (failure to complete one's term of service) and education credentials possessed by the enlistee is strong and well established. In particular, those who enlist with a GED certificate attrite at substantially higher rates than those who enlist with a high school diploma; this is true despite the fact that GED-holders must meet a higher threshold on the Armed Forces Qualification Test (AFQT) than high school diploma graduates. For more discussion of the relationship between education credentials, see [2, 3, 4, 5, and 6]. References [7, 8, and 9] suggest that

---

2. Seven of the programs award high school diplomas or alternate credentials to some or all graduates, either through agreements with a local high school or through designation as a high school of some sort. As of 2004, the programs are California, Florida, Georgia (adult high school diploma), Hawaii, Mississippi, New Jersey, and Oregon [1]. See appendix A for more details about education credentials/scholarships awarded to ChalleNGe graduates.

noncognitive factors are important in both high school completion and military success, providing a potential explanation for the high attrition rates of those who leave high school without graduating.

ChalleNGe graduates in the military

Given the strong military aspects of the program, it is not surprising that many ChalleNGe graduates enlist after completing the program. Indeed, according to [1], of the cadets who reported their activities, nearly 20 percent had joined the military. Assuming a constant percentage over the life of the program, this indicates that between 6,300 and 10,000 ChalleNGe graduates have joined the military between FY93 and FY04.[3]

The National Defense Authorization Act (NDAA) for Fiscal Year 1999 directed a 5-year pilot program to treat successful completion of the ChalleNGe program in conjunction with a GED certificate as Tier 1 for enlistment purposes. (The same pilot program directed the Services to treat a home school diploma as a Tier 1 credential for enlistment purposes.)

Because many ChalleNGe graduates enlisted during a 5-year pilot program when their credential was considered Tier 1 if accompanied by a GED, they did not have to meet the higher AFQT standard required of dropouts and those holding GEDs. For this reason, ChalleNGe graduates may enter the military at a disadvantage; however, their experiences in ChalleNGe could partly or completely counteract this disadvantage.

Not all ChalleNGe graduates earn GEDs, so it is likely that some graduates who enlisted did not hold GEDs. In this case, these graduates would have entered the Services without a high school credential; in their official military records, they would not be coded as ChalleNGe

---

3. Both figures assume the same level of enlistment across years. The figures may be thought of as lower and upper bounds or estimates; the 6,300 figure assumes that *none* of those who did not report their activities enlisted, while the 10,500 figure assumes that 20 percent of those who did not report their activities enlisted.

graduates but instead would be considered dropouts. Also, some graduates surely enlisted before FY98; at that time, ChalleNGe + GED was not a recognized credential and these ChalleNGe graduates would have entered with only a recognized GED, a Tier 2 credential.

Evaluation of the performance of these home-schooled and ChalleNGe recruits was a congressional requirement as well; CNA collected data and assessed separation ("attrition") rates of enlistees. To ensure correct identification of those who successfully completed the ChalleNGe program and the GED test, as well as those who were home-schooled, CNA conducted a series of surveys at all four Services' bootcamps between March 1999 and February 2000. The surveys included information on over 64,000 recruits (of a total of 183,895 recruits during the survey period). Next, the Defense Manpower Data Center (DMDC) matched the Social Security Numbers (SSNs) provided by recruits on the surveys to their files; this provided CNA with information about recruits' performance. In particular, we tracked attrition very closely. Our first report [5] indicated that the ChalleNGe recruits in the Marine Corps and the Army performed at levels similar to those of high school diploma graduates, in terms of 12-month attrition (ChalleNGe graduates in the Navy and Air Force had much higher attrition rates). However, our later analysis revealed that, over time, the attrition rates of ChalleNGe graduates across all four Services rose to be quite a bit higher than the rates of traditional high school diploma graduates [6].

The sponsors of the ChalleNGe program expressed concerns over our results because the survey captured very few ChalleNGe recruits; the sponsors suspected that many ChalleNGe recruits were actually entering the Services only after achieving additional education credentials. Also, the ChalleNGe program records indicated that far more ChalleNGe graduates entered the military than CNA's survey located. Therefore, this research focuses on all ChalleNGe graduates over the life of the program. By using detailed data kept by the program, we are able to do two things. First, we analyze the ChalleNGe program itself in detail; second, we use identifying information on the ChalleNGe files that DMDC matched against its files to locate *all* ChalleNGe participants who ever enlisted. With this more complete sample, we are able to perform more detailed analysis. Of course,

more than 5 years passed between collecting the CNA survey data and pulling the ChalleNGe program data for the current analysis. During this time, new ChalleNGe programs have opened and many more people have completed ChalleNGe. This also helps to provide us with a much larger sample than we had in our initial analysis.

Data and methodology

Data

ChalleNGe program data

Our primary source of information is data on all participants from all ChalleNGe programs. We have at least some information, including SSNs in most cases, on roughly 115,000 people who at least expressed interest in a ChalleNGe program between 1999 and 2004, inclusive.[4] ChalleNGe records have basic information on three groups:

1. Those who entered and graduated from a ChalleNGe program

2. Those who entered a program but were terminated before graduation

3. Those who expressed interest in, but did not enter, a program.

Of the roughly 60,000 who entered a ChalleNGe program, about 64 percent completed the program. We use the ChalleNGe program data to explore questions about which people are most likely to participate in ChalleNGe (of those who express an interest), as well as who is most likely to complete the program (of those who enter), and who is most likely to complete a GED or other credential (among graduates). We refer to those who graduated from a ChalleNGe program as *graduates,* to those who were terminated from a program as *nongraduates,* and to all who expressed an interest (whether they entered a program or not) as *participants.*

The Defense Manpower Data Center keeps official records on all enlistees (across all Services). We requested that DMDC match our

---

4. Program data include very little information before 1998; the 1998 data have extensive missing information, so we exclude this year from our analysis of ChalleNGe outcomes. See appendix A for more details.

SSN list of all ChalleNGe participants (including graduates, nongraduates, and those who never entered the program) to their files.[5] According to DMDC's files, nearly 8,500 ChalleNGe participants enlisted between FY99 and FY04, inclusive. This match produced a file that includes both ChalleNGe program information and data on military success. We use this matched dataset to determine which ChalleNGe participants enlist, as well as their military performance. See appendix A for more details on the data.

DMDC longitudinal sample

DMDC also provided us with a basic extract of all enlistees whose official records indicate that they completed ChalleNGe programs in FY93 through FY04. (To parallel our analysis of the ChalleNGe program data, we focus on FY99 through FY04.) We also requested that DMDC include data on those who enlist with a traditional high school diploma, those who enlisted with a GED, and those who enlisted with no credential (i.e., dropouts) during the same time period. We use these data to describe general characteristics of ChalleNGe graduates in the military and to indicate the total number of enlistees who have official education credentials indicating ChalleNGe completion. See appendix A for descriptive statistics of these data.

For various reasons, we believe it is likely that some ChalleNGe graduates' official records will indicate other education credentials. For example, a ChalleNGe graduate who completes high school before enlistment will be considered a high school graduate; a ChalleNGe graduate who completes a semester at a community college before enlistment will be considered to have "some college." Also, some programs award high school diplomas. Finally, because the ChalleNGe credential is relatively new, misclassification of those who have completed ChalleNGe may occur. Therefore, our main analysis rests on the ChalleNGe program files, matched to DMDC's files for measures of military success (as discussed above). Because most of our analysis uses DMDC's files to measure attrition of various groups, these data

---

5.   In particular, we thank Deborah Williamson of DMDC for her work matching the files.

are the most appropriate for measuring the success of (identified) ChalleNGe graduates in the military.

Methodology

Our methodology relies on both summary statistics and regression analysis. In brief, we use summary statistics to explore differences between groups (i.e., those who graduate from ChalleNGe versus those who do not). In many cases, these groups differ in ways that are likely to affect their probability of completing the ChalleNGe program: for example, graduates have higher initial standardized test scores than nongraduates. We use regression analysis to separate out the influence of these various factors. We would like to know, for example, what portion of ChalleNGe program success is associated with program differences versus individual differences.

Using the different datasets discussed earlier, we look at a number of different outcomes, as listed below. Following the list, we briefly discuss our reasons for selecting the variables we include in our analysis.

- **ChalleNGe program data**

    — *Acceptance/entry into ChalleNGe program:* We compare those who enter the program with those who do not.

    — *Graduation from ChalleNGe:* Among those who enter, we compare those who successfully complete the program with those who do not

    — *Attaining a GED (or other credential):* Among ChalleNGe graduates, we compare those who attain GEDs with those who do not. Some programs award high school diplomas or other credentials; we classify those with alternate credentials as having GEDs. (While we focus on ChalleNGe graduates, it is likely that some who do not graduate earn GEDs, but ChalleNGe records on those people are limited).

- **ChalleNGe program data merged with DMDC files**

    — *Joining the military:* We compare those who join the military with those who do not.

— *Success in the military:* We look at several indicators of military success; completion of service (lack of attrition) is our primary measure. We test the hypothesis that performance in a ChalleNGe program affects eventual military success.

- **DMDC longitudinal file.** We compare success in the military of ChalleNGe graduates and those with other credentials. We also include analyses of attrition rates at several points, based on official DMDC education credentials (see appendix A).

Success in the ChalleNGe program, and beyond, is likely to depend on many factors. Some of these factors are characteristics of the person in the program, but characteristics of the program could certainly affect success as well. We have some demographic information on ChalleNGe participants, including age at enlistment, gender, ethnicity, and family income. We would like to have more complete information, such as quality of school attended, family structure, and quality of neighborhood where the person lived. Because we do not have such information, the variables we have will serve as "proxies" for other unmeasured characteristics. For example, ethnicity may proxy for the type of neighborhood where the participant lived, and perhaps the quality of schools available. Gender may proxy for the participant's attitudes; we expect that men and women have different expectations and that, for example, women who enter ChalleNGe programs may be more self-confident than other female high school dropouts. We have a categorical measure of family income, but we interpret this variable with caution because we know nothing about family structure—some people may have indicated only their own earnings—and because we suspect that teens have only limited knowledge about their families' finances anyway.

We also include a measure of the initial Test of Adult Basic Education (TABE) score, as well as an indicator of initial physical fitness, as factors that may affect completion of ChalleNGe (we use initial measures because, in most cases, we do not have final measures on those who do not complete the program). We include measures of the final TABE score, as well as physical fitness upon leaving the program, as measures that may affect both the probability of getting a GED and military success.

Finally, because program-level differences could be important explanations of success, we include an indicator for which program the participant entered and a measure of the calendar year to control for other time-varying factors (such as the unemployment rate).

In each case, we first look at descriptive statistics to see whether people with different outcomes differ in obvious ways. We next include regression analysis to separate out various effects—for example, those related to the person's characteristics versus those related to characteristics of a specific ChalleNGe program.

Results

Our results section is organized by outcome. In each case, we first discuss descriptive statistics and then include a summary of our regression results. We list our outcomes below:

- Acceptance into a ChalleNGe program

- Graduation from a ChalleNGe program (for those accepted)

- Attaining a GED (for those who graduate from ChalleNGe)

- Joining the military (for all ChalleNGe participants)

- Military success (for those who join the military).

Acceptance into a ChalleNGe program

Descriptive statistics

ChalleNGe programs gather information not only on those who actually join the program but also on those who show an interest but do not apply and those who apply but are rejected. There are racial differences between these three groups (see figure 1). Youth in the "Applied and accepted" group are more likely to be either white or Hispanic and less likely to be African-American than the "Applied but rejected" group. Table 1 shows differences between these groups in terms of income. Compared with the "Applied and accepted" group, the "Showed interest but did not apply" group is disproportionately from the lowest income group. The "Applied but rejected" group is similar to the "Applied and accepted group."

Differences in the "Showed interest but did not apply" group and the other two groups could be driven entirely by differences in the data collected by each program. For instance, New Jersey reports that over 40 percent of those who showed an interest did not apply, while Camp Minden in Louisiana reports no one in that category. This

suggests that some programs are more complete than others in what they report. If so, one possible explanation why the "Showed interest but did not apply" group is disproportionately more likely to be minority compared with the other groups may be that programs that are disproportionately more likely to serve minorities are also more likely to report those who showed an interest but did not apply.

Figure 1. Race/ethnicity by status
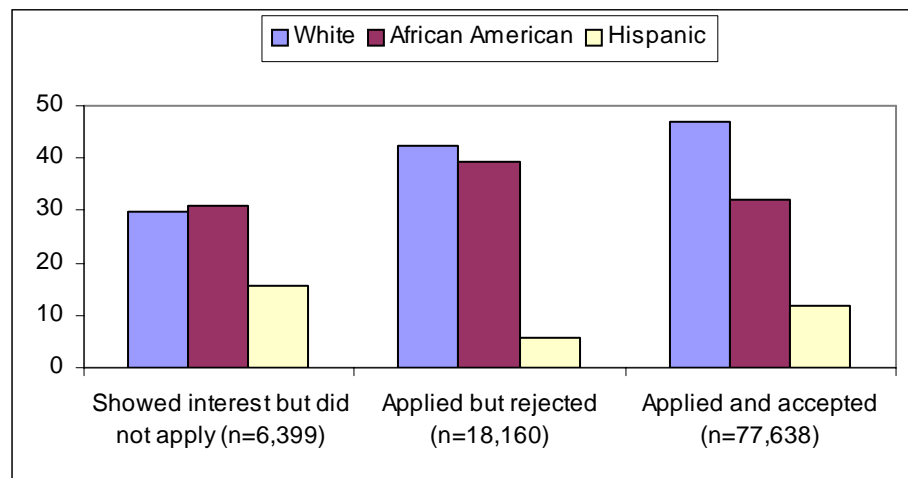
Table 1. Family income by status

Family income	Showed interest but did not apply	Applied but rejected	Applied and accepted
Less than $15,000	97.7%	84.9%	87.3%
$15,000-$25,000	1.5%	8.3%	6.0%
$25,000-$35,000	0.2%	1.7%	2.4%
$35,000-$45,000	0.1%	1.1%	1.0%
Greater than $45,000	0.6%	4.0%	3.4%
Number of observations	5,491	13,929	59,442

Figure 2 shows the percentage of applicants who were rejected by each program. There is a great deal of variation in the rejection rate

across the programs, ranging from 1 percent (Illinois and Arizona) to 43 percent (Hawaii). Eight programs had rejection rates over 30 percent, while five programs had rejection rates under 5 percent. Again, these differences could be entirely driven by differences in the data collected by each program.

Regression results

Due to the differences in the data reported by the various programs as well as the differences in how the various programs are implemente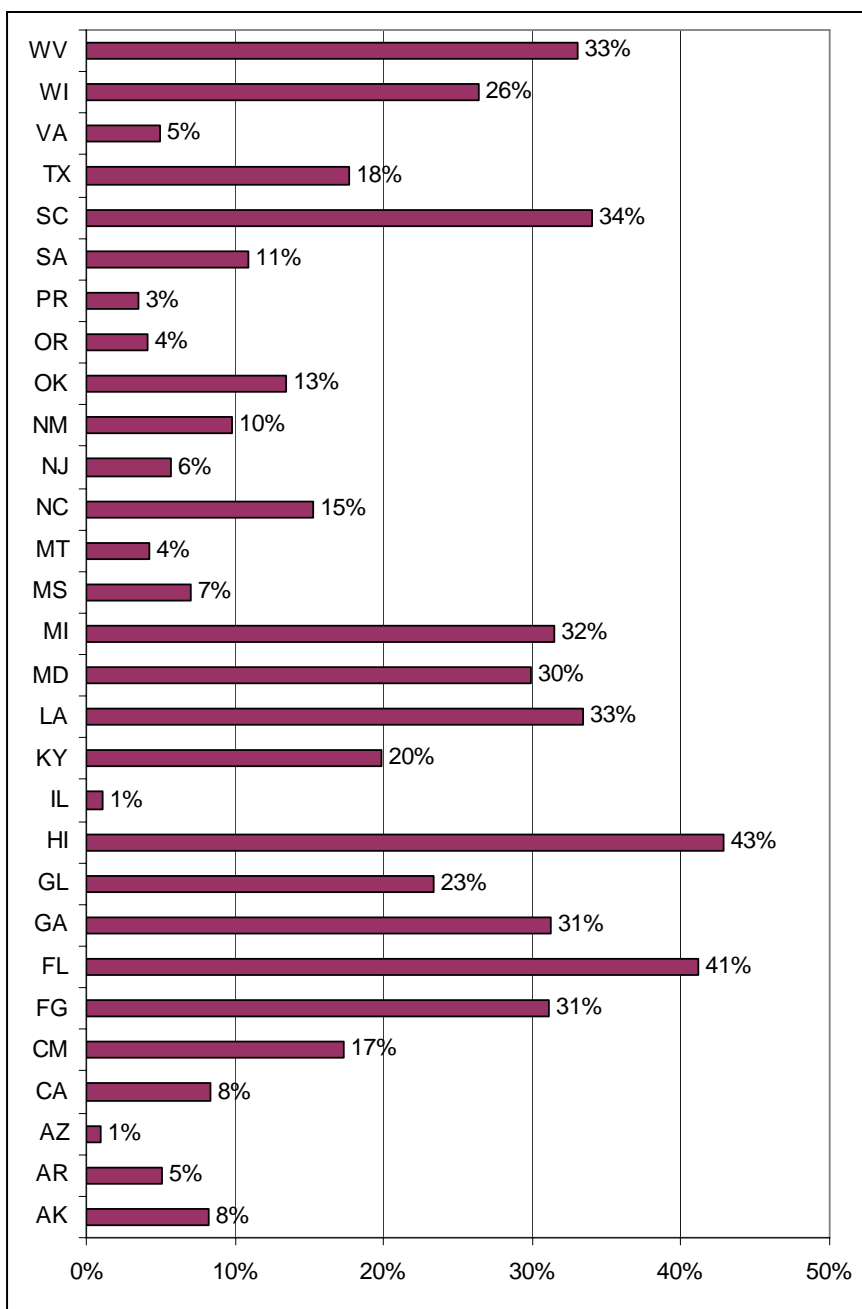d, it can be hard to interpret the differences in the means between the three groups: "Showed interest but did not apply," "Applied and accepted," and "Applied but rejected." Any of the differences in the demographics between the three groups may be driven entirely by differences in the demographics of the population served by the various programs. To isolate the effect of demographic variables on both the probability of applying after showing an interest and on the probability of being accepted after applying, we use regression analysis.

Throughout the results section, we model a variety of dichotomous outcomes; these outcomes can be thought of as taking on a value of 0 or 1 (or, equivalently, "yes" or "no"). In such cases, linear regression is not appropriate. Rather, we use a logit (logistic) regression. In such a regression, the coefficients have a nonlinear relationship with the dependent variable. For this reason, we include "marginal effects" in our results that follow; full regression results for each model are included in appendix B.[6] The marginal effect is the change in the estimated probability of ChalleNGe graduation due to a one-unit change in the variable. Like our dependent variable, most of our variables of interest (sometimes referred to as "independent variables")

---

6. Our models in this section and the next are "fixed effects" models. We use control variables for the program, year, and class. These variables control for program-specific factors that do not change over time, as well as for time-varying factors that affect all programs. Because our individual variables (such as gender) are measured at a different level than our program variables, our standard errors are biased; to correct for this bias, we also "cluster" the standard errors on the program.

Figure 2.   Rejection rates by ChalleNGe program

Figure 2.   Rejection rates by ChalleNGe program

| Program	Rate
WV	33%
WI	26%
VA	5%
TX	18%
SC	34%
SA	11%
PR	3%
OR	4%
OK	13%
NM	10%
NJ	6%
NC	15%
MT	4%
MS	7%
MI	32%
MD	30%
LA	33%
KY	20%
IL	1%
HI	43%
GL	23%
GA	31%
FL	41%
FG	31%
CM	17%
CA	8%
AZ	1%
AR	5%
AK	8%

are dichotomous. In such cases, the marginal effect refers to the change in the predicted probability of completing the ChalleNGe program due to, for example, being female (versus male). These regression-adjusted marginal effects hold all other factors constant and thus isolate the effect of being female, for example, from the effect of having a high TABE score.

Figure 3 shows the predicted probabilities for each ethnicity. It is striking that, despite statistically significant differences[7] in terms of applying after showing an interest and of being accepted after applying, these differences are not large in magnitude. Both the probability of applying after showing an interest and the probability of being accepted after applying vary by only 1 or 2 percentage points.

Figure 3.   Predicted probabilities for different races/ethnicities

---
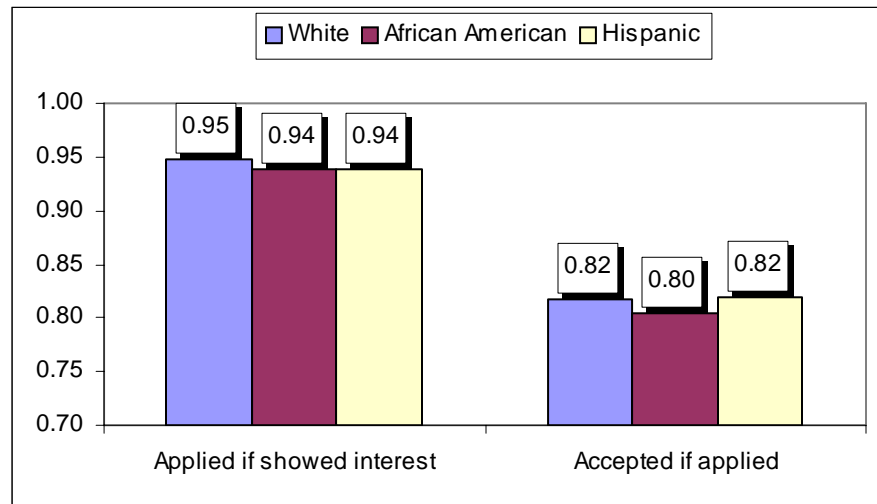
7. The difference between white and African-American is statistically significant at the 1-percent level for both the probability of applying after showing an interest and the probability of being accepted after applying. The difference between white and Hispanic is not significant at the 5-percent level for either the probability of applying after showing an interest or the probability of being accepted after applying.

The only other demographic variables that are statistically significant[8] are age and family income for the "applied if showed interest" regression (see table 2). While the probability of applying is statistically larger for 17- than for 16-year-olds, the difference is very small. The probability of applying is higher both for those with family incomes of $25,000 to $35,000 and greater than $45,000 compared with those with family income less than $15,000. But, again, the differences are less than 5 percentage points.

Table 2.   Predicted probabilities for various ages and income levels

Variable	Predicted probability of applied if showed interest
16 years old	0.994
17 years old	0.996
Family income less than $15K	0.930
Family income $25k - $35K	0.974
Family income greater than $45K	0.968

In conclusion, while there are statistically significant differences in terms of who applies and who is accepted, the magnitude of these effects is quite small.

ChalleNGe graduation

Descriptive statistics

To begin, table 3 shows some statistics on ChalleNGe participants—divided into those who completed ChalleNGe (graduates) and those who entered but did not complete ChalleNGe (nongraduates).

---

8. We discuss only those regression results that are statistically significant at the 5-percent level or better. Thus, for any result discussed, there is less than a 5-percent chance that it occurred by chance. Most of the results discussed meet higher thresholds (i.e., 1 or 0.1 percent), but we use the widely accepted 5-percent threshold as our cutoff. The complete regression results in appendix B include levels of statistical significance.

Table 3. Descriptive statistics on ChalleNGe participants

	Graduates	Nongraduates
Male	81%	82%
Ethnicity:		
Asian/Pacific Islander	2.7%	1.8%
American Indian	2.6%	3.7%
African-American	29%	32%
Hispanic	13%	11%
White	49%	47%
"Other"	3.7%	4.5%
Age at entry	16.7	16.7
Age missing	2%	53%
Family income:		
< $15,000	66%	69%
$15,000 - $25,000	5%	4%
$25,000 - $35,000	2%	2%
$35,000 - $45,000	1%	1%
> $45,000	4%	2%
Family income missing	22%	22%
Initial TABE score	7.4	6.7
Initial TABE score missing	61%	82%
Initial physical fitness level	0.03	-0.01
Initial fitness level missing	13%	70%
Jan-June class	51%	50%
July-Dec class	49%	50%
N	36,906	21,140

In this section of our analysis, we do not include variables that indicate characteristics of the person's ChalleNGe experience, such as the number of contacts with a mentor or TABE posttest scores. Nongraduates are likely to differ on these measures simply because they left the program before graduates; thus, those who leave early will, by necessity, have less mentor contact and be unlikely to have posttest scores. When looking at the likelihood of earning a GED in the next section, however, we examine only graduates and do include such variables.

As indicated in table 3, ChalleNGe graduates differ from ChalleNGe nongraduates on several attributes. Although the vast majority of ChalleNGe participants are male, a slightly higher proportion of

women than men graduate. In terms of ethnicity, most groups complete the program at about the same rate, although African-Americans are slightly less likely than others to graduate while Hispanics and whites are slightly more likely. Of those who report income, the majority of participants report a family income of less than $15,000 per year.[9]

The TABE results indicate that, on average, both graduates and nongraduates score well below grade level in terms of academic achievement, but those who will eventually graduate from ChalleNGe have higher initial scores than those who will not graduate. Nongraduates test, on average, at the 7th month of the 6th grade upon entry; graduates are about 6 months ahead on average, testing at the 4th month of the 7th grade (a score of 7.4 indicates the 4th month of the 7th grade).[10]

The ChalleNGe program data include information on many different physical fitness tests. However, many records do not include complete information. To standardize the information, we gathered all diagnostic test scores on each participant, selected the highest test scores in each subcategory when the person had multiple scores, and standardized the average. We standardized men's and women's scores separately. Therefore, a man who entered ChalleNGe at an average fitness level (compared with the sample of all men) has a score of 0; an average woman has the same score. Scores above 0 indicate above-average fitness; scores below 0 indicate below-average fitness. A fitness score of 1.0 indicates that the man or woman was more fit than 84 percent of ChalleNGe entrants. A score of 0.68 indicates a fitness level in the top 25 percent; a score of -0.68 indicates a fitness level in the bottom 25 percent of all ChalleNGe entrants. Initial fitness levels of

---

9. For comparison, the 2000 Census indicates that, among 16- to 18-year-olds who are not in school, have not completed high school, and live with at least one parent or stepparent, median household earnings in 1999 were $33,800. The 25th percentile of earnings for this group was $17,000, indicating that most ChalleNGe participants come from families whose income is in the lowest quartile. An income of $45,000 falls near the 65th percentile for this group. As seen in table 3, 22 percent of graduates and 22 percent of nongraduates reported no family income.

10. See appendix A for details about missing TABE scores.

those who graduate and those who do not are quite close (within a couple of percentage points).[11]

To present the information in a slightly different manner, we look at the graduation rates of various subgroups. As table 4 shows, women graduate at a higher rate than men (consistent with the information shown in table 3), but the difference does not seem to be solely tied to gender. When we look at ethnic groups by gender, we see that the pattern for men and women varies. For example, as shown in the same table, black women graduate at a much higher rate than black men, but white women graduate at a lower rate than white men.

Table 4.   Graduation rate, by group

Group	Graduation rate
All males	63%
All females	65%
African-American males	60%
African-American females	66%
Caucasian males	65%
Caucasian females	64%
Family income < $15,000	63%
Family income > $45,000	75%
TABE pretest >= 9.3	83%
TABE pretest <= 5.2	73%
TABE pretest missing	57%
Initial physical fitness, top 25%	83%
Initial physical fitness, bottom 25%	79%
Initial physical fitness, missing	24%
First class (Jan-June)	64%
Second class (July-Dec)	63%
Year:	
1999	61%
2000	63%
2001	65%
2002	64%
2003	65%
2004	63%

11. See appendix A for more details about the physical fitness data.

Also consistent with the descriptive statistics shown in table 3, we see in table 4 that those with higher family incomes are more likely to graduate; table 4 also makes it clear that the difference is quite large. Those who enter the program more physically fit are slightly more likely to graduate; the same is true of those who enter with higher TABE pretest scores. TABE scores, in particular, appear to be fairly important. Those scoring at the 9th grade, 3rd month level (the 75th percentile) on their initial TABE test are about 10 percentage points more likely to graduate than those scoring at the 25th percentile (the 2nd month of 5th grade). This difference is much greater than the difference between the 25th and the 75th percentile of physical fitness. We note that those with missing TABE scores graduate at a very low rate probably because many left the program before completing the TABE. However, the majority of those with quite low TABE scores complete the program successfully.

Finally, differences across time are fairly small; the graduation rate has been roughly constant over the years included in our sample. Those in the first class of each year graduate at a slightly higher rate than those in the second class.

Our descriptive statistics indicate that several individual factors are related to graduation rates. Next, we use multiple regression analysis to separate the effects of various individual factors (gender, ethnicity, family income, initial TABE score, etc.) from program effects.

Regression results

We model the probability of ChalleNGe graduation for all who enter the program, controlling for all of the characteristics in table 3.[12] Figure 4 shows the marginal effects of some of the variables of interest. Our results indicate that individual characteristics matter for completing ChalleNGe. In each case, figure 4 shows the regression-adjusted marginal effect; this effect holds constant all other individual factors (such as test scores and physical fitness) as well as program and time effects.

---

12. Full regression results appear in appendix B, table 17.

Figure 4.   Regression-adjusted graduation rates, by gender and ethnicity
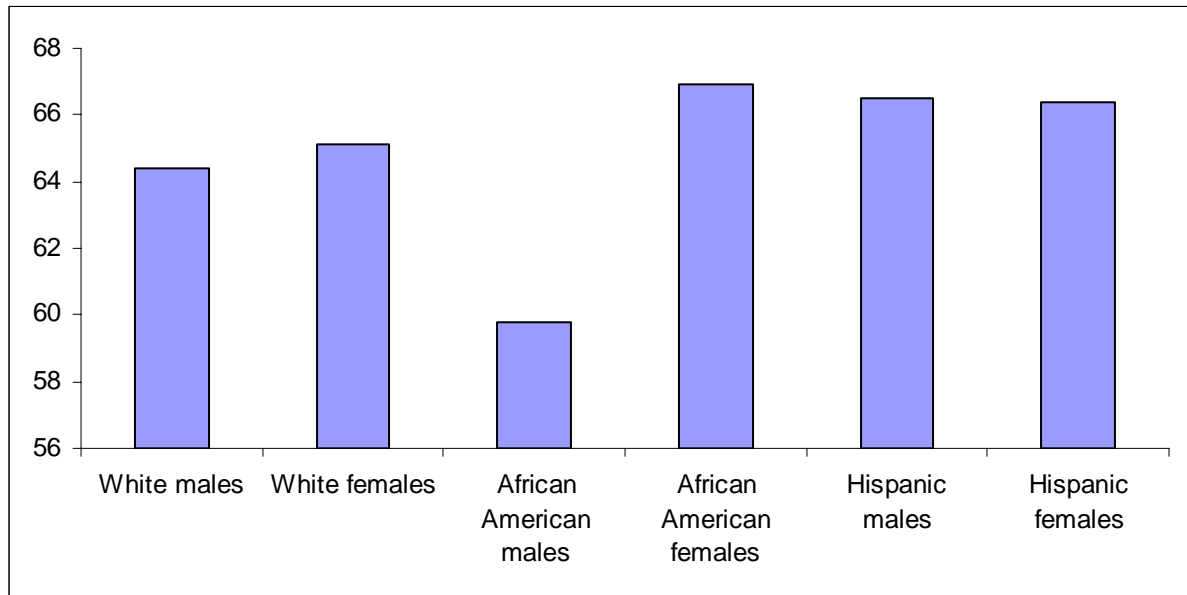
First, we note that both ethnicity and gender have an effect on graduation rates. While white (Caucasian, non-Hispanic) women are slightly more likely to graduate than white men, African-American women are much more likely than African-American men to graduate. This difference among Hispanics is small. In most cases, the gender effects are smaller than the ethnicity effects; however, we emphasize that African-American males, in particular, graduate at a rate much lower than other groups, while African-American women graduate at a rate higher than any other group.

Other factors also matter for graduation. For example, figure 5 shows that those who come from families with higher incomes graduate at substantially higher rates. This could be due to family resources, or to the quality of the schools these students attended, or to other factors. Figure 5 also shows that graduation rates vary somewhat based on initial physical fitness. Finally, given our descriptive statistics, it is no surprise that having a higher initial TABE score increases the probability of completing a ChalleNGe program. However, the size of the test score effect is roughly the same as the physical fitness effect (in each case in figure 5, we compare the graduation rates of those at the 25th,

50th, and 75th percentiles). Recall that, in the descriptive statistics, the TABE effect was larger; this indicates that those with high TABE scores also tend to have other characteristics that improve the probability of graduation (e.g., they may come from families with relatively high incomes). Therefore, both physical fitness and TABE scores seem important in completing the program successfully. Finally, we found that those who enter the first class of each year have a higher probability of completing the program than those who enter the second class (the effect is small but statistically significant, consistent with our descriptive statistics).

Figure 5. Graduation rates by family income, physical fitness, test scores, and class
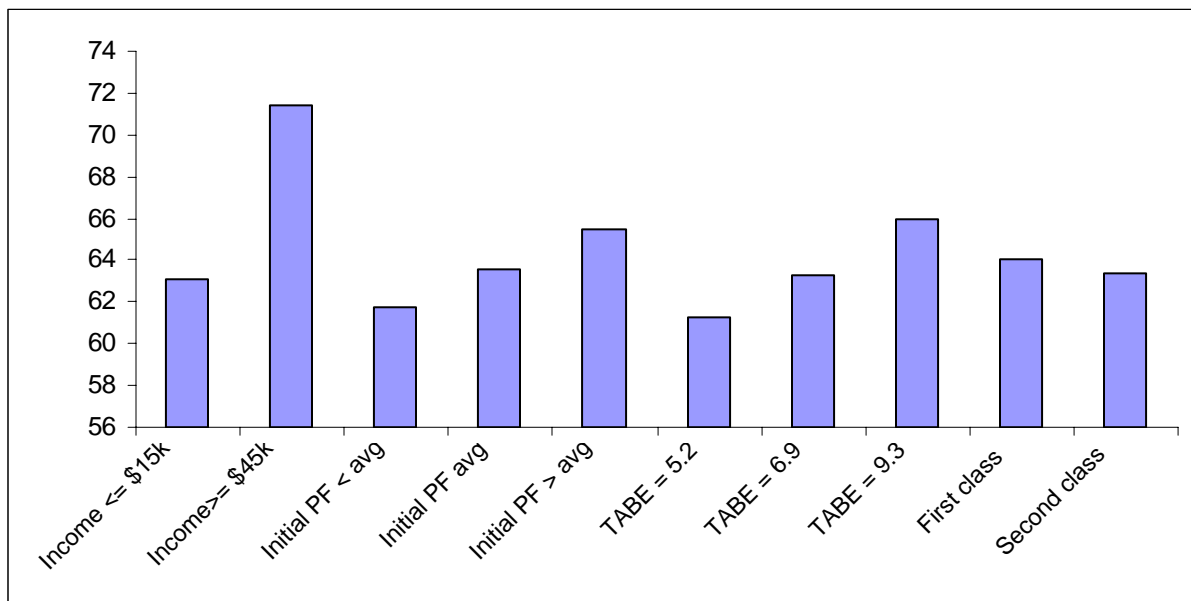
It seems likely that there are substantive program effects. That is, holding constant the measured characteristics of the ChalleNGe participants (such as gender, ethnicity, family income, and TABE scores), participants in some programs are more likely to complete than those enrolled in other programs. Therefore, we use program-level fixed effects in our regressions. Because these differences could arise from a number of causes, such as differences in admissions pro-

cedures, differences in the populations in the states where program are located, differences in how the programs operate, or differences in how data are collected, it is difficult to interpret the program-level fixed effects. We discuss program-level fixed effects from all regressions in a separate subsection at the end of the Results section.

Those who participate in ChalleNGe more than once

The ChalleNGe program data reveal that some people participate in programs more than one time. Specifically, the data indicate that over the sample period, 1,479 people participate in ChalleNGe more than one time (the vast majority participated twice, but 30 people participated three times and 1 person participated four times). This group was distributed fairly evenly across programs and years. Of those who participated twice, 745 initially failed to graduate but then graduated on their second attempt, while 682 failed to graduate on either attempt. The most common pattern is for a person who fails to complete ChalleNGe to enter again in the next class.

Earning a GED in ChalleNGe

Descriptive statistics

Next, we look at an important measure of success in the ChalleNGe program—earning a GED.[13] Although most ChalleNGe graduates earn GEDs while enrolled in the program, some 30 percent earn no credential. For this analysis, we include only ChalleNGe *graduates* (nongraduates are unlikely to earn GEDs while in the program; the records of a few indicate that they did, but in 98 percent of the cases there is no indication that a nongraduate earned a GED). We also include those who earn another credential (such as high school diploma or adult education diploma). Some programs award these

13. In roughly 7,300 cases, we cannot determine whether the ChalleNGe graduate earned a GED. These cases seem to be randomly distributed; they are not concentrated in any program or year, and those with missing GED information resemble the rest of the sample on most measures. In this section, we include only those graduates whose records indicate whether they earned GEDs.

credentials instead of or in addition to a GED. Thus, in fact, we measure whether each ChalleNGe graduate earns *a GED or some other high school credential.*[14]

In table 5, we list key descriptive statistics on those who earn GEDs (or other credentials) and those who do not. In this case, we also include several characteristics of the person's experience in ChalleNGe, such as the amount of mentor contact, because these variables could influence GED success.

In contrast to our graduation results, table 5 indicates that men participating in ChalleNGe are more likely than women to earn GEDs. Indeed, this is true of men and women overall, and of men and women within each ethnic subgroup.

Table 5 also indicates that those who earn GEDs come disproportionately from the highest family income group, perhaps indicating a difference in quality of school attended. TABE scores appear to be quite important; while those who do not earn GEDs gain about as much during the program as those who do (roughly 2 school years in each case), those who earn GEDs enter and exit with substantively higher TABE scores. We add the following caveat to these results: among program graduates, the majority have missing TABE information.

In terms of physical fitness, both those who earn GEDs and those who do not initially score above the mean compared with all entrants. (This is consistent with our finding in the previous subsection that more physically fit cadets are more likely to graduate). Both groups are near the 60th percentile in terms of initial fitness; those who earn GEDs are slightly more fit upon entry than those who do not. Also, those who earn GEDs progress more than the average ChalleNGe participant during their time in the program; upon graduation, those

---

14. We repeated the analysis looking only at earning a GED; the results were substantively similar, but some program effects were quite different because a few programs award nearly all of the adult education and high school diplomas. To be specific, three programs—California, Hawaii, and Oregon—awarded 89 percent of the alternate credentials during our sample period. See appendix A for a discussion of which ChalleNGe programs award other credentials.

Table 5. Descriptive statistics of ChalleNGe graduates, by GED status[a]

	Earned GED	No GED
Male	82%	79%
Ethnicity:		
Asian/Pacific Islander	3%	1%
American Indian	2%	3%
African-American	21%	38%
Hispanic	10%	14%
White	59%	41%
"Other"[b]	5%	3%
Age at entry	16.7	16.7
Family income:		
< $15,000	62%	63%
$15,000 - $25,000	5%	5%
$25,000 - $35,000	3%	2%
$35,000 - $45,000	1%	1%
> $45,000	5%	2%
Family income missing	24%	27%
Initial TABE score	8.6	5.5
Initial TABE score missing	57%	62%
Final TABE score	10.7	7.4
Final TABE score missing	57%	63%
Initial physical fitness level	0.047	0.039
Initial PF level missing	10%	17%
Final physical fitness level	0.07	0.007
Final PF level missing	11%	17%
Contacts with mentor	18.7	19.1
Hours of community service	90.1	78.1
Jan-June class	52%	48%
July-Dec class	48%	52%
N	20,658	8,948

a. "Earned GED" also includes those who earned an alternate credential (adult education diploma or high school diploma) in place of a GED. See appendix A for a discussion of which programs award such alternate credentials.

b. "Other" category includes both those who indicated "Other" and those who did not indicate any ethnicity.

who earn GEDs are at the 68th percentile among those with final physical fitness scores, and those who do not earn GEDs finish the program at about the average. (Note that those who fail to earn a GED *do* make progress in terms of physical fitness during their time at ChalleNGe, but they make less progress than the average participant.) Differences in mentor contact are very small, but those who do not earn a GED actually have more contact with mentors than those who do—perhaps because their mentors understand that they are struggling academically. Finally, those who earn GEDs spend more hours in community service than those who do not, and those who earn GEDs are slightly more likely to be in the first than the second class.

As we did in the graduation section, we next detail the GED rate of various groups. Table 6 indicates that men are more likely to complete GEDs than women; moreover, this pattern generally holds within ethnic groups although the differences are smaller in some groups than in others (American Indians are the exception). Those who come from families with relatively high incomes are much more likely to earn GEDs. Those who enter the program at a higher level of physical fitness, as well as those who leave with a higher level of fitness, are slightly more likely to earn GEDs. Initial and final TABE scores are highly correlated with earning a GED, as one would expect. Those who enter the program below the 6th grade level (in the lowest 25 percent) have a very low likelihood of earning GEDs, despite the fact that these participants gain, on average, 2 years of achievement. Those who enter at or above the 9th grade level (in the top 25 percent) earn GEDs at very high rates. Those in the first class of each year are more likely to earn GEDs, and the rate of GED recipiency varies somewhat across years.

Table 6.   GED recipiency rate, by group[a]

Group	GED recipiency rate
All males	71%
All females	66%
African-American males	58%
African-American females	51%
Hispanic males	64%
Hispanic females	60%
Caucasian males	77%
Caucasian females	76%
Asian/Pacific Islander males	92%
Asian/Pacific Islander females	89%
American Indian males	60%
American Indian females	60%
"Other" males[b]	77%
"Other" females[b]	74%
Age 16 at entry into ChalleNGe program	69%
Age 17 at entry into ChalleNGe program	71%
Age 18 at entry into ChalleNGe program	69%
Family income < $15,000	69%
Family income > $45,000	86%
TABE pretest >= 9.0	96%
TABE pretest <= 5.9	37%
TABE posttest >= 12.3	95%
TABE posttest <= 7.9	34%
Initial physical fitness, top 25%	69%
Initial physical fitness, bottom 25%	66%
Initial physical fitness, missing	57%
Final physical fitness, top 25%	75%
Final physical fitness, bottom 25%	68%
Final physical fitness, missing	59%
First class (Jan-June)	72%
Second class (July-Dec)	68%
Year: 1999	73%
2000	74%
2001	63%
2002	67%
2003	72%
2004	70%

a. "Earned GED" also includes those who earned an alternate credential in place of a GED. Appendix A discusses which programs award such alternate credentials.
b. "Other" includes those who selected "Other" and those with no data on ethnicity.

Regression results

Next, we model GED success very much as we did ChalleNGe success earlier.[15] We include only those who complete the ChalleNGe program, and we include the characteristics of the program discussed previously. Figures 6 and 7 show marginal effects of several significant variables: these are the effects on GED recipiency from changing only the indicated variable while holding all others constant. Once again, gender and ethnicity are factors, as they were in ChalleNGe graduation (see figure 6). However, as was true in the descriptive statistics, across ethnicities men earn credentials at higher rates than women. Also, across the board, minorities earn GEDs at lower rates. Although there is little research on GED passing rates by ethnicity, these findings are generally consistent with those of [10].

As with graduation rates, other factors also affect GED recipiency. As figure 7 shows, those who come from families with higher incomes earn GEDs at higher rates. This could reflect the higher individual resources in those families or the higher quality of schools attended. We find that physical fitness makes little difference in GED recipiency, which suggests that the ChalleNGe program requires both physical fitness and classroom achievement but that the GED depends mostly on classroom achievement. Figure 7 also indicates that the final TABE score is an important determinant of GED recipiency. Although our descriptive statistics indicated that those in the first class are more likely to earn GEDs, our regression results indicate that

---

15. In our regression results, we continue to group anyone who earns an alternate credential (adult education diploma or high school diploma) with those who earned GEDs. When we test a specification excluding those who earned alternate credentials, the results are quite similar but some program effects differ greatly because alternate credentials tend to be assigned to most or all graduates, but only at certain programs. Also, we experimented with including a measure of community service in our regression. We excluded it from the final regression because conversations with program directors indicated that, in some cases, those who competed their GEDs earlier than others performed community service in the interim. Thus, community service may be associated with GED recipiency, but it is unlikely to *cause* people to pass the exam. Results including community service were quite similar to our final specification. Full regression results appear in appendix B, table 18.

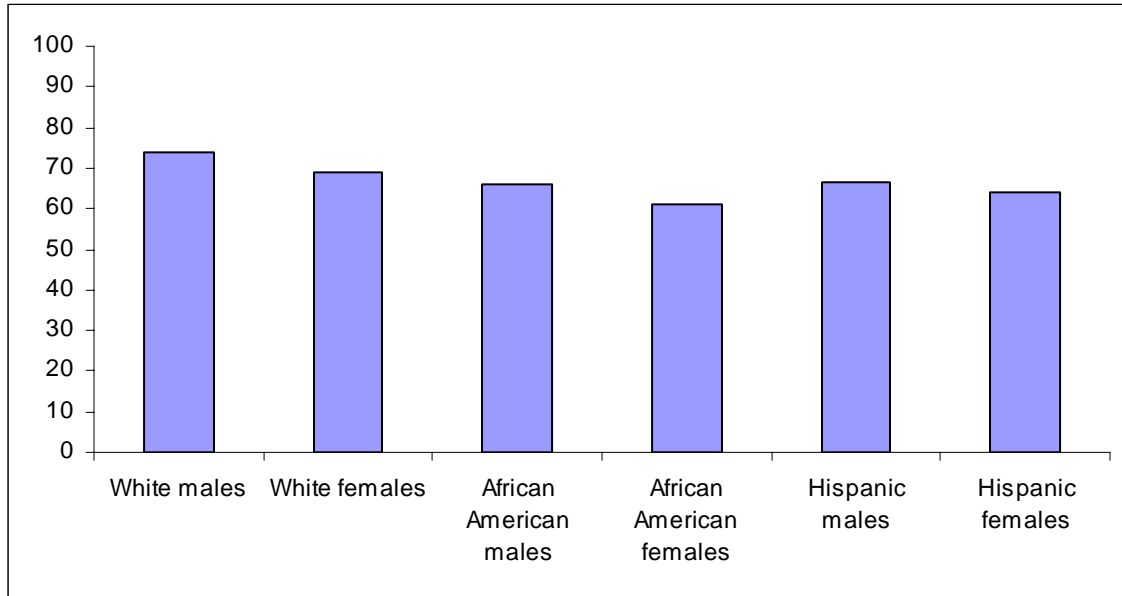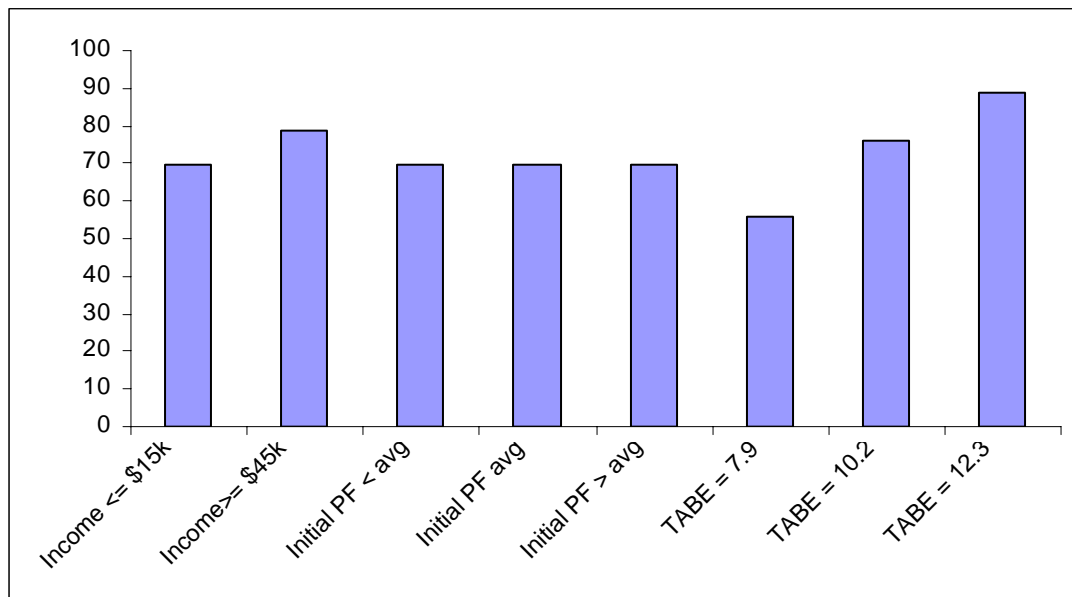Figure 6.   Regression-adjusted GED rates, by gender and ethnicity

Figure 7.   Regression-adjusted rates of GED recipiency, by characteristic

this difference is due to other factors; holding other factors constant, there is no significant difference in GED recipiency between classes.

Finally, as before, we included program-level fixed effects. Also, as before, we discuss these effects in a separate subsection at the end of the Results section. Next, we begin to examine those ChalleNGe participants who eventually join the military.

Which ChalleNGe participants join the military?

In this subsection, we again use DMDC data. We submitted to DMDC a list of Social Security Numbers of *all* participants in our ChalleNGe program files (including those who completed ChalleNGe, those who did not graduate, and even those who showed interest in but never actually entered the program). The DMDC staff matched our list of SSNs to files of all non-prior-service active-duty enlistees for FY93 through FY04; we focus our attention on the data from FY99 to FY04. In this section, we first detail DMDC education codes and compare them with the information included in the ChalleNGe program files. Next, we discuss descriptive statistics and, finally, regression results—explaining which ChalleNGe participants enlist.

## ChalleNGe participants and their official education credentials

Past research has shown evidence of "misclassification." In some cases, Servicemembers who are surveyed indicate that they have different education credentials than those listed on their official records [5, 6]. While it is perfectly plausible that people may exaggerate their own levels of education on surveys, in many cases of misclassification people indicate they actually have *less* education than their records indicate. For example, a Servicemember may indicate that he earned a GED, while his official record indicates that he is a high school graduate. The ChalleNGe data offer an opportunity to measure the extent to which misclassification occurs. We suspect that misclassification may be a particular problem in the case of ChalleNGe graduates because the credential is relatively new.

As shown in figure 8, the number of ChalleNGe participants who enlisted in the military grew fairly steadily from FY98 through FY04

(this figure includes all participants, not just graduates).[16] Next, we use both the longitudinal DMDC dataset (discussed in more detail in appendix A) and the matched ChalleNGe dataset to compare the total number of Servicemembers who took part in ChalleNGe and enlisted in the matched dataset with the number identified by DMDC as having enlisted after completing ChalleNGe and earning GEDs.

Figure 8. Number of accessions who had previously attended ChalleNGe, by fiscal year
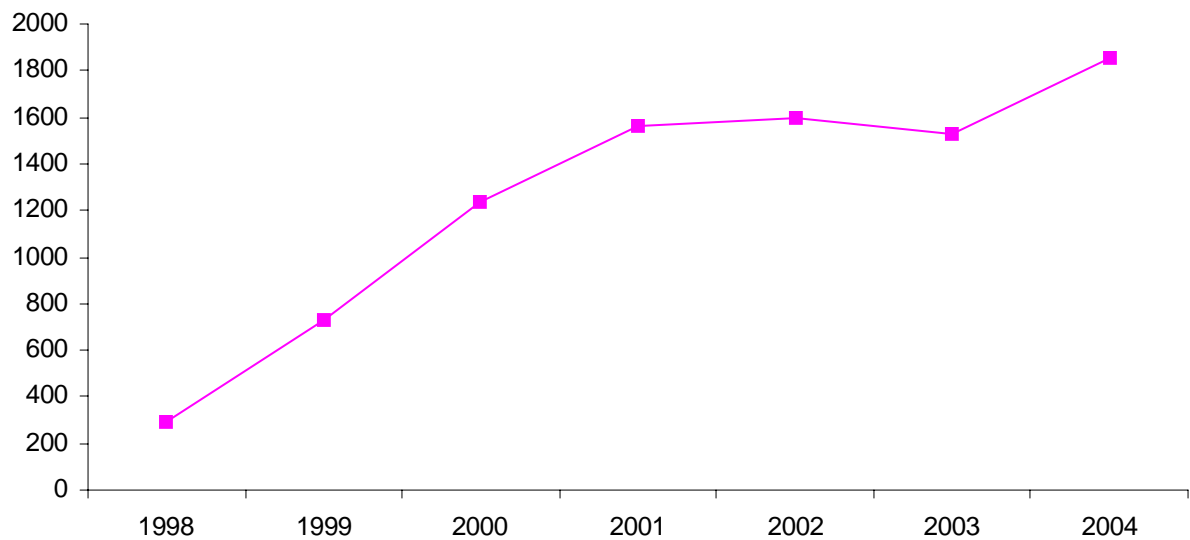
From FY99 to FY04, our matched sample indicates that 8,485 ChalleNGe participants enlisted and that 4,065 of them have records indicating that they were ChalleNGe graduates. Therefore, it appears that a substantial number of ChalleNGe participants enlist with a different (non-ChalleNGe) education credential. Some did not complete the ChalleNGe program (or did not earn GEDs); others earned high

16. For comparison purposes, we note that the official DMDC education codes indicate that 4,999 non-prior-service accessions entered the Services in FY99 through FY04 with ChalleNGe education credentials, only 12 enlistees with ChalleNGe credentials entered in FY98, and none entered between FY93 and FY97 because the ChalleNGe credential was established in FY98 and became widespread in FY99 with the advent of the pilot program. For this reason, we focus on FY99 through FY04.

37

school diplomas through ChalleNGe; others may have earned additional credentials after completing ChalleNGe. Figure 9 shows that more than three-quarters of ChalleNGe participants who enlist first completed a ChalleNGe program. About 6 percent entered a program but were terminated, and a larger group expressed interest but did not enter a program. However, this suggests that most of the ChalleNGe participants who enlist are indeed ChalleNGe graduates.

Figure 9. ChalleNGe outcome of eventual enlistees[a]
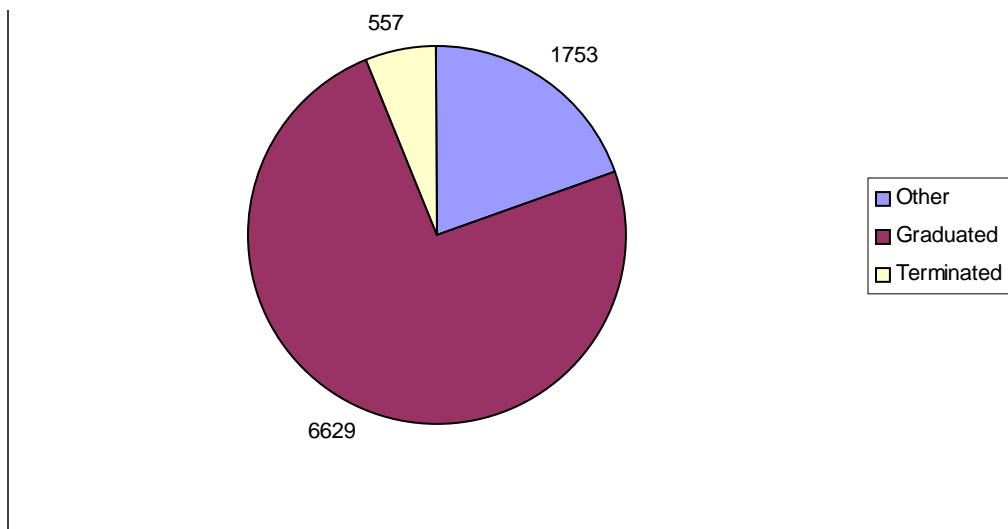
a. "Other" category includes "Pending," "Unregistered," "Rejected," "Not Applied," and "Deceased."

Next, we compare the total number of ChalleNGe graduates in our matched sample with the number in the DMDC longitudinal file. As shown in figure 10, we identify fewer ChalleNGe graduates in the matched dataset than in the DMDC longitudinal dataset each year. In most cases, however, we can identify the majority of those who should have ChalleNGe credentials, and over time the total number of ChalleNGe enlistees in the matched dataset grows closer to DMDC's total. We believe that the difference is at least partly due to quality problems with the SSN data in the ChalleNGe program files. But the decrease in the difference over time is consistent with an improvement in the quality of the ChalleNGe program data over time.

Figure 10. Enlistees with ChalleNGe credentials
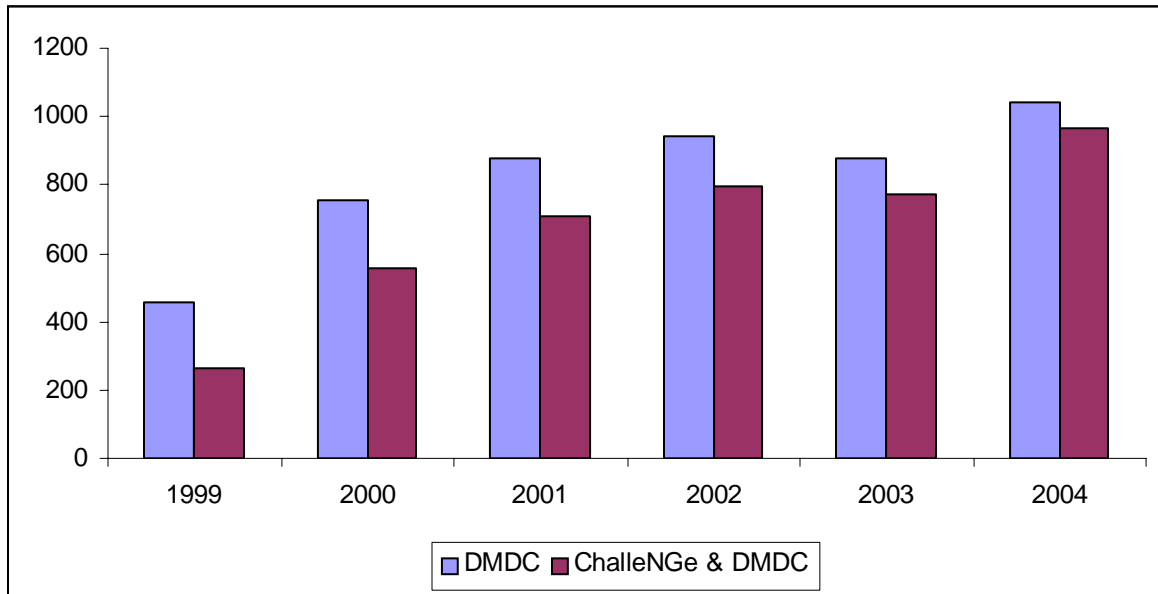
It is impossible for us to say how many, if any, of those who enlisted with ChalleNGe credentials did not participate in ChalleNGe. Because of the large number of illegitimate SSNs in the ChalleNGe program files, we expect our match of 8,485 to be a lower bound on the true number of ChalleNGe participants who enlisted, but we simply cannot estimate the legitimate number of ChalleNGe enlistees beyond stating that the number is larger than 8,485.

Next, we explore in more depth the credentials of those who participate in ChalleNGe. Recall that ChalleNGe program officials have indicated that some who complete the program return to school and, therefore, may enlist with additional credentials (i.e., a high school diploma). Also, some programs award high school diplomas. In these cases, individual DMDC records would not indicate that the person completed ChalleNGe; only one education credential is listed on a person's record. As above, we examine *all* people in the matched dataset—all who participate in or express an interest in ChalleNGe and enlist.

As shown in figure 11, among ChalleNGe graduates, most have official records that indicate they are ChalleNGe graduates. However, a sizable minority enters with other Tier 1 credentials; the official records of a few do not indicate their ChalleNGe status but instead classify their credentials as Tier 2 or 3. Among graduates who enter with other Tier 1 credentials, over one-third come from ChalleNGe programs that award high school diplomas. Many of the rest do not join ChalleNGe immediately and, therefore, could have attained other credentials.

Figure 11. Official education credentials of ChalleNGe participants who enlist[a]
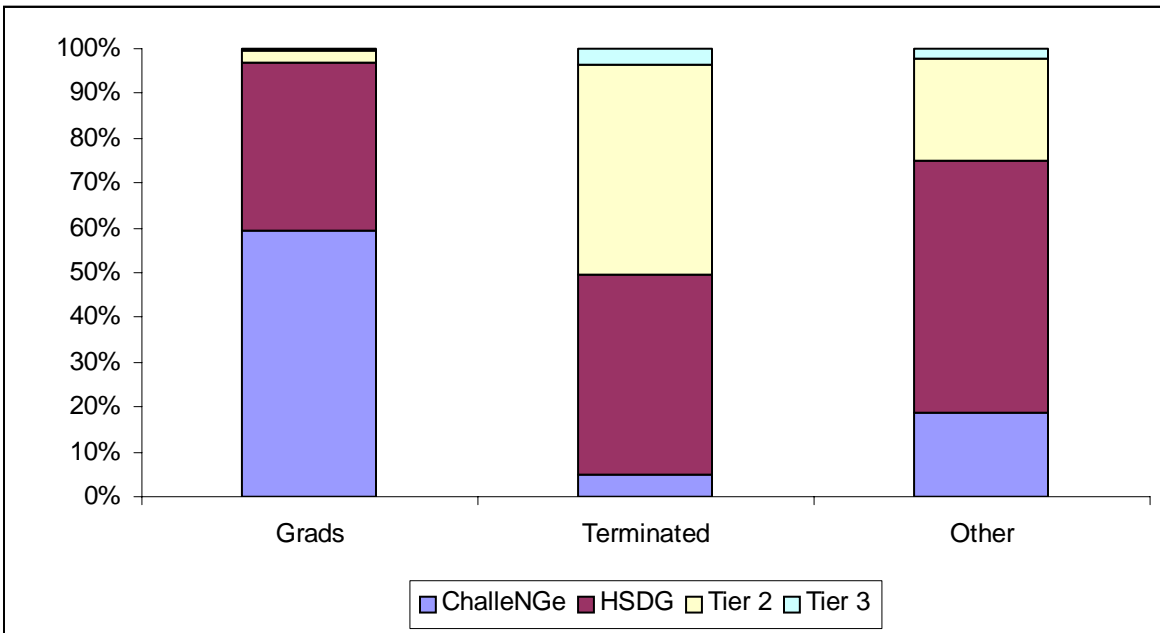
We also looked at how credentials varied over time and across the Services. These differences usually are small, but we note an important exception: over *90 percent* of ChalleNGe graduates who entered the Air Force have official records that indicate they are high school diploma graduates. The vast majority do not come from ChalleNGe

programs that award high school diplomas. It is possible that these ChalleNGe graduates complete high school before enlistment, but the average amount of time between ChalleNGe and enlistment is about the same for this group as for other graduates. We are not able to directly determine the legitimacy of these credentials, but we do note that this discrepancy helps to explain the relatively high attrition rates found among the very small group of Air Force ChalleNGe graduates in the DMDC longitudinal sample (see appendix A) versus the much more modest rates found in our matched sample (described next).

Among ChalleNGe nongraduates, most have other (non-ChalleNGe) credentials. However, a few of this group have records indicating ChalleNGe graduation.[17] Among other ChalleNGe participants, the largest group has official credentials indicating Tier 1 status while nearly one-quarter have credentials indicating Tier 2 (GED) status. Nearly one-fifth have official ChalleNGe credentials. In the case of this subgroup, nearly 90 percent come from programs with questionable status data. Therefore, we suspect that most of this group did, in fact, successfully complete a ChalleNGe program.

We also note that those with different ChalleNGe statuses tend to enlist in different Services. Specifically, patterns of enlistment are similar between graduates and those who neither graduated nor were terminated, but those who were terminated are much more likely to enlist in the Army, and less likely to enlist in the Air Force or Marines, than other ChalleNGe participants. This difference is likely to affect raw attrition rates, but with regression analysis we can adjust for this difference.

In summary, we have some concern that education credentials may not always reflect true educational experience, but in general the pattern of official education credentials is what we would expect. ChalleNGe graduates tend to have ChalleNGe credentials; other participants usually have other credentials.

---

17. It is possible that some who were terminated later reentered and completed ChalleNGe but do not show up in our data due to bad SSNs.

Descriptive statistics

In some ways, ChalleNGe participants who joined the military are similar to all participants. We do find that men are more likely than women to enlist; however, female ChalleNGe graduates enlist at much higher proportions than female high school students. Among ChalleNGe participants/graduates, whites are more likely than others to enlist, while both Hispanics and African-Americans are less likely.

ChalleNGe participants who enlist have much higher TABE scores than other ChalleNGe graduates (this is true for both pretests and posttests; see table 7). However, we also note that ChalleNGe participants who enlist are very likely to have missing TABE scores. This suggests that ChalleNGe enlistees may come from programs with poor record-keeping.

Table 7. Descriptive statistics on ChalleNGe participants, graduates, and military enlistees

	ChalleNGe participants	ChalleNGe graduates	ChalleNGe in military
Male	0.81	0.81	0.91
Black	0.31	0.30	0.21
Hispanic	0.12	0.12	0.08
White	0.50	0.50	0.65
Asian/Pacific Islander	0.03	0.04	0.03
American Indian	0.03	0.03	0.02
Other	0.01	0.01	0.01
Initial TABE	7.3	7.4	9.0
Initial TABE missing	0.36	0.37	0.61
Final TABE	9.5	9.6	11.1
Final TABE missing	0.29	0.34	0.56
ChalleNGe grad		100	

ChalleNGe participants who joined the military are more likely to come from some programs than from others. Of course, the number of participants varies by program. In figure 12, for each program we calculate the proportions of graduates and of participants who join

the military. (There is a positive correlation of 0.84 between the proportion of graduates and the proportion of participants who join the military.) There are vast program differences between the proportion of graduates who join the military. The median program has 18 percent of their graduates join the military, but three programs have more than 25 percent and three programs have less than 10 percent of their graduates join the military.

Figure 12. Proportion of graduates and participants who join the military, by program
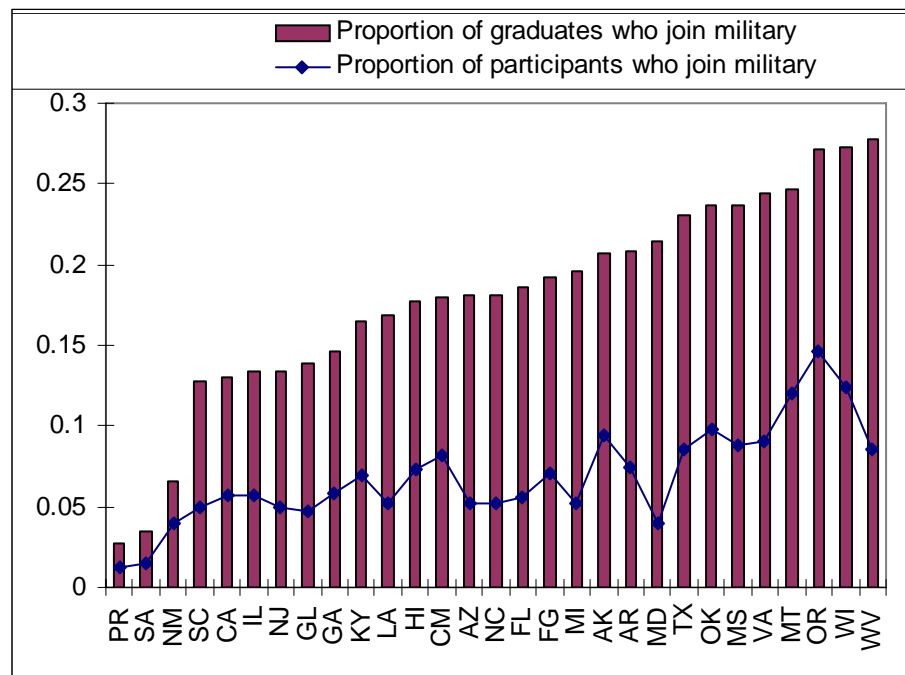
Regression results

We next performed a logistic regression to see which ChalleNGe participants ended up joining the military; we ran separate regressions for men and women. (See appendix B, tables 19 and 20, for full regression results.) As before, we use our regression results to produce predicted probabilities of enlistment; these allow us to measure

and compare the sizes of the effects of different variables. These results are shown in figures 13 through 18.[18]

Figure 13 shows that, for men and women, respectively, the probability of enlisting increases by 14 and 10 percentage points if they earn a GED. Similarly, as shown in figure 14, the probability of enlisting is much lower for those who are terminated from ChalleNGe (2 percent for both men and women) than for those who graduate from the program (22 percent for men, 12 percent for women).[19]

The probability of enlisting is much higher for those cadets who both earn a GED *and* graduate from ChalleNGe than for cadets who only do one or the either.[20] This is consistent with the fact that both of these conditions need to be met in order to enter the military with a Tier 1 credential.

---

18. We obtained results both excluding and including data from those programs with missing data problems as defined in appendix A. We present the results excluding data from these programs but note that only one set of results changes if we include these data. That result is the predicted probability of enlisting for those ChalleNGe participants who are neither graduates nor terminates. For men, the predicted probability of enlisting for this group including data from these programs is 0.16; for women, the predicted probability of enlisting is 0.04.

19. For men, the difference between the probability of enlisting for those who graduate from ChalleNGe and those who neither graduate nor terminate is not statistically significant at the 5-percent level. For women, the difference between the probability of enlisting for those who terminate and those who neither graduate nor terminate is not statistically significant at the 5-percent level.

20. For men, cadets who earn both a GED and graduate have a probability of enlisting of 0.28. Cadets who only earn a GED have a probability of enlisting of 0.20, while cadets who only graduate have a probability of enlisting of 0.12. For women, cadets who earn both a GED and graduate have a probability of enlisting of 0.16. The probability of enlisting for those who only earn a GED is 0.06 and for those who only graduate is 0.05.

Figure 13. Predicted probability of enlisting by GED recipiency status
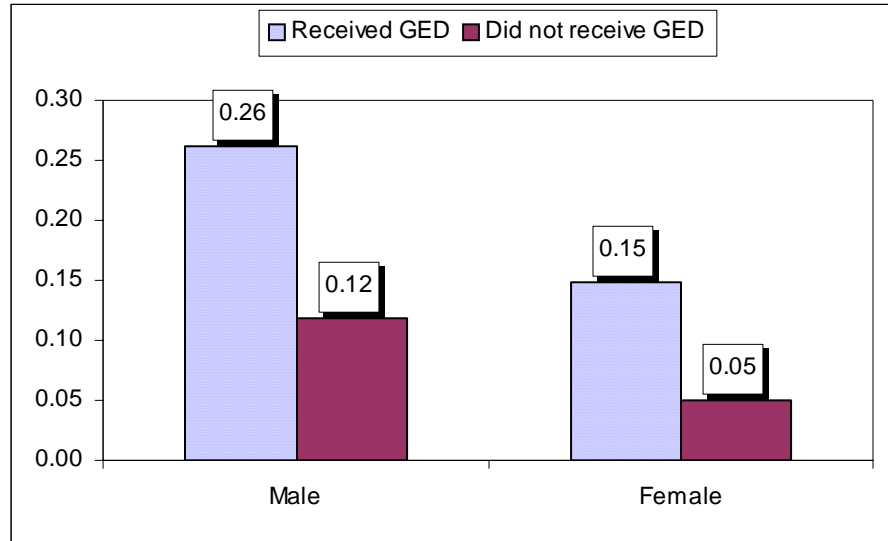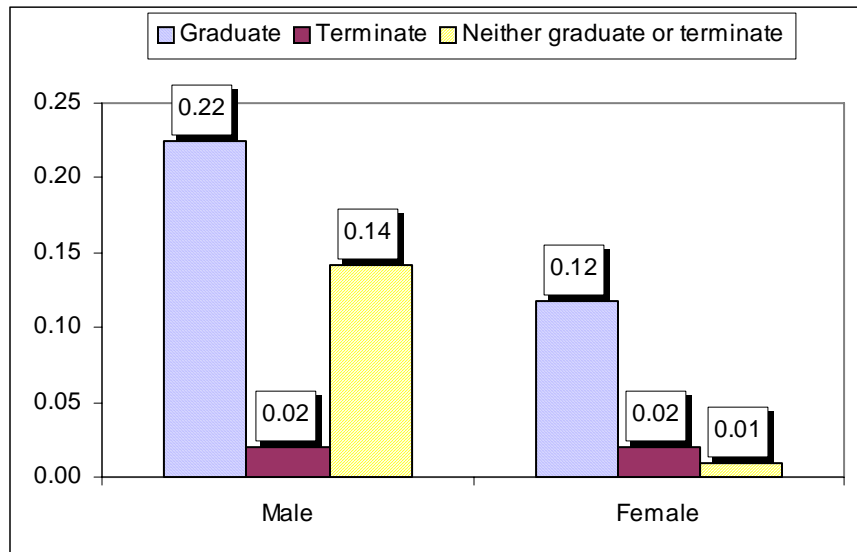

Figure 14. Probability of enlisting by ChalleNGe graduation and
ChalleNGe termination status

There are also large differences in the probability of enlisting by TABE pretest score (see figure 15). Those who score above the 75th percentile are much more likely to reenlist, even holding GED status constant. For men, the probability of enlisting is 8 percentage points higher if they score above the 75th percentile in the TABE pretest than if they score between the 25th and 75th percentile. For women, the probability of enlisting is 7 percentage points higher.

Figure 15. Predicted probability of enlisting by score on TABE pretest
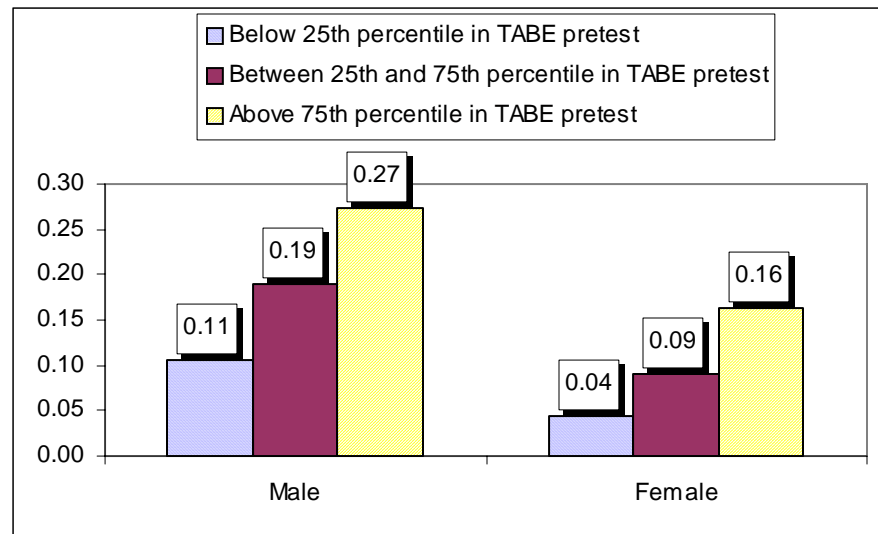
The probability of enlisting is particularly low for those who fail to earn a GED *and* score below the 25th percentile on the TABE pretest. For men, the probability of enlisting is 5 percent for this group, and, for women, the probability of enlisting is 2 percent. It is likely that few in this group can meet the AFQT requirement.

Age also matters in terms of the probability of enlisting. Those who enter ChalleNGe at age 16 are less likely to enlist compared with those who enter ChalleNGe at age 17 or 18 (see figure 16).[21] Men who enter ChalleNGe at 18 are 7 percentage points more likely to enlist than men who enter at age 16, while women who enter the program at 18 are 5 percentage points more likely to enlist than women

who enter at 16. This is most likely due, at least in part, to the Services' age requirements.

Figure 16. Predicted probability of enlisting by age
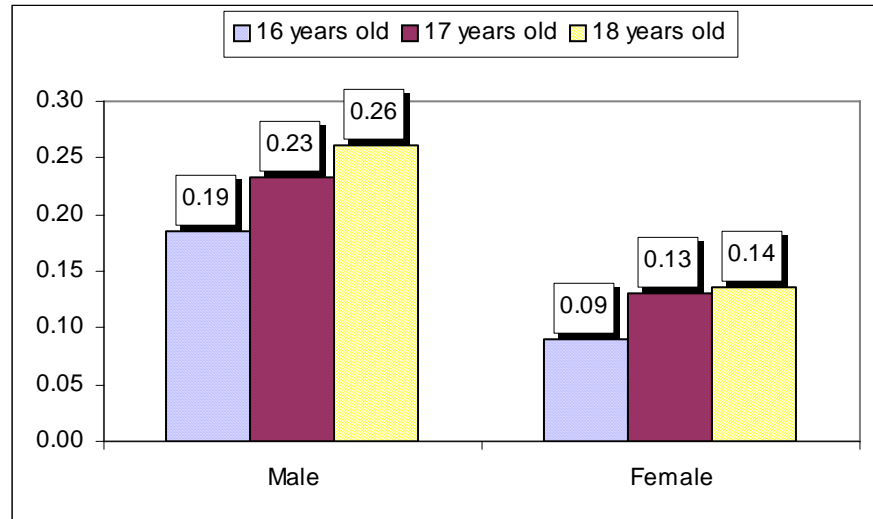
While the initial physical fitness score is statistically significant in the logistic regression, the difference in the predicted probability is only 4 percentage points between men who score below the 25th percentile and men who score above the 75th percentile (see figure 17). For women, this difference is also 4 percentage points.

There are also significant differences in the probability of enlisting by race. Figure 18 shows that white men have a probability of enlisting of 24 percent, a full 8 percentage points higher than the probability of enlisting for black men and 5 percentage points higher than for Hispanic men. Similarly, white women are 3 percentage points more likely to enlist than black women and 5 percentage points more likely to enlist than Hispanic women.

---

21. For women, the difference between the probability of enlisting for those 17 years old and those 18 years old is not statistically significant at the 5-percent level.

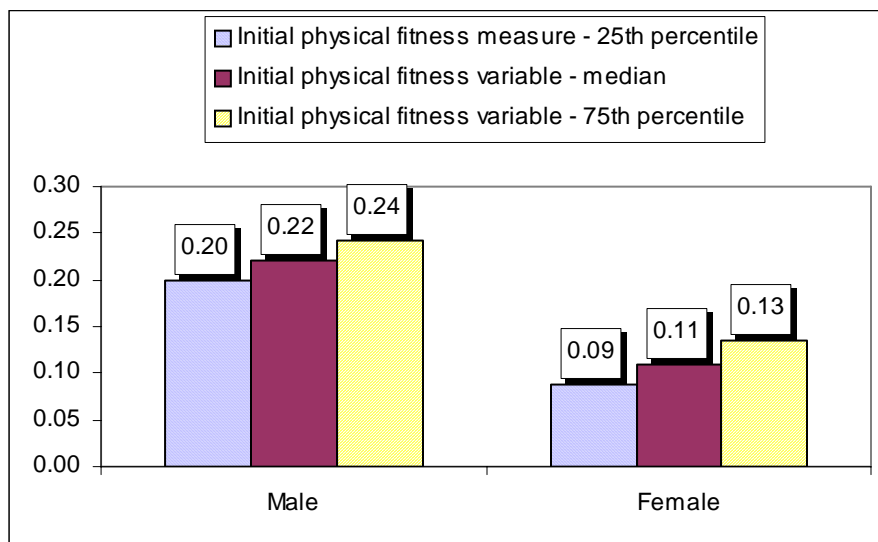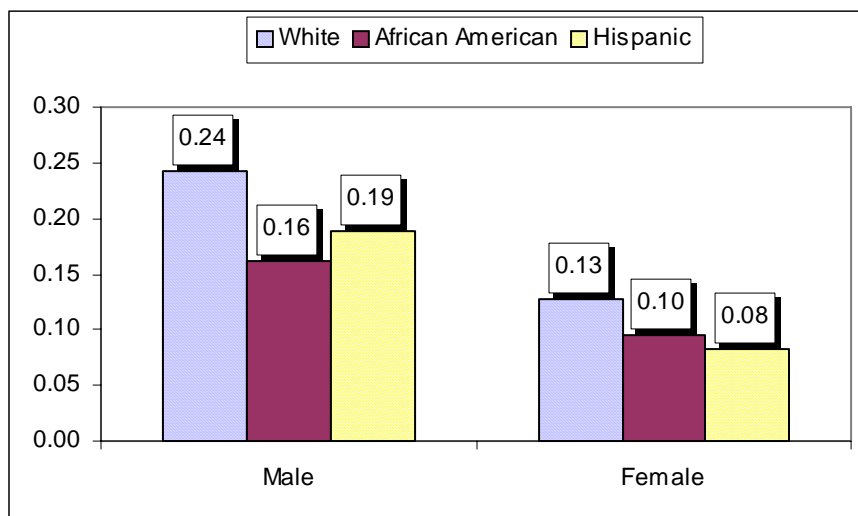Figure 17. Predicted probability of enlisting by initial physical fitness

Figure 18. Predicted probability of enlisting by race/ethnicity

48

The probability of enlisting is not statistically different for youth from different family incomes.

In summary, we find that some groups, particularly people who earn GEDs, are far more likely than others to enlist. This suggests that the pilot program may have served as an important incentive for ChalleNGe participants to complete GEDs. Graduates are far more likely than nongraduates to enlist; also, those who are more physically fit are more likely to enlist. Those who score the highest on the pretest TABE are also far more likely to enlist. Thus, it appears that, among ChalleNGe participants, those who perform well in the ChalleNGe program are more likely to enlist.

ChalleNGe participants' military performance

Descriptive statistics

Our central measure of ChalleNGe graduates' performance in the military is attrition. Attrition is extremely expensive for the Services; therefore, the Services prefer to recruit those who are most likely to complete their initial term of service. In particular, we focus on 36-month attrition because this measure picks up both initial bootcamp attrition and attrition that occurs during training and duty. However, we also discuss "interim" measures, specifically 3-month and 12-month attrition rates.

To begin, we look at some potential quality measures of ChalleNGe participants who enlist. Table 8 indicates the AFQT percentile score, and presence of a waiver (as well as a "serious" waiver) for ChalleNGe graduates, for those who entered but were terminated from the program, and for those who expressed an interest in but never officially entered the program. We also include statistics on high school diploma graduates (HSDGs), those who enter the Services with GEDs, and dropouts. We include these last three groups because they represent the largest credentials in Tiers 1, 2, and 3, respectively. Recall that those with Tier 1 credentials (the majority of whom are HSDGs) have much lower attrition than other groups. Also note that we draw our statistics on the last three groups from the DMDC longitudinal dataset discussed earlier, using the data from FY99 to FY04.

ChalleNGe participants—especially ChalleNGe graduates—are younger than many other recruits. One difference between ChalleNGe graduates and participants who enter the military is that graduates typically allow little time to elapse between the ChalleNGe program and military enlistment; the majority enlist within a year or so of *entering* the ChalleNGe program. In contrast, both those who leave the program and those who express interest but do not enter often allow more time to elapse before enlistment.

Table 8. Descriptive statistics—ChalleNGe participants and others in the Services

	ChalleNGe graduate	ChalleNGe terminated	ChalleNGe nongrad[a]	HSDG	GED-holder	Dropout
Average AFQT score	50.2	53.5	51.0	59.8	60.0	62.7
Required a waiver	14%	16%	17%	15%	20%	46%
Required "serious" waiver[b]	5%	6%	6%	5%	7%	9%
"Non-negative" separation code[c]	13%	7%	15%	33%	20%	17%
Entered Service within ~1 year of entering ChalleNGe	53%	28%	35%	~	~	~
Entered Service within ~2 years of entering ChalleNGe	86%	65%	66%	~	~	~
Average ChalleNGe pretest[d]	9.2	9.0	~	~	~	~
Pretest missing	84%	93%	100%	~	~	~
Avg ChalleNGe initial fitness eval. score[d]	0.035	0.043	~	~	~	~
Initial fitness eval. score missing	17%	62%	100%	~	~	~

a. We include the following groups in ChalleNGe nongraduates: those who were rejected and those whose status code indicates that they expressed an interest but never enrolled (e.g., "Accepted," "Pending," "Unregistered").
b. Defined as a waiver for a serious misdemeanor or any felony.
c. Separation for completed term of service, Officer Candidate School, Service Academy attendance, disability, or other reason that does *not* indicate failure to adapt or disciplinary or similar problem. Percentage calculated for those who had a separation code; those who remain in the Service have no separation code.
d. Among those with no missing scores.

ChalleNGe participants have low AFQT scores compared with other enlistees. AFQT scores are often viewed as a measure of "trainability" [3, 4]. Those who enter the Services with GEDs or as dropouts face a higher AFQT cutoff than those who enter with a Tier 1 credential; during most of this time period, ChalleNGe graduates who also earned GEDs have Tier 1 status. However, ChalleNGe graduates have far lower AFQT scores, on average, than HSDGs, despite facing the same requirements. This remains true although those enlisting are unlikely to have the lowest TABE scores among ChalleNGe participants/graduates (see previous section).

As shown in table 8, ChalleNGe participants—especially ChalleNGe graduates—usually are no more likely to require a waiver than other enlistees; the same is true of a "serious" waiver (defined as one for a felony or a serious misdemeanor). However, among those enlistees who had left the Service at the time our dataset was assembled, ChalleNGe participants (and especially those who were terminated from the program) are much less likely than other accessions to have a "non-negative" separation code.

We note that these descriptive statistics may not tell the entire story; the four Services assign both waivers and separation codes in different ways [6]. Therefore, the extent to which ChalleNGe participants are overrepresented or underrepresented in a given Service may explain some of these differences as well as differences in military performance. We explore this question further below.

Attrition rates of ChalleNGe participants

Next, we look at attrition rates of all ChalleNGe participants who entered the military between FY99 and FY04. We report 3-month, 12-month, and 36-month attrition rates. In the case of 12- and 36-month attrition rates, we report two types of rates: conditional and unconditional. Conditional 12-month attrition rates are reported on those who successfully complete 3 months of service; unconditional 12-month rates are reported on the whole sample and thus include all who attrite any time within the first 12 months of service. Conditional 36-month rates are reported for those who complete 12 months of service. The advantage of unconditional rates is that they give us a

straightforward measure of total attrition at any point in time; the advantage of conditional rates is that they allow us to separate early attrition (and the factors that influence it) from later attrition. We believe that unconditional rates are the most straightforward measures for descriptive statistics and graphs. In our regression section, however, we are interested in narrowing down factors that affect attrition during various periods, so we model conditional attrition rates, such as 12-month attrition conditional on not attriting during the first 3 months. Such measures allow us to focus on factors affecting attrition during the first 3 months versus the next 9 months; we expect different factors to affect attrition during different periods.

We do not have attrition rates on all of those who enlisted because, at the time we formed our sample, a small number had enlisted within the previous 12 months and a larger number within the previous 36 months. Compared with high school diploma graduates, the group of ChalleNGe participants evidenced fairly high attrition rates (see table 9). However, attrition rates of ChalleNGe participants were several percentage points below attrition rates of those who enlisted with GEDs during the same time period. In particular, ChalleNGe graduates have quite low attrition rates through the 12-month window; only at the 36-month window do these rates approach those of enlistees with GEDs or no credential. Also, ChalleNGe graduates have rates that are much lower than those of ChalleNGe nongraduates and substantially lower than those of others who expressed interest in the ChalleNGe program.[22] Next, we examine attrition rates of certain groups in more detail.

---

22. We tested ChalleNGe participants to see whether attrition differed by their DMDC education code. In other words, we tested for attrition differences among ChalleNGe participants who enlisted as ChalleNGe participants, those who enlisted as high school diploma graduates, and those who enlisted as GED-holders. However, differences by DMDC education code were small and ChalleNGe status (graduate, nongraduate, or participant/"other") seemed to be a more meaningful grouping, so we follow this grouping in our analysis here.
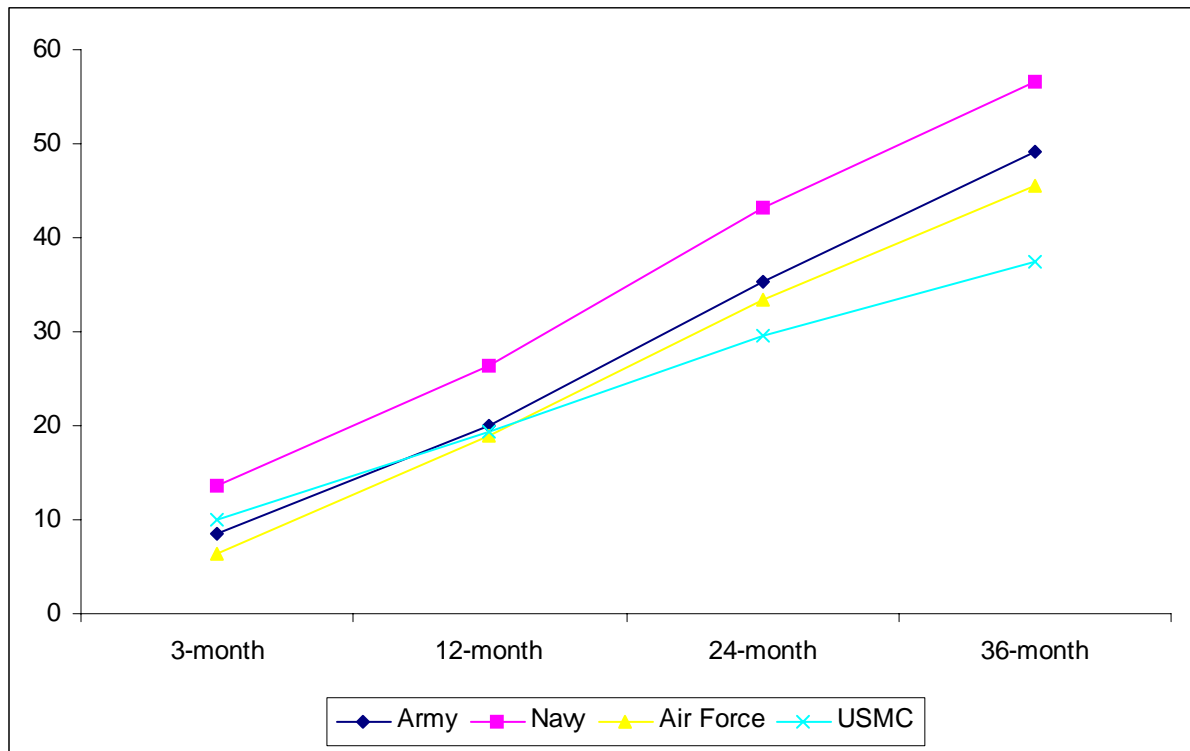
Table 9. Attrition rates of ChalleNGe participants and others

	ChalleNGe grads	ChalleNGe, terminated	ChalleNGe, other	HSDG[a]	GED[a]	Dropout[a]
3-month attrition	8.5	17.3	11.6	8.0	13.7	16.1
12-month attrition	19.3	36.0	23.0	14.7	26.3	26.9
36-month attrition	45.5	60.6	50.8	29.1	50.5	47.1

a. Calculated using DMDC longitudinal file, including all accessions from FY99-04, by official education credential.

First, we look at attrition of all ChalleNGe participants by Service (see figure 19). This figure indicates that attrition rates do differ across Services. For example, attrition rates of ChalleNGe participants in the Navy are consistently higher than those in the other Services. The relationships among the other Services change over time, however; initial (bootcamp) attrition rates are higher in the Marine Corps than in the Army or the Air Force, but this pattern reverses by 36 months. Figure 19 indicates that controlling for Service will be important to accurately compare attrition rates.

Figure 19. Attrition rates of ChalleNGe participants, by Service

Together, table 9 and figure 19 suggest that attrition rates vary by Service *and* by ChalleNGe status (i.e., graduate versus nongraduate). On top of this, the proportion of ChalleNGe participants who are graduates is likely to vary by Service. Therefore, in table 10 we detail attrition rates by Service *and* education credential; we include the same groups shown in table 9 but calculate attrition rates separately for each of the four Services. We also indicate the size of each group of enlistees. .

Table 10. Attrition rates, by education credential and Service

	ChalleNGe[a]			Non ChalleNGe[b]		
Attrition:	Graduate	Terminated	Other	HSDG	GED	Dropout
ARMY						
3-month	7.1	16.5	9.9	8.4	12.7	12.4
12-month	17.3	36.3	20.3	16.9	26.1	23.6
36-month	45.1	63.1	49.7	37.2	53.1	41.4
Number of obs[c]	2,535	310	748	286,750	47,963	764
NAVY						
3-month	12.6	20.4	15.0	9.3	17.1	16.5
12-month	24.5	37.1	28.0	15.3	28.0	27.3
36-month	54.1	71.2	57.5	28.3	47.5	47.6
Number of obs[c]	1,395	123	426	209,038	12,229	8,218
AIR FORCE						
3-month	5.8	*[d]	8.7	5.4	8.3	7.7
12-month	18.1	*[d]	21.5	9.9	21.6	13.6
36-month	46.0	*[d]	42.4	20.9	25.5	24.7
Number of obs[c]	975	37	161	183,378	1,159	142
USMC						
3-month	9.0	*[d]	13.0	8.4	9.9	15.8
12-month	17.6	*[d]	23.0	15.3	18.7	28.9
36-month	34.3	*[d]	45.1	24.3	38.8	47.3
Number of obs[c]	1,079	38	200	161,520	4,208	455

a. ChalleNGe participants' attrition rates calculated from matched ChalleNGe program-DMDC sample.
b. Attrition rates of those holding high school diplomas (HSDGs), GEDs, and no credential (dropouts) calculated from DMDC files for FY99-FY04.
c. "Number of obs" refers to the number of observations in the 3-month attrition calculation; other samples are smaller as some people had served more than 3, but fewer than 12 or 36, months at the time of data collection.
d. Sample size is too small for reliable calculations of attrition rates.

Table 10 indicates that attrition rates and enlistment rates vary by Service and education credential. In fact, there are so few ChalleNGe terminates enlisted in the Air Force and Marine Corps that we cannot reliably calculate attrition rates for these groups. The sample of participants who neither graduated nor were terminated is larger in each case. As discussed in an earlier subsection, however, we believe that at least some of these individuals did, in fact, complete a ChalleNGe program.

Table 10 indicates that, in general, ChalleNGe graduates have attrition rates below those of other ChalleNGe participants. Within each Service, ChalleNGe graduates also tend to have attrition rates above those of high school diploma graduates, but somewhat below the attrition rates of GED-holders and dropouts. (In contrast to the general pattern, attrition rates of ChalleNGe graduates and of other ChalleNGe participants increase sharply in the Navy and the Air Force between 12 and 36 months of service.) However, the attrition rates listed in table 10 are simple averages; they do not adjust for personal characteristics (such as gender or AFQT score, the fiscal year the recruit enlisted, or any other factor that may affect attrition). Next, we focus on how these characteristics are related to attrition.

As discussed earlier, the credential of ChalleNGe graduates who passed the GED and enlisted during a 5-year pilot program was recognized as Tier 1. For that reason, these ChalleNGe graduates could enlist with lower AFQT scores than if they enlisted with GEDs alone. (The AFQT cutoff for those with GEDs is 50 in most cases. In contrast, those with high school diplomas or other Tier 1 credential may enlist with an AFQT score in the 30s; there are small differences among the Services.) Given the relationship between AFQT scores and success in training, this may put ChalleNGe graduates at a relative disadvantage. Roughly half of the ChalleNGe enlistees in our data have AFQT scores of less than 50 (see figure 20). Thus, the majority of ChalleNGe graduates who enlist would not be able to do so with a GED alone. We also note that those with AFQT scores less than 50 are somewhat more likely to enlist in the Navy, and somewhat less likely to enlist in the Air Force, than ChalleNGe graduates with higher AFQT scores.

Figure 20. AFQT distribution of ChalleNGe enlistees
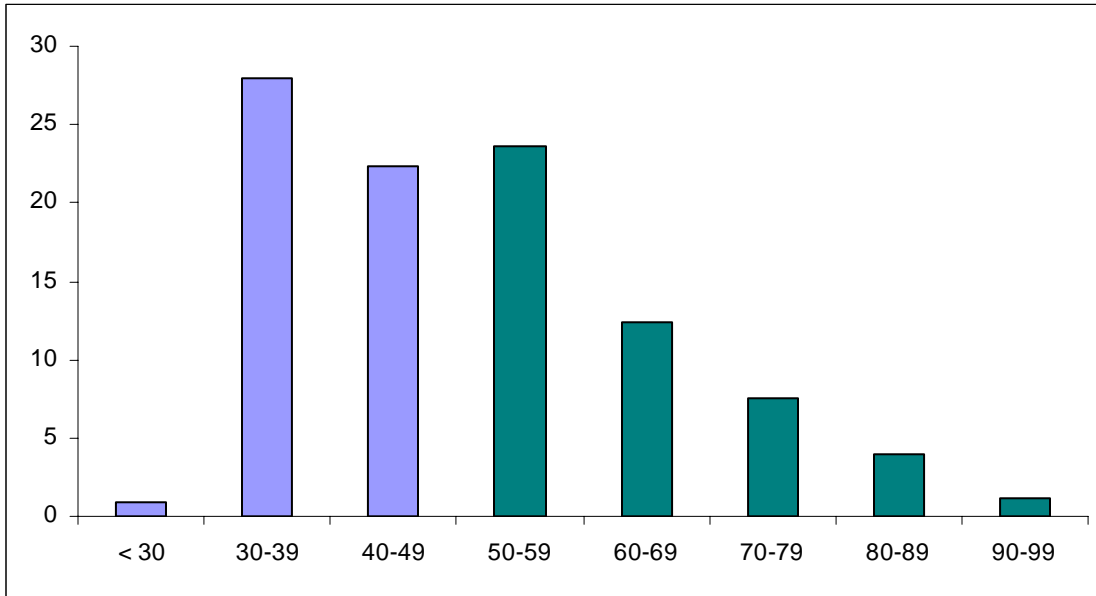
As shown in figure 21, attrition does vary by AFQT score. When we separate those with AFQT scores of 50 or more from those with lower scores, those with higher AFQT scores have somewhat lower attrition rates. The difference is not large, but it does increase over time.

Given their training and exposure in ChalleNGe, we suspect that female ChalleNGe graduates may be more prepared for the military environment than other women who enlist. Traditionally, women who enlist have higher attrition than their male counterparts, particularly during bootcamp. As shown in figure 22, women who participate in ChalleNGe do have higher attrition than men, especially over the first 12 months after accession. However, the attrition rates grow close over time. This suggests that while women struggle during the first year, they perform well over the next 2 years. .

Because of the manner in which men's and women's attrition rates change over time, we next examine conditional attrition rates. Specifically, figure 23 shows attrition rates by gender, for those who do not attrite during the first 3 months. As indicated, by 36 months the

Figure 21. Attrition rates of ChalleNGe enlistees, by AFQT score
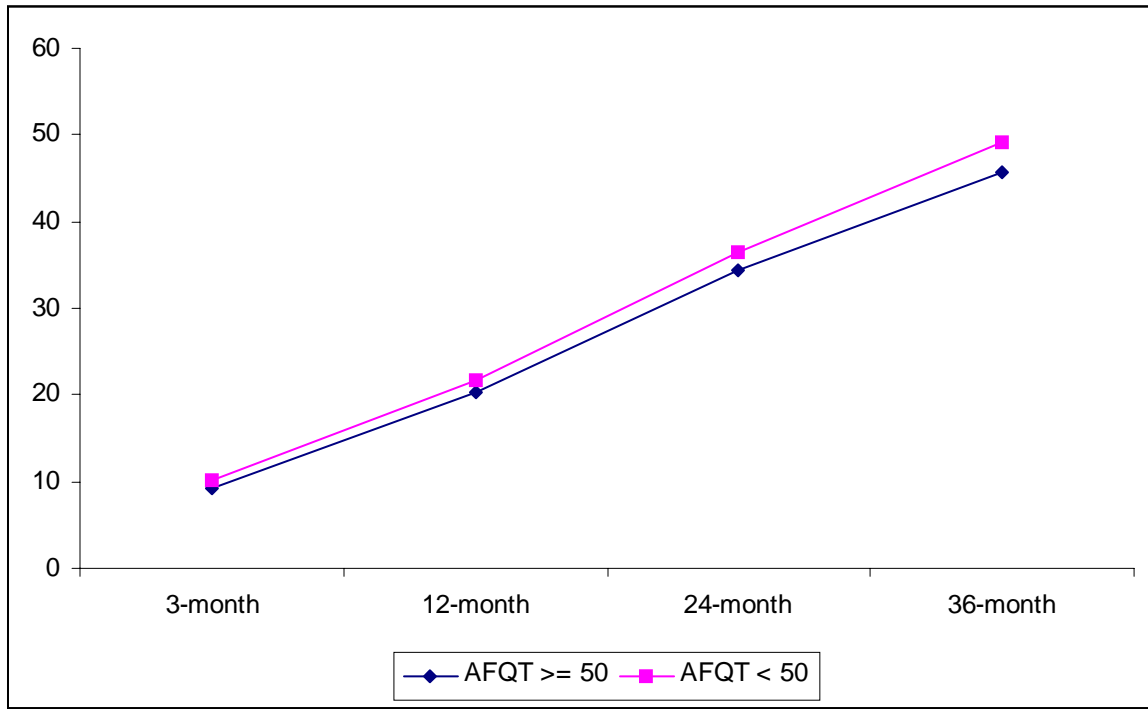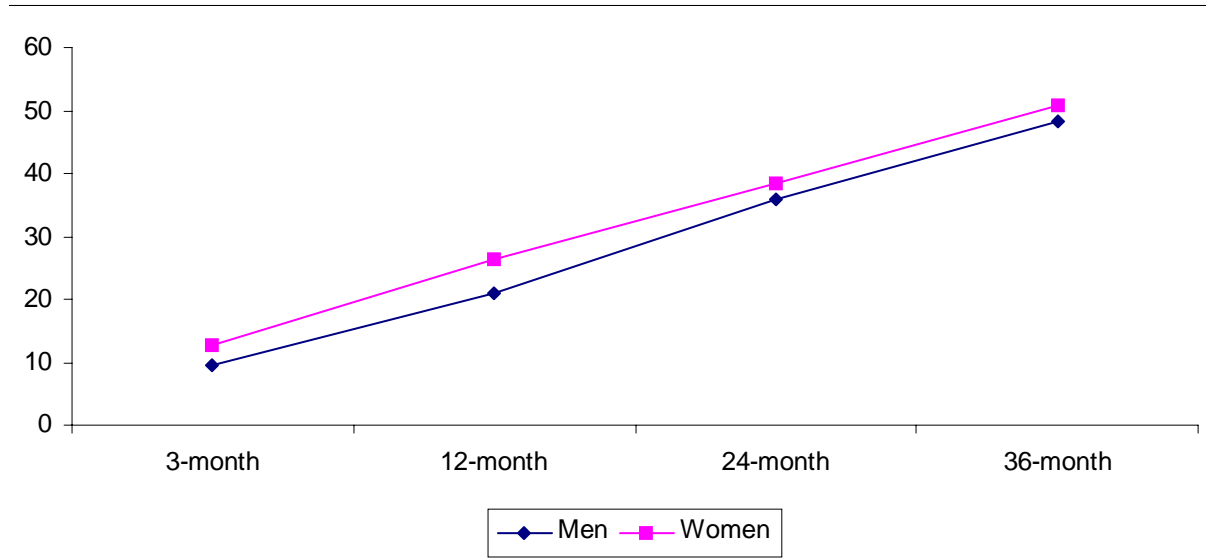

Figure 22. Attrition rates of ChalleNGe participants, by gender

attrition rates of ChalleNGe participants who survived bootcamp do not differ by gender. This suggests that, while women may find boot-camp problematic, they perform well in terms of training, and especially service, attrition. Based on these descriptive statistics, we model our attrition equations in the next section carefully, allowing various factors to affect the attrition rates of men and women differently.

Figure 23. Attrition rates of ChalleNGe participants by gender, conditional on continuing for 3 months
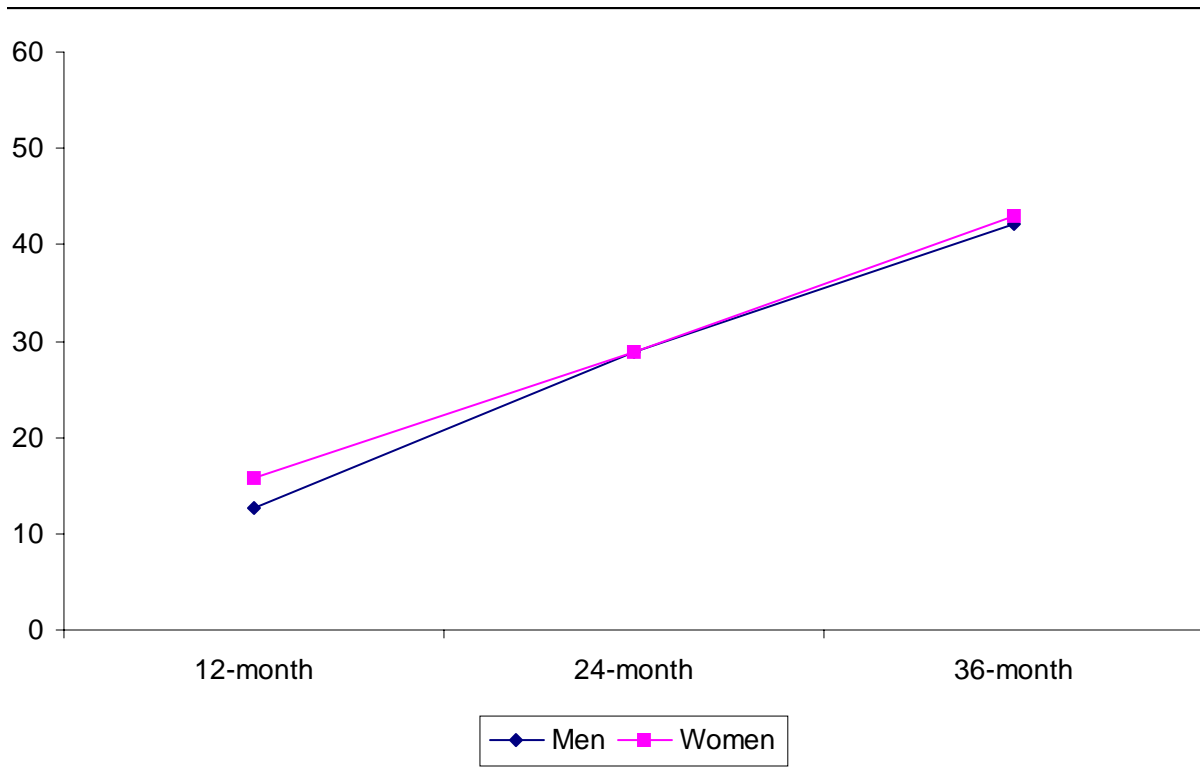
Next, we use regression analysis to separate the effects of ChalleNGe program status from that of branch, time, and other personal characteristics.

Regression results

Our attrition regressions include many of the variables used in our analysis of ChalleNGe graduation. We include measures of ethnicity and gender, as well as age at accession. We include several military-specific variables, such as AFQT score and the existence of waivers. We also include variables to control for the fiscal year of accession into the ChalleNGe program and physical fitness measured at the end of the program. Finally, we include ChalleNGe graduation status, as defined earlier, plus other measures of participants' ChalleNGe experience/performance. (See appendix A for complete variable definitions.)

In this section, we estimate conditional attrition rates to separate factors that influence initial (bootcamp) attrition from what we refer to as "preservice" attrition (attrition during months 4-12) versus "service" attrition (occurring in months 13-36). We recognize that the length of the training pipeline varies between Services and military occupations; we use these labels only as rough indicators of Service-members' progress.

We ran specification tests to determine which variables to include in our attrition equations. In particular, we tested TABE scores, hours of community service, and earning a GED in ChalleNGe. These variables had no substantive, significant effect on attrition. Because we had no strong theoretical reason to include them, we excluded these variables from our analysis. In general, we attempted to estimate parsimonious equations because our sample, particularly in the case of those who completed at least 36 months, is not large.

Bootcamp attrition

Our regressions explaining bootcamp attrition indicate that many of the characteristics and factors discussed earlier in this paper are important in early military success. Based on our descriptive statistics, we tested the hypothesis that factors may act differently to explain men's attrition versus women's attrition. We discovered this to be true for several personal characteristics. For example, age at accession explains attrition, and has a different effect for men than for women

(see figure 24).[23] The same is true of AFQT scores. As indicated, the patterns for men and women are quite different. Men who are 18 or older at accession have higher bootcamp attrition rates than younger men; the opposite is true of women. Men with higher AFQT scores have slightly lower bootcamp attrition, whereas women with higher AFQT scores have substantively higher attrition.

Figure 24. Men and women's bootcamp attrition, by personal characteristics
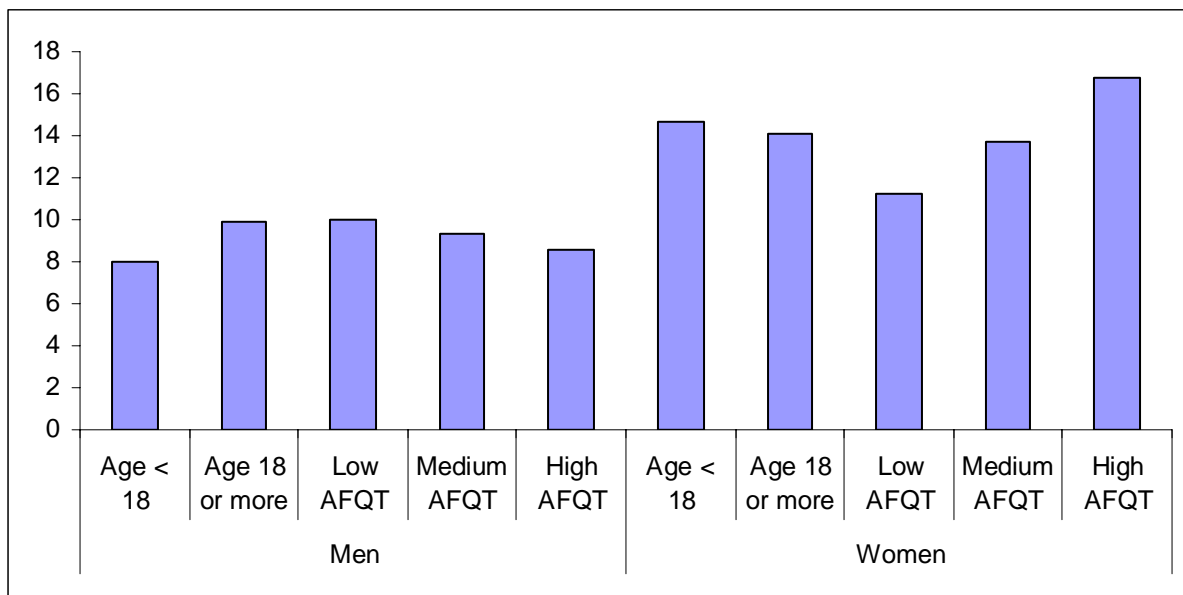
Other factors have comparable effects on men and women, as shown in figure 25. For example, for both men and women, those with better physical fitness at the end of ChalleNGe have lower attrition rates than those who were less physically fit at the end of ChalleNGe.[24]

---

23. We also tested a variable measuring the length of time between completing ChalleNGe and enlisting. This variable was highly correlated with age at accession; we use age in our preferred specification.

24. Physical fitness is coded as a standardized variable, by gender, as discussed above. See appendix A for a detailed description of this variable.

Figure 25. Bootcamp attrition, by ChalleNGe attributes
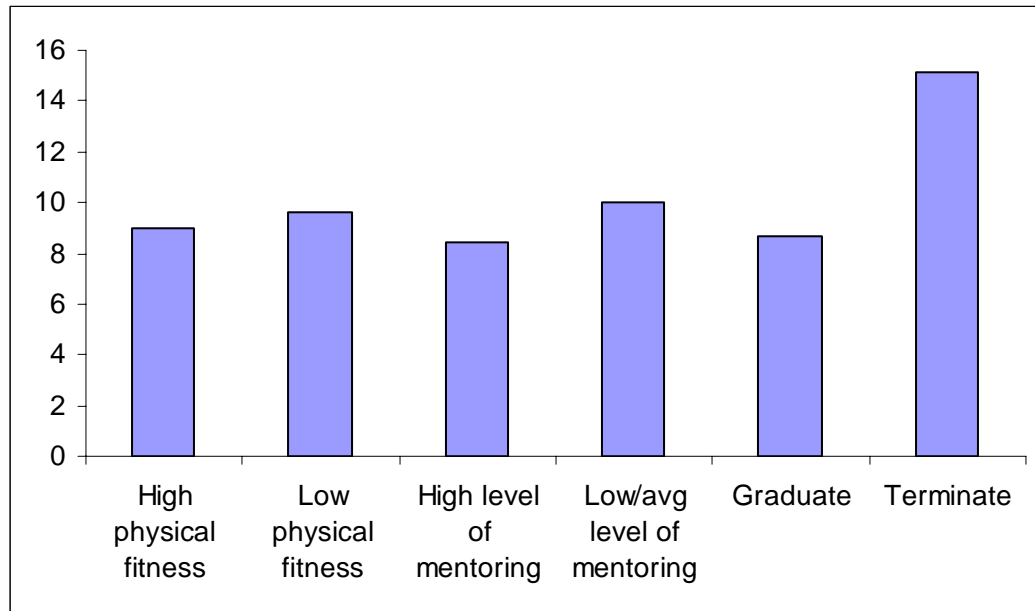
These effects are fairly small, as we would expect; fitness levels upon entering the military may be quite different from those at the end of ChalleNGe for some participants.

An important result is that, overall, ChalleNGe graduates have lower attrition than other participants; the attrition rate of nongraduates is much higher than that of other participants (see figure 25).[25] Finally, mentoring is important. Those who had a relatively high level of mentoring contact have lower bootcamp attrition.[26] Therefore, while the effects of personal characteristics sometimes vary by gender, the

---

25. As before, we include three groups of ChalleNGe participants: those who were terminated from the program (nongraduates), those who graduated, and those whose records indicate that they considered but never entered the program.

26. A high level of mentoring contact is defined as at least 19 contacts; roughly 75 percent of ChalleNGe participants had fewer than 19 contacts with their mentor recorded.

effects of ChalleNGe seem more gender-neutral. This is consistent with our findings on ChalleNGe graduation rates.

Finally, we look at how attrition varies by Service and gender. As indicated in figure 26, overall attrition rates are lower in the Air Force than in the other three Services. This finding contrasts sharply with that of [5]. The difference may be due to the larger sample we have for this analysis (we have all ChalleNGe participants who enlisted, with the exception of those who could not be matched due to bad data). Also, over the 6 years between CNA's initial analysis of ChalleNGe participants and this analysis, many more participants have completed the program and enlisted, again increasing our sample size. However, this finding also contrasts with our results using the longitudinal dataset (see, for example, appendix A, figure 38). This is due to nearly all ChalleNGe graduates who enlist being classified as high school diploma graduates on their DMDC records (see previous section). Those who are officially classified as ChalleNGe graduates exhibit high attrition rates, while those who are classified as high school diploma graduates have lower attrition rates. This discrepancy could be due to the differences between the Air Force education codes and those used by the other Services, as detailed in [2]. This has the effect of making Air Force ChalleNGe graduates appear to have very high attrition rates. We also note that, while women have generally higher attrition than men, in the Air Force women actually have slightly lower bootcamp attrition rates than men. Full regression results appear in appendix B, table 21.

Preservice attrition

Next, we use regression analysis to explain attrition that occurs within months 4-12 after accession. For many recruits, much of this period is spent in training. Recruits in training may put less emphasis on physical fitness, and more on classroom achievement. For this reason, it is likely that different factors matter for training, versus bootcamp, attrition. To explore this question, we use a model identical to that used to estimate 3-month attrition. We model conditional attrition; that is, we include all who successfully completed 3 months of their obligation and model the probability of completing months 4-12.

Figure 26. Bootcamp attrition, by branch
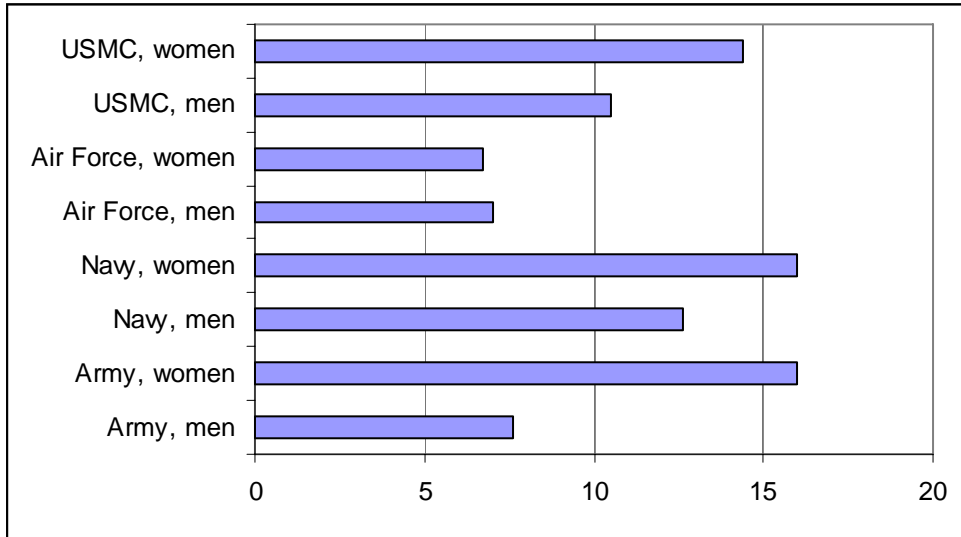
Our results indicate that many factors that influence 3-month attrition do not affect attrition over the next 9 months. For example, ChalleNGe physical fitness, mentoring, and AFQT scores no longer have a significant effect on attrition. The insignificance of AFQT scores indicate that success of ChalleNGe participants is probably not linked to ability to complete training coursework; the AFQT is widely viewed as a measure of "trainability" [3, 4]. It is also possible, however, that those who fail at training do not leave the Services until after 12 months.

ChalleNGe nongraduates (those who were terminated) continue to exhibit high attrition rates. Age is still a factor, but the age relationship has now reversed; younger men have slightly higher preservice attrition, while younger women have slightly lower preservice attrition. There are still some differences across branches in overall attrition. At this point, women in the Navy have lower attrition than otherwise similar men, while there are no significant differences across the other branches (see figure 27). Complete regression results appear in table 22, appendix B.

Figure 27. Men and women's preservice attrition
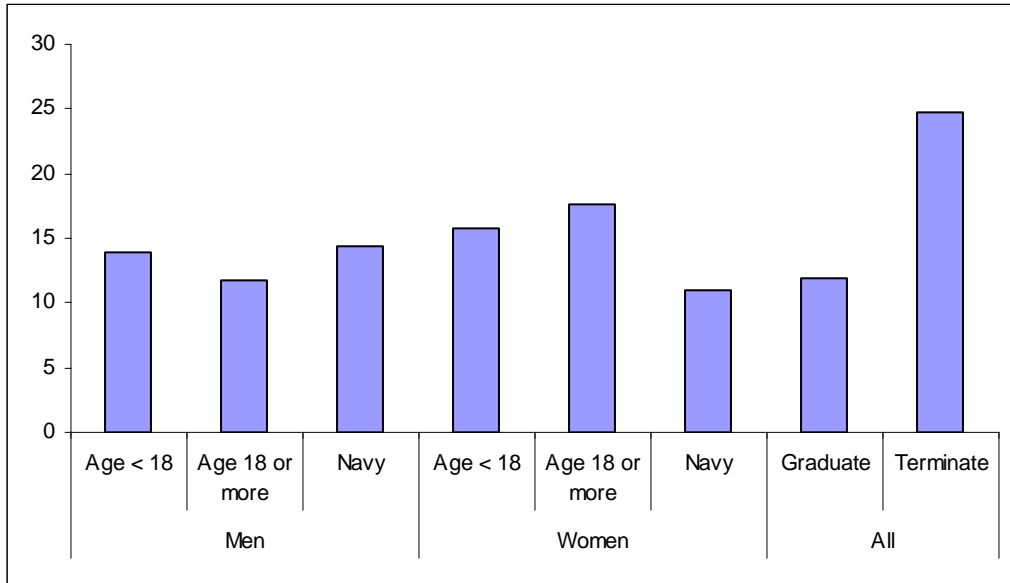
Service attrition

Finally, we use regression analysis to focus on attrition that occurs after initial training, within 13-36 months of accession. Our sample consists of all who successfully completed the first 12 months. At this point, both age and AFQT scores are factors in attrition; however, ChalleNGe physical fitness levels, level of mentoring, and ChalleNGe graduation status no longer have significant effects on attrition. Service attrition is slightly lower for those who are older; also, service attrition is lower for those with higher AFQT scores. Both of these results generally hold for men and women, although the magnitudes differ somewhat by gender (see figure 28).

Like earlier attrition detailed above, service attrition behavior differs across the Services, and by gender. As shown in figure 29, women who complete the first 12 months have lower attrition over the next 24 than similar men in the Navy and the Air Force. In the Army and the Marine Corps, women have higher attrition than men. Complete regression results appear in table 23, appendix B.

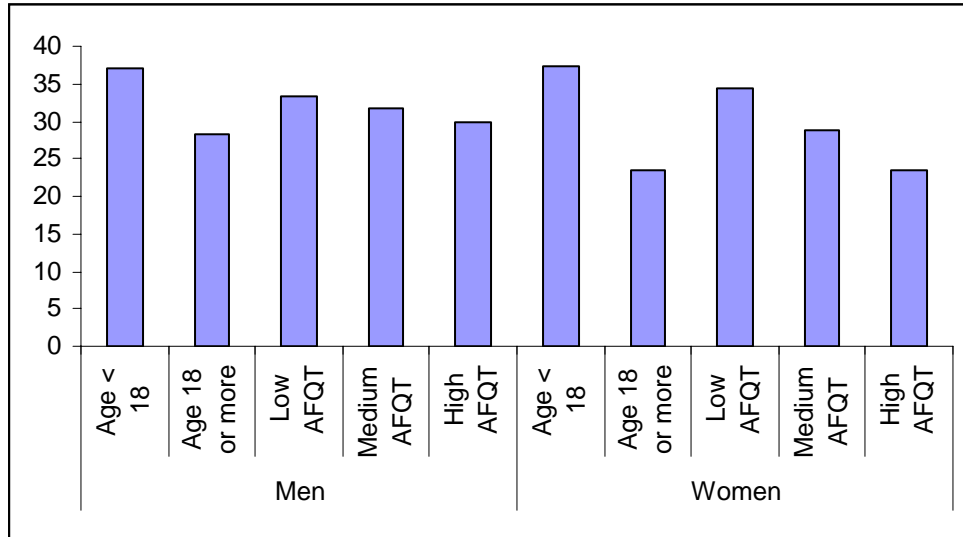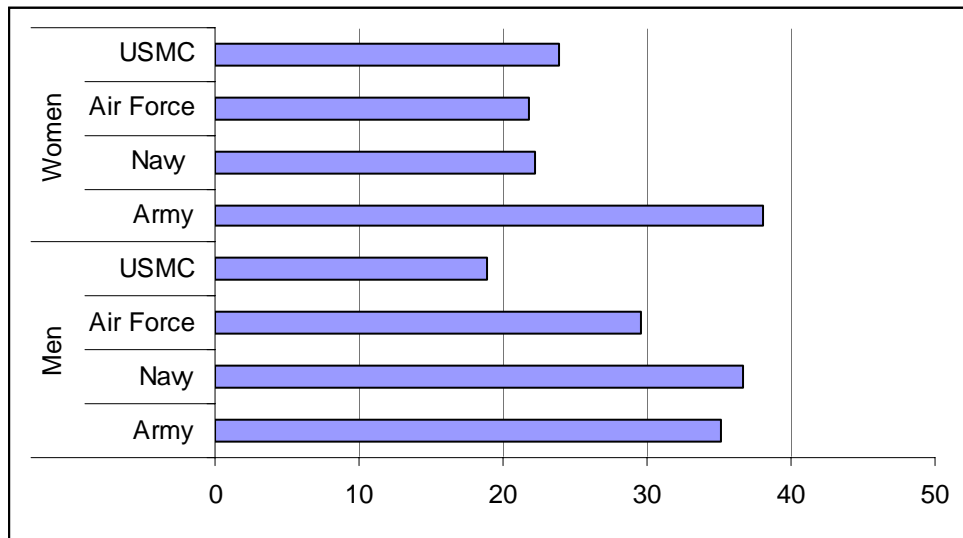Figure 28. Men and women's service attrition, by personal characteristics

Figure 29. Men and women's service attrition, by branch

Attrition over the first 3 years

Because some factors affect early attrition but not service attrition, and a few factors seem have opposite effects on early and late attrition, we next estimate an unconditional model of 36-month attrition. This model includes all the factors in the above models; it measures the net effect of these factors on the probability that a person will attrite during the first 3 years of service. Results of this regression indicate, first, that ChalleNGe graduates have much lower 36-month attrition rates than nongraduates. Also, physical fitness at the end of ChalleNGe and mentoring both lower overall 36-month attrition. Overall, those with higher AFQT scores, as well as those who are at least 18 at enlistment, have lower attrition (regardless of gender). In the Navy and the Air Force, women have significantly lower attrition rates than men; in the Army and the Marines, women have higher predicted attrition but the difference is insignificant. Thus, to the extent that there are differences by gender in bootcamp attrition, the differences even out over time and generally don't affect overall 36-month attrition rates. Complete regression results appear in appendix B, table 24.

Program effects

In this section, we focus on the program effects from all regressions. Our regression results indicate that program-level differences are important in all of the outcomes we examine here; in each regression discussed earlier, we control for the program so that we can examine, such as the effect of physical fitness on graduation rates across all programs. In this section, we discuss specific analysis of the program-level effects and present effects for all programs, for all outcomes.

To begin, we examine program-level effects for graduation and GED recipiency jointly. We would like to know if there is a tradeoff between program completion and GED recipiency. For example, it may be that some programs are more effective than others at "weeding out" those who are less likely to receive a credential before graduation. In this case, such a program might have a relatively low graduation rate but a high rate of GED recipiency. To explore this idea, we look at several measures.

First, we examine the graduation and GED rates for each program. (These rates are not adjusted to account for any factors; they are simply the total rates for each program.) These rates are highly and positively correlated, but this may simply indicate that participants in some programs are better prepared than participants in others. For example, some programs may draw students with relatively high test scores or family incomes; both of these factors increase graduation rates and GED rates. Therefore, we next look at the regression-adjusted graduation and GED rates. The regression-adjusted rates are calculated holding all other measured factors constant; this allows us to look at program effects net of test score, income, and other individual effects. The adjusted graduation and GED rates are again positively correlated, but the correlation is quite small. This suggests that there is not a tradeoff between graduation and GED recipiency but rather that some *programs* either admit generally better-prepared participants or actually perform better than others; however, we stress again that the correlation between adjusted graduation rates and GED recipiency rates is quite small. Also, we recommend caution in interpreting the program-specific effects due to missing data issues. We have attempted to control for differences in data quality across programs, but it is still possible that programs with more missing data seem to perform better because they are more likely to include data on people who graduate and/or receive GEDs. Next, we entered the regression-adjusted, program-specific graduation rate into the regressions explaining GED recipiency. The effect was small and insignificant. This is consistent with our earlier finding of a small correlation between program performance in terms of graduation and GED recipiency. Therefore, we conclude that there is no substantive tradeoff between graduation rates and GED recipiency rates.

We note that state-level effects could be important in explaining both ChalleNGe graduation and GED recipiency. For example, some states require exit exams for graduation while other states do not. Research suggests that such exams cause some students to leave school (e.g., see [11]). In this case, ChalleNGe participants from states with exit exams might be better prepared than ChalleNGe participants from other states; such a difference could affect both graduation and GED recipiency rates. Also, state-level GED requirements vary; this could affect the rate of GED recipiency at different

programs. We tested a regression specification that included state-level data on exit exams, Carnegie-unit requirements, and GED requirements in our regressions. However, we could not produce reliable estimates on these effects because data on these requirements are available from only limited years and, therefore, there was little variation across states with ChalleNGe programs. We do suggest that such state-level variation could be an interesting area for future research on ChalleNGe programs.

As a next step, we produce a single table including regression-adjusted program effects for each outcome (see table 11). These effects come from our regressions on program graduation rate and GED/credential rate discussed above, as well as attrition regressions. In this section, however, we would like to focus on how completing the program affects attrition, so we re-run the attrition regressions after first dropping data on nongraduates. In this way, the program-level attrition effects measure the performance of those who complete the program and then enlist (the program-level effects on graduation and GED/credential recipiency measure the performance of all who enter the program, and all graduates, respectively). Before rerunning our attrition regressions, we also drop data from four programs that have too few enlistees to produce reliable estimates. The four programs deleted are Louisiana–Camp Minden (CM), New Mexico (NM), Puerto Rico (PR), and South Carolina–Camp Long (SA). In some cases we can produce reliable estimates of 3- and 12-month attrition rates, but most graduates who enlisted did so less than 36 months before we collected our data so we do not have enough information to produce reliable 36-month estimates. This is the case for the Georgia-- Fort Gordon (FG), Kentucky (KY), Michigan (MI), North Carolina (NC), and New Jersey (NJ) programs. Several of these program began more recently than most; this may explain the relatively small number of enlistees.

When using a series of dichotomous variables to identify different programs (or similar factors) in regression analysis, coefficients are calculated in relation to one excluded program. In each case, we carefully choose the excluded program to be the program with performance closest to the average across the sample. Thus, the figures in table 11 are calculated on a normed basis, in relation to the average

Table 11. Regression-adjusted program-level effects[a]

Program	Graduation rate	GED/ credential rate	3-month attrition	(Conditional) 12-month attrition	(Conditional) 36-month attrition	(Total) 36-month attrition
AK	1.58	-2.38	1.59**	0.44	1.42	1.02
AR	-16.6***	-2.89**	5.68***	1.49	11.75***	16.45***
AZ	-9.21***	-8.9***	-2.15***	0.75	7.53***	9.47***
CA	-4.03**	-6.31***	-5.62***	-5.55***	-9.45***	-21.73***
CM	9.53***	-18.11***	~[b]	~[b]	~[b]	~[b]
FG	-4.03**	-3.41*	-4.98***	-4.62***	~[b]	~[b]
FL	12.79***	16.46***	-3.18***	6.07***	~[c]	~[c]
GA	3.51**	-6.9***	-0.13	-3.01***	-4.90***	-7.34***
GL	5.76***	-6.14	1.89**	0.70	-1.82	5.37***
HI	1.44	27.75***[d]	-3.65***	-5.76***	-3.84	-12.04***
IL	-10.37**	0	2.08***	-1.75**	3.73*	2.58
KY	-7.63***	15.37***	-0.05	1.38**	~[b]	~[b]
LA	11.98***	-1.86	2.01***	0.78	-3.60***	1.09
MD	2.37*	3.44	-2.21***	0	-1.54	-4.94***
MI	-5.64**	-3.18	0.48	0.82	~[b]	~[b]
MS	17.09***	-0.01	3.32***	4.95***	-0.14**	1.16
MT	-4.04**	0.65	2.44***	-3.37***	-1.52***	-1.04*
NC	1.91**	3.65	0.66	-2.39***	~[b]	~[b]
NJ	0	22.38***[dv]	-0.81	0.54	~[b]	~[b]
NM	8.15***	-23.45***	~[b]	~[b]	~[b]	~[b]
OK	-6.65***	-4.28	-3.90***	-2.18***	-1.12	-3.09***
OR	7.64***	22.98***[d]	-4.08***	-5.95***	-2.01	-9.99***
PR	3.43	-9.30***	~[b]	~[b]	~[b]	~[b]
SA	-1.95	-15.59***	~[b]	~[b]	~[b]	~[b]
SC	5.42***	10.81***	-0.19	1.88***	-1.16	-3.23
TX	1.81*	-10.19***	0	2.86*	-9.15***	-6.40***
VA	8.31***	-1.58	-1.55***	0.75	1.76	1.94*
WI	1.22	10.17***	-0.24	-1.39**	0	0
WV	1.23*	8.3***	-1.82***	3.42***	-1.42	3.80 ***
Excluded	NJ	IL	TX	MD	WI	WI

a. Level of statistical significance, compared with the average (excluded) program: * indicates difference is statistically significant at the 10% level; ** indicates 5% level; *** indicates 1% level. We emphasize that many factors could explain the differences between programs.
b. Too few observation on enlistees to calculate reliable attrition rates.
c. First graduate enlisted in 2002; not enough data to calculate 36-month attrition rates.
d. Recall that this program awards high school diplomas to ChalleNGe graduates.

program. For this reason, we exclude different programs in different outcomes. For example, we exclude New Jersey when measuring graduation rates and Illinois when measuring GED/credential recipiency; we note which program is excluded at the bottom of each column. Therefore, the coefficients that appear in table 11 calculate the performance in relation to the excluded program. Taking the first program as an example, Alaska has a slightly higher graduation rate than the average (as represented by New Jersey) but a slightly lower GED/credential rate than the average (as represented by Illinois). However, we also note that in the case of Alaska (and many other programs), the difference is not statistically significant (recall that small differences, as well as differences based on small numbers of observations, are less likely to be significant and that insignificant differences may arise by chance). Therefore, we would say that the Alaska program's performance in terms of graduation and GED/credential recipiency is roughly average. Also note that positive differences in terms of graduation and GED recipiency reflect positive performance, while positive differences in terms of attrition reflect relatively high attrition rates of graduates.

We also look at how attrition depends on program effects in table 11. We calculate how 3-month attrition, as well as conditional 12- and 36-month attrition rates, differ between programs; in the final column, we calculate how overall 36-month attrition varies. These columns, especially when compared with other outcomes in table 11, indicate that most programs have results that are "mixed" in some manner. For example, a program may have lower-than-average graduation rates coupled with lower-than-average attrition rates for graduates who enlist. Also, some programs have very low initial attrition rates but higher 36-month attrition rates. This type of mixed result, in particular, could result from improvements in the program that have been reflected by the stronger performance of recent graduates. Such mixed results could also occur if programs do a good job preparing cadets for bootcamp, but the cadets struggle with training.

Overall, program level effects can reflect differences unrelated to straightforward efficacy of the programs. Even though we try to control for differences in data quality, such differences could explain program-level effects, especially if some programs are more likely to

enter data on successful cadets/graduates. Finally, differences in the level of preparation of cadets could explain many of these findings. We discourage ranking or rating the programs based on this information. Also, we caution that statistically significant results may not be of substantive importance. For example, some programs have attrition rates that are statistically significantly different from the excluded program, but they have actual differences of a few percentage points. Such small variation is unlikely to reflect meaningful program-level differences.

Next, we present the attrition information in table 11 in a slightly different manner. Figures 30 through 33 include regression-adjusted attrition rates of the sample of graduates only from programs with sufficient sample size (exactly the sample in table 11). But these figures also include horizontal lines indicating the average attrition rates of high school diploma graduates in each Service (calculated with our DMDC dataset, FY99-FY04). Note that all four figures exclude programs with fewer than 50 military accessions; figures 32 and 33 also exclude programs with too few early enlistees to calculate reliable 36-month attrition rates.

Figures 30 through 33 demonstrate several points. First, average attrition differences are large across the Services. Second, attrition rates of ChalleNGe graduates vary widely depending on the program attended. However, many 3-month attrition rates fall in the area defined by high school diploma graduate attrition in the Navy and the Air Force. Third, graduates of a few ChalleNGe programs exhibit very low attrition rates, on a par with those of high school diploma graduates in the Air Force. Finally, relative attrition rates of ChalleNGe graduates do increase over time; by the 36-month point, attrition rates of ChalleNGe graduates are, in most cases, higher than those of high school diploma graduates (see figure 32). Figure 33 presents unconditional (total) 36-month attrition rates, as well as the unconditional rates of HSDGs in the Army and the Air Force and the rates of GED-holders in each Service. Although figure 32 showed that ChalleNGe graduates' attrition rates increase compared to those of HSDGs during the second and third years of service, figure 33 indicates that total 36-month attrition rates of some programs are within the range defined by attrition rates of HSDGs in the Army and the

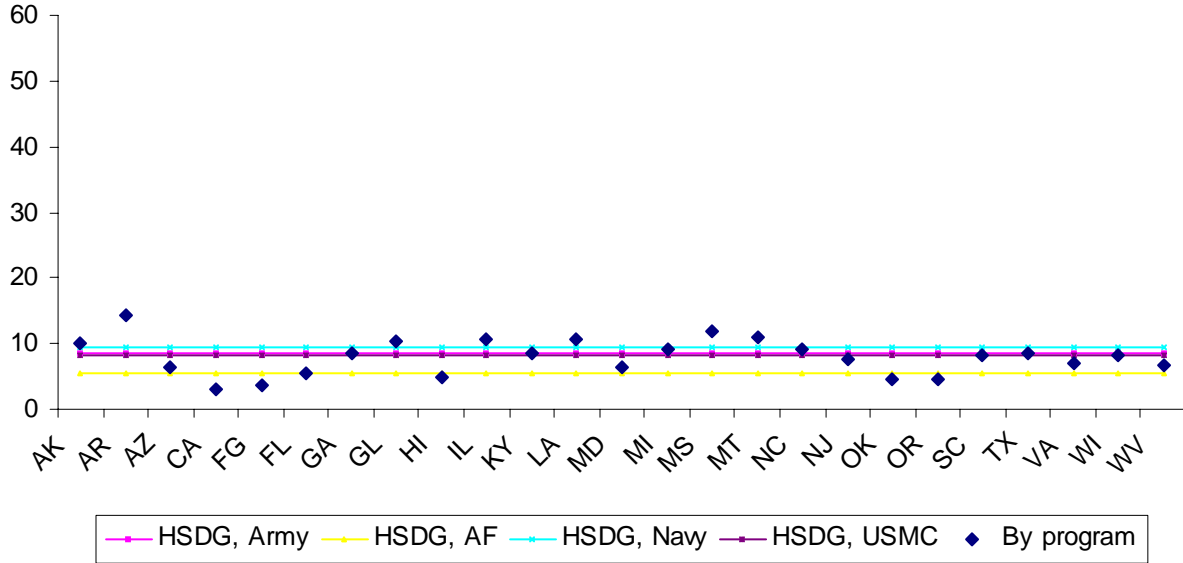Figure 30. Regression-adjusted program effects, 3-month attrition

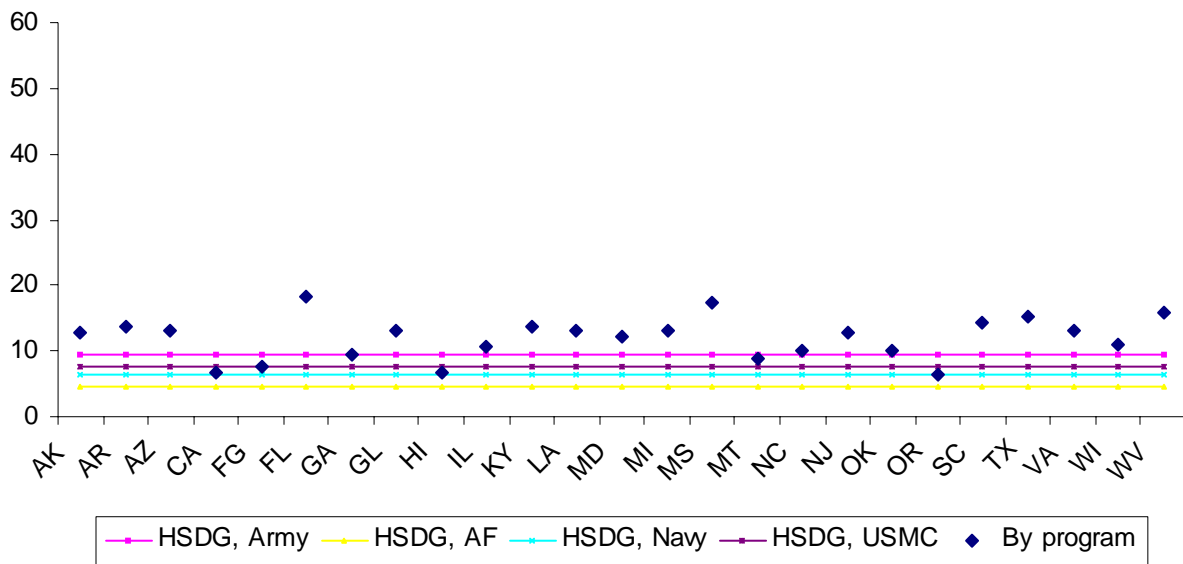Figure 31. Regression-adjusted program effects, conditional 12-month attrition

Figure 32. Regression-adjusted program effects, conditional 36-month attrition
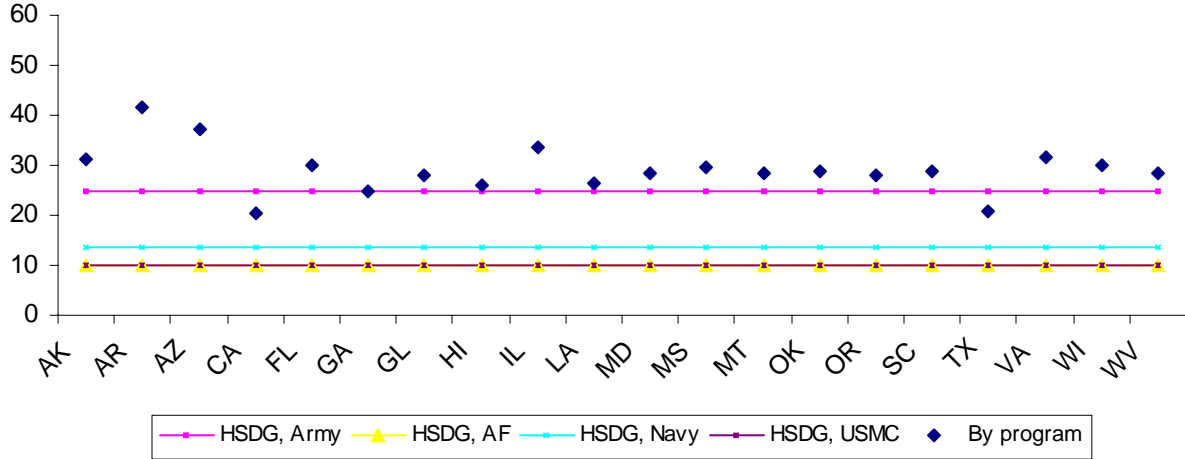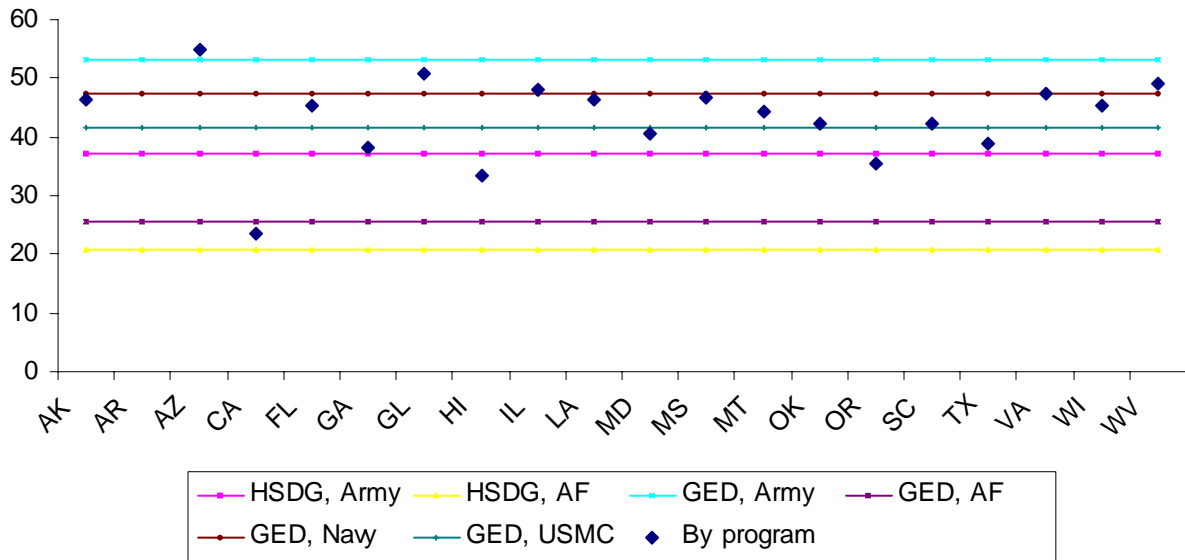

Figure 33. Regression-adjusted program effects, unconditional (total) 36-month attrition

Air Force. Additionally, figure 33 indicates that 36-month attrition rates of ChalleNGe graduates are generally below those of other GED-holders. As time passes and more ChalleNGe graduates enlist, it would be worthwhile to track attrition rates of this group through the end of the first term (48 months, in most cases) as well as reenlistment rates.

At this point, we would like to stress that interpreting the program-level effects is not straightforward. Many factors could influence these numbers, including the quality of data collected by ChalleNGe programs. The quality of the ChalleNGe data has improved in recent years, and we expect this trend will continue. This will be helpful but will not completely solve this problem. Of course, missing program data decrease our ability to control for measured background factors (such as family income or initial test scores). But there are many other unmeasured factors that are sure to affect program success, and some of these are beyond the control of ChalleNGe programs. Examples include both school and neighborhood qualities. Programs in states with weaker schools are likely to have more difficult-to-educate cadets; this could affect graduation rates, GED recipiency, and military attrition. Cadets from neighborhoods or families with fewer resources are also likely to be more difficult to educate. Of course program policies, both official and unofficial, along with how skillfully programs are managed, are likely to influence outcomes in subtle but important ways. We would certainly expect that better managed programs have better outcomes. However, given the purposes of ChalleNGe, it is also possible that programs may have worse outcomes if they work harder with their population. For example, information gained during our site visits indicated that different programs have somewhat different ways of dealing with cadets who wanted to leave and with disciplinary problems. A program that works harder to keep troubled youth from leaving may have a lower gradation or GED rate as a result, and may even see graduates with higher military attrition rates. Because the central purpose of the ChalleNGe program is to help disadvantaged youth, rather than produce high-quality military enlistees, we recommend against "grading" the programs based on the results in table 11. Rather, we suggest that these results be used to guide program leadership in exploring important program-level differences, and perhaps in assigning extra resources, should they

become available. Also, we suggest that linking additional data on ChalleNGe participants' schools and neighborhoods to the program data could provide a great deal of insight into program-level differences. We discuss this briefly with our other recommendations.

Summary of attrition results

Particularly in the case of 3-month (bootcamp) attrition, ChalleNGe factors are important determinants of success. Those with higher ChalleNGe physical fitness, as well as those with more mentoring, are more likely to complete their first 3 months in the Services. Those who graduated from ChalleNGe have much lower attrition rates throughout the first year of service than those who were terminated from the program.

Consistent with earlier studies, other factors are also important. However, few other studies allow the effects to differ by gender, so it is difficult to compare some of our findings with those of earlier researchers. Our AFQT findings indicate that, within the first 3 months, women with higher AFQT scores are much more likely to attrite; men with higher scores, in contrast, are more likely to stay. It is surprising that AFQT scores have little effect during the preservice phase; we believe this indicates that many who attrite due to problems in training do so after the 1-year mark, perhaps after repeating training more than once. By the second and third year of obligation, those with higher AFQT scores are less likely to attrite, regardless of gender (although the effect is slightly stronger for women than for men), and this result is true for overall 36-month attrition as well. There are substantial differences in attrition rates among the Services (consistent with earlier research). In the Navy, Army, and Marine Corps, we find that women struggle in bootcamp and are more likely to attrite than similar men. Attrition rates in the Air Force consistently are more similar between men and women than in the other Services. By the second and third years of obligation, women in the Air Force and the Navy have attrition rates on a par with or below those of similar men. Finally, we find evidence that attrition rates vary by ChalleNGe program, although we urge caution in interpreting the program-level effects.

Conclusion and recommendations

The ChalleNGe program is a unique residential program for youth age 16 to 18 who have dropped out of high school. Most of the youth served by the program are quite disadvantaged, as indicated by the limited family income data available as well as initial test scores. Those who enter the program perform, on average, at the 7th grade level. During the 5.5-month-long program, the average participant gains more than two grade levels; most also earn a GED while enrolled in ChalleNGe.

The program combines classroom work with a strong emphasis on discipline and physical fitness; both components are important in explaining success of those who complete the program.

Our results focus on the following outcomes:

- Acceptance into a ChalleNGe program

- Graduation from a ChalleNGe program (for those accepted)

- Attaining a GED certificate (for those who graduate from ChalleNGe)

- Joining the military (for all ChalleNGe participants)

- Military success (for those who join the military).

Acceptance into the program is not random, and different programs emphasize somewhat different factors. Based on our site visits, it appears that many programs give preference to those who are 18 years of age (versus 16 or 17); however, most cadets are younger than 18. There are statistically significant differences in the racial background characteristics of applicants who are accepted versus rejected, but the differences are small in all cases.

Missing data—a major problem—cause some issues in determining who was accepted. In some cases (program- and class-specific), few or

77

no people are listed as entering the program; rather, the status of most or all is listed as "Not Applied," "Pending," or something similar. We delete these program participants from our analysis of ChalleNGe outcomes and do not include them in the analysis of who is accepted. But, based on our analysis of military performance, we suspect that many of these people do actually complete the program.

Graduation from ChalleNGe depends both on participants' background characteristics, such as gender, ethnicity, and family income, and on program characteristics. In general, those with higher incomes are more likely to complete the program; also, women complete at higher rates than men. Those with higher initial standardized tests scores, as well as those with higher initial physical fitness levels, are more likely to complete the program. Aside from these factors, the individual program the cadet attends makes a difference; some programs have higher overall graduation rates than others, even holding other factors constant.

Earning a GED depends on some of the same factors as ChalleNGe graduation; but, as one would expect, physical fitness has no influence on GED recipiency. Initial test scores are important. Those who score below the 6th grade level on the pretest, or below the 8th grade level on the posttest, have a very low probability of earning a GED. Also, female cadets earn GEDs at lower rates than male cadets.

Cadets are much more likely to join the military if they both graduate from ChalleNGe and earn GEDs. This is consistent with the fact that both of these conditions are necessary to enter the military with a Tier 1 credential. But meeting either of these conditions increases military enlistment, holding the other condition constant. In other words, cadets who earn GEDs are much more likely to join the military than cadets who fail to earn GEDs, holding graduation from ChalleNGe constant. And, cadets who graduate from ChalleNGe are much more likely to join the military than cadets who fail to graduate from ChalleNGe, holding GED attainment constant. Scoring above the 75th percentile on the TABE pretest is also a strong predictor of military enlistment.[27] Older cadets, as well as more physically fit cadets, are

---

27. The 75th percentile on the TABE pretest is 9.3 for both men and women.

also more likely to enlist. In addition, there are racial differences in military enlistment; white cadets are more likely to enlist than Hispanic or African-American cadets.

We continue to express concern about the coding of the ChalleNGe credential in enlistees' official military records. Over 30 percent of ChalleNGe graduates who enlist are coded as high school diploma graduates in their official records; of these, the majority do *not* attend programs that award high school diplomas. In particular, ChalleNGe graduates in the Air Force almost always have official records that indicate completion of a high school degree.

Finally, we examine the military performance of those ChalleNGe participants who enlist. Our main measure of military success is attrition. Our first result is that those who complete ChalleNGe have significantly, substantively lower attrition rates than those who drop out of ChalleNGe. While we have no true random control group, we believe that ChalleNGe dropouts serve as a good comparison, especially given the program-level differences in completion.

In terms of attrition, we find large differences across the Services. The attrition rate of women is higher than that of men. This difference, however, disappears after the first year. We do find that elements of the ChalleNGe program are important predictors of early attrition; in particular, cadets who have more contact with a mentor have lower bootcamp attrition. Finally, there are large program-specific effects. Graduates of some ChalleNGe programs have consistently lower attrition than graduates of other programs and indeed have attrition rates below those of typical high school diploma graduates. These differences are likely due to a combination of unobserved differences in the state populations, the programs' various admissions procedures, and other program-level factors. While program management and policies are likely to be important, it is difficult to separate the effects of these factors.

Our recommendations follow:

- Continue to work to improve the quality of the data entered into the ChalleNGe system at the sites. We discovered on our site visits that data on a single cadet are entered by a number of

different staff members. While this makes sense because staff enter the data they have the most knowledge about, it may explain some of the incomplete data. In particular, we recommend that programs continue to work on entering "good" (legitimate) SSNs. There is no real incentive to do this at the sites; indeed, it is very difficult to know if the SSN is correct (many cadets, for example, may not know their SSNs). However, given the uncertainty of the reporting of the ChalleNGe credential at the DMDC level, good program-level SSNs provide the only realistic check. Also, having high-quality program-level data is absolutely necessary to compare program effectiveness. Given the variations among ChalleNGe programs, it is likely that the programs will learn a great deal from each other, if adequate data exist.

- We emphasize that, as long as ChalleNGe graduates are coded as high school diploma graduates, the ChalleNGe program will not "get credit" for the performance of these graduates in any analysis based on DMDC's data. Fortunately, the ChalleNGe program data provide a potentially rich source for analysis; we believe that further analysis is likely to be very helpful to the program. In particular, we recommend followup analysis to look at how performance changed after the end of the 5-year pilot program.

- We recommend following up on our results in two other ways: first, matching the ChalleNGe program data to Census data by utilizing the ZIP codes on the files will allow comparisons of the populations served by different programs and will allow more control for background characteristics. By using ZIP-code-level Census data, one can essentially control for characteristics of the neighborhood where each cadet lived (such as educational attainment and unemployment); this could change program-level effects substantively. Also, because ZIP code information exists on the DMDC files, it would be possible to compare the performance of ChalleNGe graduates in the military with the performance of those from similar areas, rather than simply comparing ChalleNGe graduates with all high school diploma graduates or all GED-holders. Second, qualitative analysis of

how policies relating to admission and discipline differ across programs could reveal the source of some program-level differences.

- As more ChalleNGe graduates enlist and as those who have enlisted progress through the ranks, it will undoubtedly be worthwhile to examine longer-term attrition and reenlistment rates of this group.

Appendix A: Data sources, program details, and variable definitions

We use two primary data sources in this paper. The first is data collected by each Challenge program, including such information as age at admission, gender, ethnicity, family income, initial and final physical fitness measures, initial and final scores on the Test of Adult Basic Education (TABE), number and type of contacts with mentor, and hours of community service. This dataset also contains some limited information on the ChalleNGe program—in particular, some information on the demographics of mentors.

The second primary source is data on all Servicemembers collected by the Defense Manpower Data Center. We requested that DMDC match the ChalleNGe program data to its active duty accession files; this produced a single file that included information on the ChalleNGe experience and the military performance of those who participated in ChalleNGe and later enlisted in the military.

In addition, we requested from DMDC a longitudinal file, including all who enlisted with one of the following four credentials: ChalleNGe completion (and GED), high school diploma, GED, or no credential ("dropout"). We used this file to track the total number of ChalleNGe graduates who enlisted over time and to provide background attrition information on each group. In this appendix, we discuss each dataset and detail the extent of missing variables as well as the construction of key variables.

ChalleNGe program data

Our data on the various ChalleNGe programs include information on people who entered the program, and some limited information on those who expressed interest in, but did not enter the program. In general, the ChalleNGe program data are missing a great number of

data. In addition, some variables take on unreasonable values in many cases. Variables that are of particular concern are:

- *Social Security Number:* This variable is of key importance in the analysis since it allows us to determine whether the ChalleNGe participant eventually joined the military. Although SSNs are not often missing, many are obviously incorrect (e.g., "11223" rather than a legitimate, 9-digit number). We deleted all observations with SSNs that had fewer than 9 digits, although we did allow for SSNs with leading zeros. We also deleted those 9-digit numbers that were obviously incorrect (i.e., "111111111"). The ChalleNGe program data include each participant's name, but DMDC matches only using SSN because matching by name is likely to yield multiple Servicemembers. In some cases, "bad" SSN data were concentrated within a specific program/time frame. For example, of the 484 ChalleNGe participants in Arizona in the first class in 2002, 276 had SSNs ranging from 100000001 to 100000406. In the second class in Arizona in 2002, the majority of SSNs ranged from 200000001 to 200000148. It is clear, therefore, that some ChalleNGe employees are simply entering expedient numbers rather than legitimate SSNs. For this reason, we know that we have not identified all former ChalleNGe participants in the Services.

- *Certain classes of certain programs:* In some cases, ChalleNGe program data are much more likely to be missing for those who do not complete the program. For example, those who do not complete ChalleNGe rarely have a legitimate age included in their files. In other cases, however, the missing data are clearly specific to certain classes of certain programs. We found that, in these classes, the vast majority of participants were coded as neither "graduate" nor "terminated"; in most cases, many were coded as "not applied" or "pending." In our analysis of ChalleNGe outcomes, we deleted all observations for the following programs and years for this reason:

  — New Jersey, 1999, classes 1 and 2

  — New Jersey, 2000, classes 1 and 2

  — New Jersey, 2001, class 1

- — Arizona, 2002, class 2

- — Illinois, 1999, class 1

- — North Carolina, 1999, class1

- — Oregon, 2000, class 1

- — South Carolina (Aiken), 2003, class 2.

- *Pre-1999 observations:* We deleted *all* observations from years before 1999. The program data include very little information before 1998, and we decided to delete all of the 1998 observations because our initial analysis indicated that at least half of the programs had severe problems with missing data.

- *Indication of earning a GED:* Earning a GED is one of our outcome measures, as well as a central goal of the ChalleNGe program. However, of the 36,906 graduates, we have no indication whether about 8,000 earned a GED or not.

- *Alternate credentials:* According to [1], the following programs award an alternate credential:

  - — California: high school diploma or GED (program is a state charter school)

  - — Florida: high school diploma (upon passing a comprehensive assessment test)

  - — Georgia (Fort Gordon and Fort Stewart): adult education diploma

  - — Hawaii: high school diploma

  - — Mississippi: high school diploma

  - — New Jersey: New Jersey state high school diploma

  - — Oregon: high school diploma

  - — The ChalleNGe program data indicate alternate credentials for some graduates; nearly all of those with alternate credentials attended programs in California, Hawaii, or Oregon. We use this information when examining the probability of completing a GED (or alternate credential).

Some programs, such as the following, award class credits, scholarships, or tuition grants to encourage ChalleNGe graduates to continue their education:[28]

- The Arizona program issues $66,000 per class in scholarships to those wishing to gain more education.

- The Georgia program offers a $500 HOPE tuition voucher to offset the costs of future postsecondary education within the state.

- The Illinois program has offered scholarships to nearly half of all graduates, with an average value of ~$600.

- Louisiana offers free tuition at any tech school to all graduates.

- Michigan (an accredited alternative school) offers 4 credits to those who wish to transfer back to high school and up to 15 credit-hours through a local community college.

- Mississippi offers up to 9 hours of credit at William Carey College.

- New Mexico offers the possibility of earning 15-18 credit hours at a local community college in specific trades.

- North Carolina offers selected recruits the opportunity to earn up to 12 hours of college credit.

- Texas offers a $1,000 educational stipend to graduates.

- Wisconsin offers High School Equivalency Diplomas through state DPI (requires a "health, citizenship, and employability skills requirement," as well as career-awareness counseling (this program is considered equivalent to a high school diploma by the Wisconsin DPI).

In the next sections, we discuss issues surrounding several specific variables.

---

28. All information on credits/scholarships comes from [1] and was current as of 2004.

Physical fitness data

The ChalleNGe program data include records of scores on a variety of physical fitness tests. These tests include pushup, pull-up, curl-up, V-sit, flex-arm, sit-reach, shuttle run, and 1-mile run.[29] The average ChalleNGe participant had three separate records, each containing scores on as many as eight of the above tests. Some records were labeled "diagnostic," some "progressive," and some "final." We focus our attention on the diagnostic and final physical fitness tests.

For each person, we took the best test result of each type available. Therefore, in the case of pushups, we selected the highest number of pushups on a diagnostic test, as well as the highest number on a final test. On the mile run, in contrast, we selected the lowest times. We used these as measures of the person's initial and final fitness levels.

Next, we separated the data by gender. For each gender, we produced standardized measures of the person's initial fitness and final fitness. These standard variables have a mean of 0 and a standard deviation of 1. Therefore, a woman who entered at the average fitness level for women and improved by exactly the average amount over the course of the program would have scores of 0 for her initial and final fitness measures; the same is true for a man who entered at the average fitness level and improved by the average amount.

Although this methodology does not allow us to see exactly how much each person improved over the course of the program, it has two advantages: (1) we can now compare men and women in an appropriate manner, and (2) we can easily determine how a person's progress compares with that of the average participant. As additional background information, we include here a chart indicating the average fitness level of men and women on each fitness test, both diagnostic and final measures. As table 12 makes plain, men were more physically fit than women by these measures; for both men and women, the average participant was more physically fit at graduation than upon entering the program.

---

29. A few participants had half-mile times rather than mile times.

Table 12. Initial and final physical fitness measures, by gender

Fitness test	Women		Men	
	Diagnostic	Final	Diagnostic	Final
Pushups	10.9	21.1	25.4	42.0
Pull-ups	1.8	2.7	8.1	11.1
Flex-arm	4.5	4.1	1.8	1.8
Curl-up	30.4	41.4	42.2	53.1
Sit-reach	6.4	6.9	4.7	5.5
V-sit	6.3	8.4	5.1	7.2
Shuttle run	11.7	113	10.0	9.6
Mile run[a]	710	608	510	444

a. We converted these times to total number of seconds.

We prefer this standardized variable to raw scores for the reasons just discussed. However, we also experimented with data on the raw scores. We found that scores on specific physical fitness tests were often highly correlated, as one would expect (each person is likely to perform better on certain tests than on others, but generally fit people are likely to do better than average on all tests). Because of this correlation (called multicollinearity when speaking of regressions), adding all of the test results to an equation measuring attainment of a GED or graduation produces confusing results. The coefficients explain substantial variation together, but many are not statistically significant. We also experimented with using only one or a few test results. We used the mile time alone in some of our regression; in many ways, the results were similar to those using the standardized measure indicating that mile time captures general elements of fitness. However, mile time is often missing; mostly for this reason, we prefer our standardized measure and report descriptive statistics and regressions using this standardized measure throughout the paper. We also include a variable indicating that no standardized fitness score can be calculated due to missing data.

Many people had zeros listed for their best (or only) tests. In the case of pushups, pull-ups, and similar tests where higher numbers are better, we left the zeros because we suspected they were legitimate (it is quite possible that a participant could not perform a single pull-up in the time allotted). In the case of the mile and shuttle runs, however,

we replaced the zeros with missing values because we assume that the person did not actually complete the test.

Data on standardized test scores (TABE)

ChalleNGe participants took the Test of Adult Basic Education upon entering the program; graduates took the test again upon completing ChalleNGe. The TABE is a multiple-choice test used to measure academic achievement of people in nonstandard education programs (most often adult education programs). The TABE consists of tests measuring skill levels in reading, applied math, math concepts, language, and spelling. Several levels of TABE tests are available; standardized scores are reported so that comparison across tests is possible. For example, a person may initially take a level 7 test but may advance to the point where the level 8 test is appropriate near the end of the ChalleNGe program. In this way, ceiling effects can often be avoided.[30] The TABE standard scores indicate the grade level of the person's achievement; for example, a score of 9.4 indicates that the person performs at a 9th grade, 4th month level.

Many ChalleNGe participants have zeros for one or both TABE scores. This is not a legitimate TABE score. We would expect nongraduates to have missing final TABE scores, and in nearly all cases they do. However, many people also have missing (or 0) pretest scores. We considered these scores to be missing.

Our analysis indicates that the problem of missing TABE data is a program-level problem. Certain programs have very high levels of missing TABE information. In fact, nearly *all* programs have missing TABE information before 2002; by 2003 and 2004, nearly all graduates have TABE information. Even in the most recent years, however, some programs had a great deal of missing data; for example, the Oregon program listed missing test scores on the vast majority of

---

30. Ceiling effects occur when a student achieves near the maximum score on a pretest; such a student is unlikely to show much progress on the posttest. At the extreme, a student with a perfect score on a pretest will show no progress if given the same test as a posttest, no matter how great his or her academic achievement gain.

graduates in 2001, 2002, and 2003. Therefore, it seems that some programs are not entering TABE data at all, while others are entering zeros in place of legitimate test scores.

DMDC data

We cleaned the DMDC extract of ChalleNGe participants and the DMDC longitudinal dataset in exactly the same manner, as described in this subsection.

The DMDC data include variables indicating both the home state and the home ZIP code. In cases of invalid state codes, we imputed the state from the ZIP code. (We also excluded observations from American Samoa, Canal Zone, Guam, and the Virgin Islands, as well as observations mising both state and ZIP code information). Imputed states are disproportionately distributed from Alaska, Hawaii, and New Mexico.

The DMDC data also included indicators of rank at accession and current rank. A small number of observations had invalid accession rank data—either equal to 0 or greater than 4. The data on current rank were by far more problematic. While a small number of observations with valid accession rank data had current rank less than accession rank, the more troubling issue is that more than half of the observations with valid data on accession rank had current rank equal to 0. The majority of the observations with current rank equal to 0 had left the military, but not all who left had current rank coded as 0 and not all those with current rank coded as 0 had left. Due to these problems, we do not analyze the data on rank.

There were minor problems with the demographic data reported by the DMDC. A small number of observations had undetermined gender and/or marital/dependent status. While undetermined demographic variables were relatively scarce, there were many observations with values for demographic variables that were not valid. For instance, some observations had values for AFQT scores of 0; others indicated 9 dependents. There was no correlation between invalid AFQT data and invalid dependent data. The invalid dependent data are clustered in accession years 2003 and 2004; we dropped the small

number of observations listing 9 dependents. We imputed values for those with invalid AFQT score data. Finally, we excluded observations with values for age not in the range of 17-35.

Attrition rates

DMDC identifies recruits by their education credentials: traditional high school, ChalleNGe graduates,[31] GED recipients, and dropouts. Because the ChalleNGe program targets a specific population, it is not surprising that ChalleNGe graduates differ from those in the other education credential groups along various demographic dimensions. Here, we examine how ChalleNGe graduates, as identified by DMDC, differ from those with other education credentials.

First, ChalleNGe graduates are younger than those in other education credential groups. The median age of a ChalleNGe graduate is 18, while the median age of those with other credentials is higher. Figure 34 shows the age distribution by education credential. Over 70 percent of ChalleNGe graduates who enlist in the military are either age 17 or 18. Only 40 percent of traditional high school graduates, 28 percent of GED recipients, and 35 percent of dropouts fall within this age range. ChalleNGe graduates are also more likely than traditional high school graduates but less likely than GED recipients or dropouts to be married or to have dependents (see table 13). ChalleNGe graduates also have the lowest AFQT scores among all the education credential groups, as shown in figure 35.

ChalleNGe graduates' initial military experience falls somewhere in between the experience of high school graduates and other GED recipients. The ChalleNGe graduates are the most likely to need an alcohol or drug waiver to enter the military and the least likely to need a minor legal waiver. They are more likely than traditional high school graduates to need a serious legal waiver but are less likely than GED recipients and dropouts (see figure 36). More ChalleNGe graduates spend 3 months or less in DEP than do traditional high school graduates and dropouts, as shown in figure 37.

---

31. ChalleNGe graduates who have obtained higher education credentials may not be identified in the ChalleNGe group.

Figure 34. Age distribution by education credential
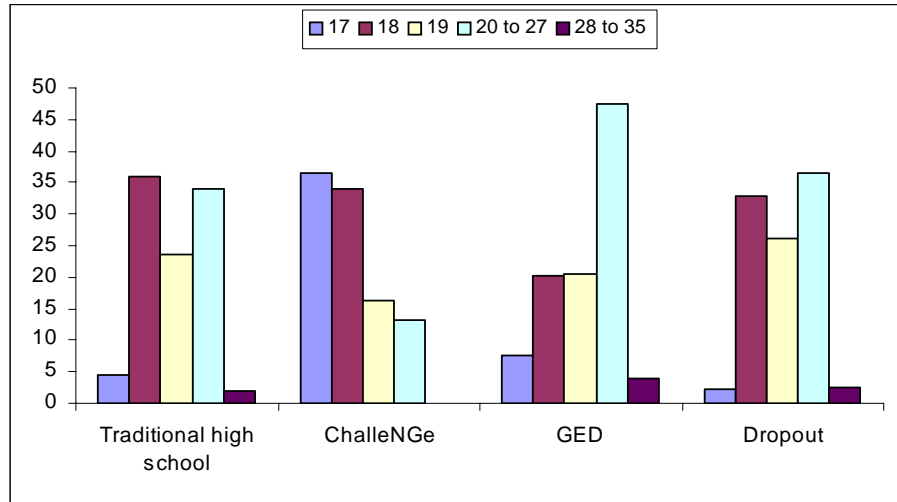
Table 13. Demographic data by education credential

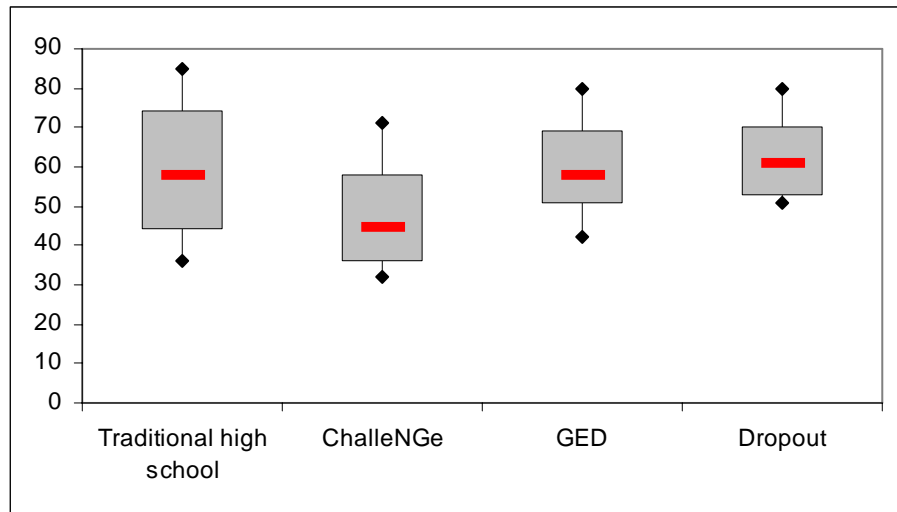|	Traditional high school	ChalleNGe	GED	Dropout
Male	91.18%	81.68%	89.48%	93.41%
Married	4.18%	7.04%	16.80%	8.25%
Have dependents	5.61%	8.73%	20.91%	14.83%

Figure 35. Boxplot of AFQT score by education credential
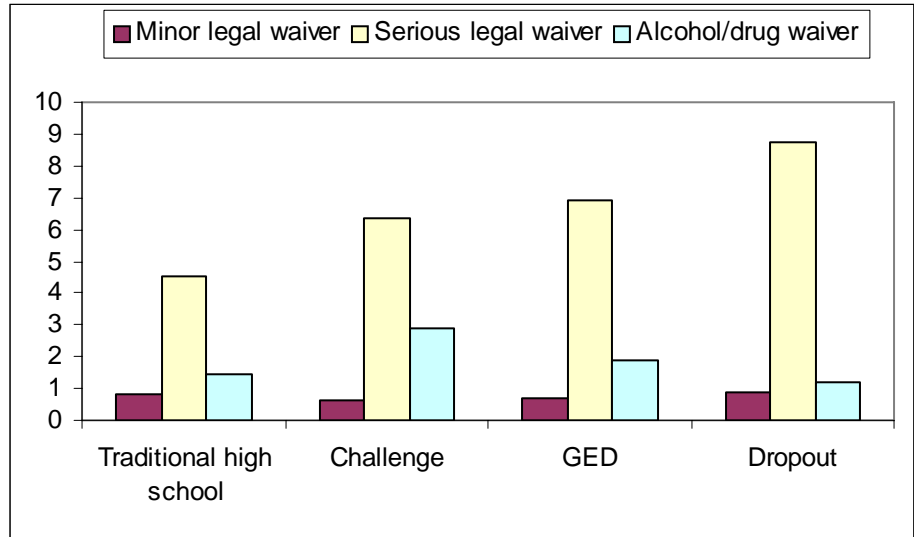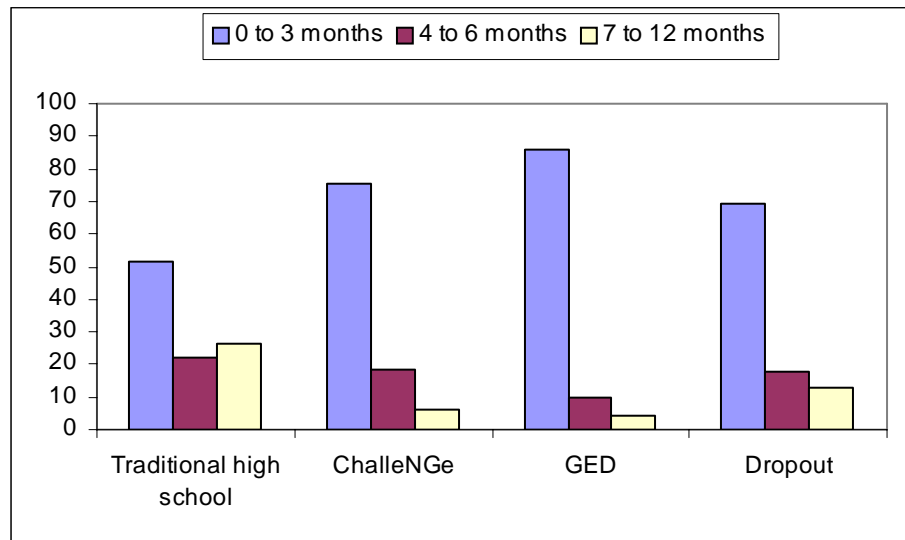
Figure 36. Waivers by education credential

Figure 37. Months in DEP by education credential

The attrition patterns of ChalleNGe graduates vary both by Service and by length of time. The 12-month attrition rates for ChalleNGe graduates (see figure 38) is about the same as for traditional high school graduates in both the Army and the USMC, consistent with the findings of [5] and [6]. The attrition rates for GED recipients and dropouts are considerably higher than the attrition rates for traditional high school and ChalleNGe graduates in these cases. In contrast, the 12-month attrition rates for ChalleNGe graduates in the Navy and Air Force are higher than the attrition rates for traditional high school graduates. In fact, ChalleNGe graduates have the highest 12-month attrition rates for the Air Force. As discussed in the text, this differs from our findings using the matched ChalleNGe sample; it is the likely result of nearly all ChalleNGe participants who enlist in the Air Force being coded as high school diploma graduates.

Figure 38. Twelve-month attrition rates by service and education credential
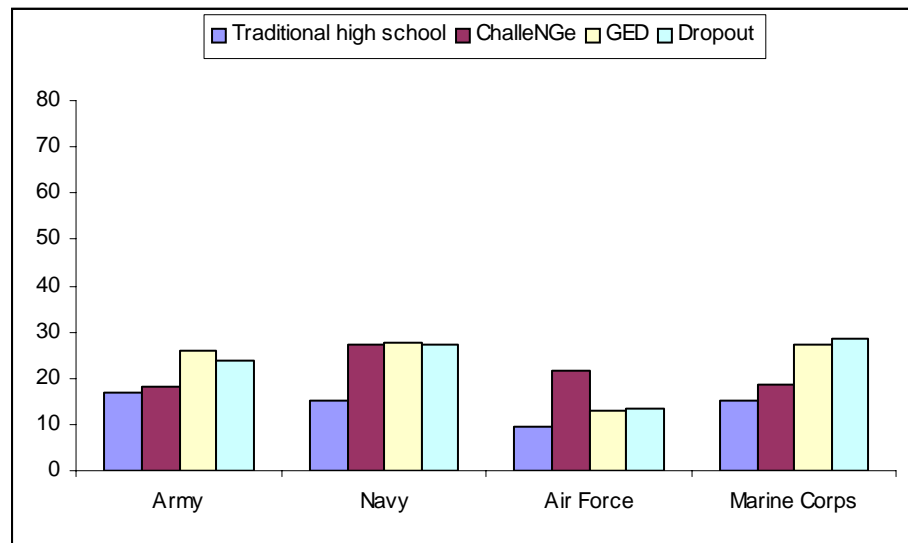
The 24-, 36-, and 48-month attrition rates follow different patterns than the 12-month attrition rates (see figures 39, 40, and 41). In each case, ChalleNGe graduates have attrition rates between those of traditional high school graduates and GED recipients in the Army. This is also true for the USMC 24- and 36-month attrition rates. The 48-month attrition rate for ChalleNGe graduates is slightly higher than that for GED recipients in the USMC. In the Navy and Air Force, the ChalleNGe graduates have the highest attrition rates. Attrition from the Air Force is particularly high for this group. Again, this is most likely due to the discrepancy in education credentials.

Figure 39. Twenty-four-month attrition rates by service and education credential
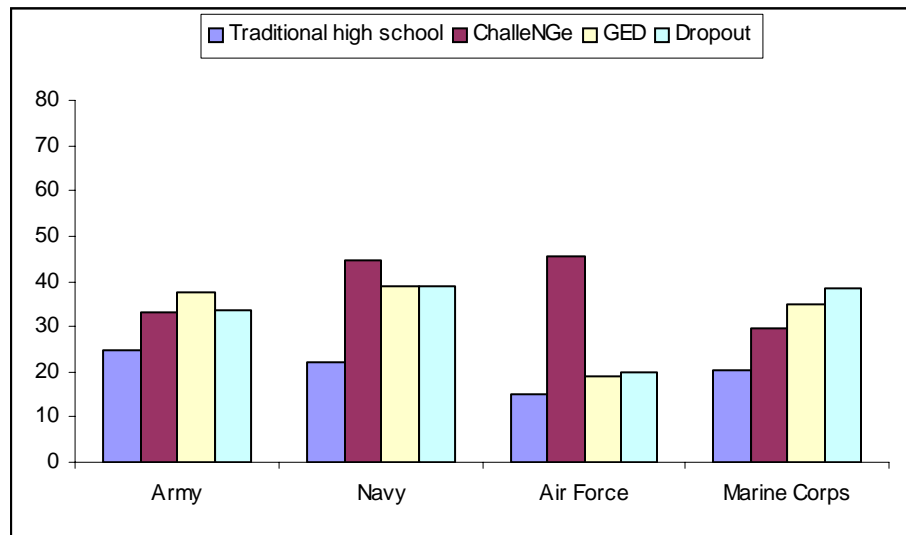
Figure 40. Thirty-six-month attrition rates by service and education credential
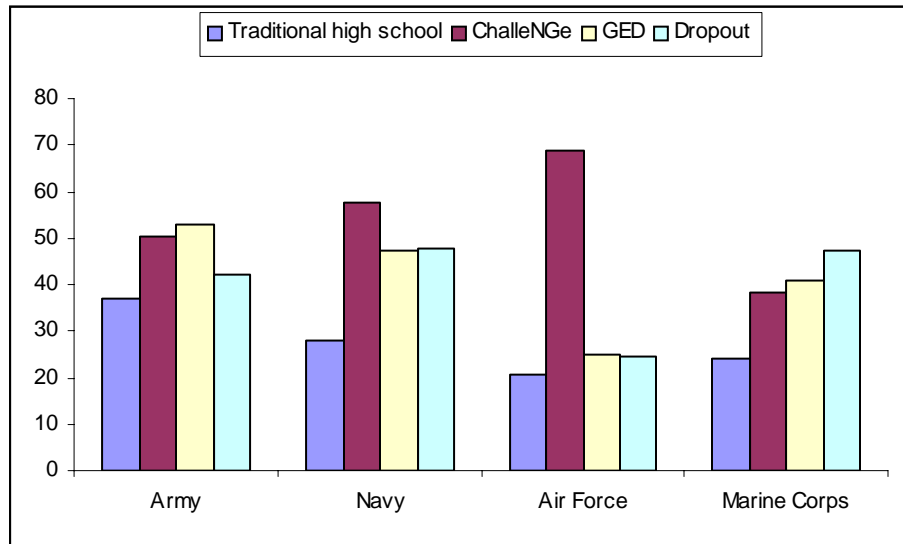
Figure 41. Forty-eight-month attrition rates by service and education credential
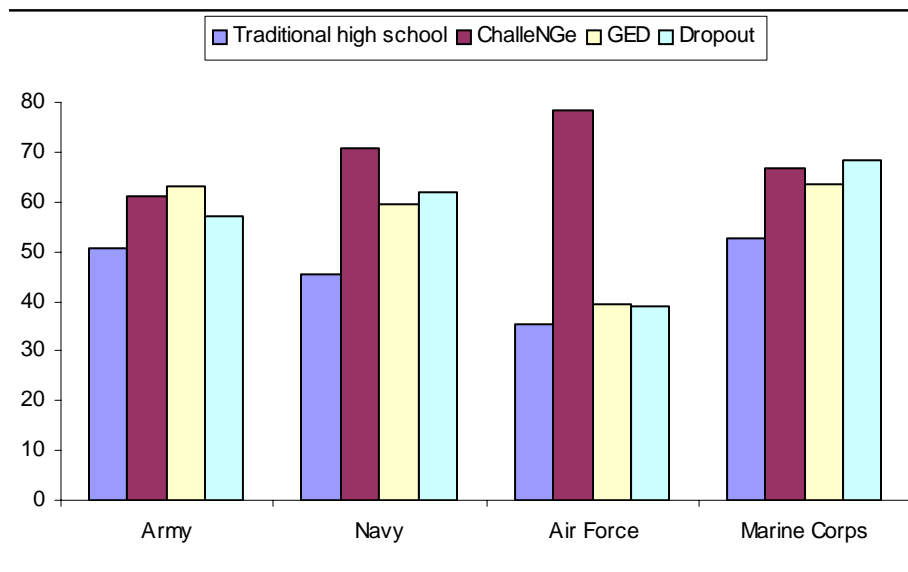
These differences in attrition patterns could be solely attributable to the demographic differences between ChalleNGe graduates and the other education credential groups. Therefore, we used logistic regression techniques to control for the initial differences in observable demographic variables, such as marital status and AFQT scores (see table 14). (Note: We include the following independent variables in our logistic regression: ChalleNGe credential, GED credential, dropout credential, AFQT score, months in DEP, African-American, Hispanic, Asian/Pacific Islander, American Indian, Other race, age between 20 and 27, age between 28 and 35, female, married, 2 children, 3 children, 4 or more children, presence of minor legal waiver, presence of serious legal waiver, presence of alcohol waiver, presence of drug waiver, failed drug test, and fiscal year controls.)

Table 14. Marginal effect of logistic regression on probability of attriting[a]

	Army	Navy	Air Force	USMC
12-month				
ChalleNGe	0.02*	0.10***	0.11**	0.00
GED	0.08***	0.10***	0.02**	0.09***
Dropout	0.07***	0.10***	0.04	0.14***
24-month				
ChalleNGe	0.08***	0.19***	0.25***	0.05***
GED	0.11***	0.13***	0.03***	0.11***
Dropout	0.10***	0.14***	0.06*	0.19***
36-month				
ChalleNGe	0.10***	0.25***	0.42***	0.08***
GED	0.14***	0.16***	0.05***	0.12***
Dropout	0.06*	0.17***	0.05	0.24***
48-month				
ChalleNGe	0.07***	0.20***	0.41***	0.08**
GED	0.11***	0.13***	0.05**	0.09***
Dropout	0.06	0.15***	0.04	0.16***

a. * indicates statistical significance at the 10-percent level. ** indicates statistical significance at the 5-percent level. *** indicates statistical significance at the 1-percent level.

These results in table 14 support what we saw in figures 38 through 41. The attrition rates for ChalleNGe graduates are generally significantly higher than the attrition rates for traditional high school graduates.[32] For the Army and USMC, the attrition rate for ChalleNGe graduates is between the attrition rate of the traditional high school graduates and GED recipients. For the Air Force and Navy, the attrition rate for ChalleNGe graduates is generally higher[33] than it is for any other education group.

---

32. The only exception is the 12-month attrition rate for USMC ChalleNGe graduates.

33. The only exception is the 12-month attrition rate for Navy ChalleNGe graduates.

Appendix B: Complete regression results

This appendix contains complete regression results for each of our models. We arrange the appendix by outcome, in the same order as the outcomes are presented in the paper. All models use logit equations to model a (0, 1) outcome, such as graduating from ChalleNGe. In such models, the relationship between the coefficient and the marginal effect is nonlinear; for this reason, we calculate marginal effects within the paper. In this appendix, we include all coefficients and standard errors, as well as measures of the overall explanatory power of our equations and the number of observations included in each.

All models include "fixed effects" to control for the program the person attended/entered. We do not report the program fixed effects in these tables, but do indicate the marginal effects of the program in the text.

When estimated using a standard logit regression, equations such as these produce potentially incorrect standard errors because some variables (e.g., program attended) are measured at a more macro level while others (e.g., age) are measured at an individual level. In each case, we correct for this by using a standard technique to "cluster" the errors.

Enter ChalleNGe

The first regression models the probability that a person who shows interest in ChalleNGe will actually apply. The second regression models the probability that a person who applies to ChalleNGe will be accepted. See tables 15 and 16.

Table 15. Regression results, applied to ChalleNGE if showed interest[a]

Variable	Coefficient[b]	Standard error
African-American	-0.19***	0.07
Hispanic	-0.19	0.20
American Indian	0.27	0.19
Asian/Pacific Islander	-0.2	0.19
"Other"	-1.2***	0.40
Male	0.08	0.05
Age 17 at entry	0.46***	0.16
Age 18 at entry	0.49	0.37
Missing age	-3.71***	0.41
Family income $15k - $25k	0.8*	0.48
Family income $25k - $35k	1.27***	0.47
Family income $35k - $45k	1.58*	0.93
Family income greater than $45k	1.01**	0.42
Family income missing	0.51	0.35
Second class of the year	-0.19	0.33
Indicator variables for specific programs	Included	
Indicator variables for fiscal year	Included	
Constant	9.12***	0.56
Pseudo R-squared	0.3522	
Number of observations	100,862	

a. Omitted categories: white (non-Hispanic Caucasian), Age at ChalleNGe entry = 16,
Family income <$15K, First class of the year
b. * indicates statistical significance at the 10-percent level.
  ** indicates statistical significance at the 5-percent level.
  *** indicates statistical significance at the 1-percent level.

Table 16. Regression results, acceptance to ChalleNGE if applied[a]

Variable	Coefficient[b]	Standard error
African-American	-0.15***	0.06
Hispanic	0.02	0.11
American Indian	-0.11*	0.07
Asian/Pacific Islander	-0.12	0.11
"Other"	-0.36***	0.13
Male	0.05	0.05
Age 17 at entry	-0.1	0.38
Age 18 at entry	-0.45	0.78
Missing age	-6.64***	0.43
Family income $15k - $25k	0.03	0.16
Family income $25k - $35k	0.38	0.38
Family income $35k - $45k	-0.37	0.26
Family income greater than $45k	-0.21	0.16
Family income missing	0.02	0.27
Second class of the year	-0.03	0.18
Indicator variables for specific programs	Included	
Indicator variables for fiscal year	Included	
Constant	8.77***	0.34
Pseudo R-squared	0.4365	
Number of observations	95,798	

a. Omitted categories: white (non-Hispanic Caucasian), Age at ChalleNGe entry = 16, Family income <$15K, First class of the year

b. * indicates statistical significance at the 10-percent level.
   ** indicates statistical significance at the 5-percent level.
   *** indicates statistical significance at the 1-percent level.

Graduate from ChalleNGe

This regression models the probability that a person who enters ChalleNGe will graduate from the program (table 17).

Table 17. Regression results, graduation from ChalleNGe [a]

Variable	Coefficient[b]	Standard error
Age 18 at entry	0.861***	0.076
Male	0.0049	0.038
African-American	0.122*	0.066
Hispanic	0.097	0.078
African-American X male	-0.327***	0.046
Asian-Pacific Islander	0.355***	0.120
American Indian	-0.276*	0.154
"Other"[c]	-0.174*	0.094
Family income $15k - $25k	0.101	0.131
Family income $25k - $35k	0.281***	0.101
Family income $35k - $45k	0.351***	0.100
Family income > $45k	0.395***	0.090
Initial physical fitness	0.264*	0.147
TABE pre-test score	0.053***	0.014
Year = 2000	0.122	0.082
Year = 2001	0.143	0.090
Year = 2002	0.069	0.097
Year = 2003	0.088	0.115
Year = 2004	-0.021	0.121
Second class of the year	-0.028	0.035
Measure of program-level missing data	0.00076	0.002
Constant	0.039	0.214
Pseudo R-squared	0.0415	
Number of observations	58,406	

a. Omitted categories: Age at ChalleNGe entry < 18, female, white (non-Hispanic Caucasian), Family income <$15k or missing, year of ChalleNGe entry = 1999. Regressions also include indicators of ChalleNGe program.
b. * indicates statistical significance at the 10-percent level.
  ** indicates statistical significance at the 5-percent level.
  *** indicates statistical significance at the 1-percent level.
c. Includes those who indicated a different ethnicity or no ethnicity.

Earn a GED

This regression models the probability that a person who completed ChalleNGe also earns a GED (table 18). Some ChalleNGe programs award different credentials, and those who earned such credentials are also considered to have earned GEDs.

Table 18. Regression results, earned a GED (or alternate credential)[a]

Variable	Coefficient[b]	Standard error
Age 18 at entry	0.088	0.065
Male	0.188***	0.064
African-American	-0.985***	0.147
African-American X male	0.233*	0.129
Hispanic	-0.718***	0.140
Asian-Pacific Islander	-0.540***	0.187
American Indian	-0.484**	0.206
"Other"[c]	-0.174	0.161
Family income $15k - $25k	-0.071	0.187
Family income $25k - $35k	0.271	0.398
Family income $35k - $45k	0.681	0.598
Family income > $45k	0.964**	0.424
Initial physical fitness	0.061	0.089
Took at least 1 practice test	-3.57***	0.497
TABE posttest	0.704***	0.068
(Natural log of) hours of comm svc	0.239*	0.147
High level of mentor contact	0.107	0.104
Year = 2000	-0.168	0.416
Year = 2001	-0.591*	0.369
Year = 2002	-0.711**	0.364
Year = 2003	-1.01*	0.567
Year = 2004	-0.350	0.552
Second class of the year	0.196	0.154
Measure of program-leveL missing data	0.0026	0.0058
Constant	-5.337***	0.991
Pseudo R-squared	0.446	
Number of observations	29.606	

a. Omitted categories: Age at ChalleNGe entry < 18, female, white (non-Hispanic Caucasian), Family income <$15k or missing, year of ChalleNGe entry = 1999. Regressions also include indicators of ChalleNGe program.
b. * indicates statistical significance at 10-percent level. ** indicates statistical significance at 5-percent level. *** indicates statistical significance at 1-percent level.
c. Includes those who indicated a different ethnicity or no ethnicity.

Enlist in the military

This regression models the probability that a ChalleNGe participant will enlist in the military (tables 19 and 20). This is estimated separately for men and women.

Table 19. Regression results, enlist in the military for male ChalleNGe participants[a]

Variable	Coefficient[b]	Standard error
Earned GED	1.04***	0.15
TABE pre-test below 25th percentile	-0.75***	0.12
TABE pre-test above 75th percentile	0.54***	0.06
Missing TABE pretest	0.22	0.13
Age 16 at entry	-0.33***	0.04
Age 18 at entry	0.17***	0.05
Missing age	-0.31	0.23
Initial physical fitness	0.22***	0.05
Missing initial physical fitness	-0.25*	0.14
Terminate from ChalleNGe	-2.17***	0.47
Graduate from ChalleNGe	0.62	0.51
Second class of the year	-0.12**	0.06
American Indian	-0.11	0.12
Asian/Pacific Islander	-0.39**	0.17
African-American	-0.57***	0.09
Hispanic	-0.36***	0.08
Other race	-0.01	0.11
Family income $15k to $25k	0.06	0.11
Family income $25k to $35k	0.01	0.18
Family income $35k to $45k	-0.24	0.32
Family income greater than $45k	0.2	0.18
Missing family income	0.02	0.08
Indicator variables for fiscal year	Included	
Indicator variables for program	Included	
Constant	-1.36**	0.59
Pseudo R-squared	0.1289	
Number of observations	25,557	

a. Omitted categories: TABE posttest between 25th & 75th percentile, non-terminate & non-graduate from ChalleNGe, white (non-Hispanic Caucasian), Age at ChalleNGe entry = 17, Family income <$15K, First class of the year

b. * indicates statistical significance at 10-percent level. ** indicates statistical significance at 5-percent level. *** indicates statistical significance at 1-percent level.

Table 20. Regression results, enlist in the military for female ChalleNGe participants[a]

Variable	Coefficient[b]	Standard error
Earned GED	1.26***	0.16
TABE pretest below 25th percentile	-0.83*	0.44
TABE pretest above 75th percentile	0.76***	0.18
Missing TABE pretest	0.24	0.2
Age 16 at entry	-0.46***	0.09
Age 18 at entry	0.05	0.15
Missing age	0.52	0.35
Initial physical fitness	0.41***	0.12
Missing initial physical fitness	0.06	0.19
Terminate from ChalleNGe	0.74	1.17
Graduate from ChalleNGe	2.74***	1.05
Second class of the year	-0.06	0.13
American Indian	-0.53**	0.27
Asian/Pacific Islander	-0.73***	0.23
African-American	-0.36***	0.11
Hispanic	-0.55***	0.19
Other race	0.22	0.48
Family income $15k to $25k	-0.01	0.35
Family income $25k to $35k	-0.36	0.6
Family income $35k to $45k	-0.95	0.75
Family income greater than $45k	-0.07	0.35
Missing family income	0.24	0.15
Indicator variables for fiscal year	Included	
Indicator variables for program	Included	
Constant	-3.84***	1.15
Pseudo R-squared	0.1433	
Number of observations	5,809	

a. Omitted categories: TABE posttest between 25th & 75th percentile, non-terminate & non-graduate from ChalleNGe, white (non-Hispanic Caucasian), Age at ChalleNGe entry = 17, Family income <$15K, First class of the year

b. * indicates statistical significance at the 10-percent level.
   ** indicates statistical significance at the 5-percent level.
   *** indicates statistical significance at the 1-percent level.

Attrition

All attrition equations model the probability that a ChalleNGe participant who enlists fails to complete some period of service. Thus, they model attrition rather than continuation; factors that negatively affect attrition positively affect continuation. The preservice and service equations are conditional. We estimate these only for those who complete their earlier service. In each case, we consider attrition to have occurred if the ChalleNGe participant leaves the Service before the end of his obligation, for reasons other than to become an Officer or due to death or disability.

Our descriptive statistics indicate that the effects of many factors may be different for men versus women. Therefore, we use "interacted" variables in our attrition regressions. An example is the age variable. We use a variable to indicate that the ChalleNGe participant was 18 years or older upon enlistment; we also use an interacted variable to indicate that the ChalleNGe participant was female *and* 18 years or older upon enlistment. In this manner, we can determine whether the effect of age on military success is different for men than for women. We represent our interacted variables in the tables below using X's, such as "AFQT X female."

Bootcamp attrition

This equation models the probability that a ChalleNGe participant who enlists will leave the Service within the first 3 months (table 21). We refer to this as "bootcamp" attrition, although most enlistees will complete bootcamp in less than 3 months.

Preservice attrition

This equation models the probability that a ChalleNGe participant who enlists *and completes the first 3 months of his obligation* will leave the service within the next 9 months (table 22). Length of training pipelines varies dramatically across occupations and Services, but this period often includes training and, for those in short pipelines, some service as well.

Table 21. Regression results, bootcamp (3-month) conditional attrition[a]

Variable	Coefficient[b]	Standard error
Female	-0.413	0.422
Asian-Pacific Islander	-0.805**	0.324
Hispanic	-0.516**	0.242
Age >= 18	0.239***	0.075
Age >= 18 X female	-0.291	0.219
AFQT	-0.0072***	0.0025
AFQT X female	0.028***	0.008
Physical fitness measure	-0.423***	0.127
Physical fitness measure missing	0.168	0.119
Require a waiver	0.118	0.126
Enlisted FY00-FY01	-0.195	0.167
Enlisted FY02-FY03	-0.328**	0.172
Enlisted FY04	-0.018	0.194
ChalleNGe graduate	-0.337***	0.117
ChalleNGe non-graduate (terminated)	0.317**	0.150
High contact with mentor	-0.202**	0.106
Navy	0.571***	0.080
Navy X female	-0.570*	0.302
Air Force	-0.096	0.113
Air Force X female	-0.908***	0.313
Marine Corps	0.359***	0.079
Marine Corps X female	-0.485	0.463
Constant	-1.725***	0.208
Pseudo R-squared	0.0488	
Number of observations	8027	

a. Omitted categories: Male, Army, age less than 18, no waiver, Enlisted in FY99, neither graduate nor terminated from ChalleNGe (expressed interest but did not enter), medium or low contact with mentor. Regressions also include indicators of ChalleNGe program.

b. * indicates statistical significance at the 10-percent level.
   ** indicates statistical significance at the 5-percent level.
   *** indicates statistical significance at the 1-percent level.

Table 22. Regression results, preservice (12-month) conditional attrition[a]

Variable	Coefficient[b]	Standard error
Female	-0.171	0.450
Asian-Pacific Islander	-0.038	0.316
Hispanic	-0.355	0.224
Age >= 18	-0.202***	0.072
Age >= 18 X female	0.339	0.213
AFQT	-0.005*	0.003
AFQT X female	0.009	0.009
Physical fitness measure	-0.197	0.155
Physical fitness measure missing	-0.025	0.121
Require a waiver	0.225	0.179
Enlisted FY00-FY01	-0.445***	0.104
Enlisted FY02-FY03	-0.499***	0.105
ChalleNGe graduate	-0.041[c]	0.126
ChalleNGe non-graduate (terminated)	0.868***	0.193
High contact with mentor	-0.150	0.123
Navy	0.223*	0.117
Navy*female	-0.808**	0.380
-Air Force	0.215	0.137
Air Force X female	-0.589	0.443
Marine Corps	-0.207	0.162
Marine Corps X female	0.714*	0.415
Constant	-1.122***	0.152
Pseudo R-squared	0.0338	
Number of observations	5984	

a. Omitted categories: Male, Army, age less than 18, no waiver, Enlisted in FY99, neither graduate nor terminated from ChalleNGe (expressed interest but did not enter), medium or low contact with mentor. Regressions also include indicators of ChalleNGe program.

b. * indicates statistical significance at the 10-percent level.
   ** indicates statistical significance at the 5-percent level.
   *** indicated statistical significance at the 1-percent level.

c. Difference between "graduate" and "terminated" is statistically significant at the 1% level.

Service attrition

This equation models the probability that a ChalleNGe participant who enlists *and completed the first 12 months of his obligation* will leave the Service during the next 24 months (before completing at least 36 months of service, total) (table 23). .

Table 23. Regression results, service (36-month) conditional attrition[a]

Variable	Coefficient[b]	Standard error
Female	1.181**	0.57
Asian-Pacific Islander	-0.622***	0.247
Hispanic	-0.416**	0.189
Age >= 18	-0.416***	0.075
Age >= 18 X female	-0.290	0.307
AFQT	-0.0073***	0.0025
AFQT X female	-0.018	0.012
Physical fitness measure	-0.067	0.113
Physical fitness measure missing	0.032	0.140
Require a waiver	0.193	0.145
Enlisted FY00-FY01	-0.071	0.150
ChalleNGe graduate	-0.106[c]	0.131
ChalleNGe non-graduate (terminated)	0.099	0.305
High contact with mentor	-0.151	0.109
Navy	0.073	0.118
Navy X female	-0.894***	0.382
Air Force	-0.260**	0.121
Air Force X female	-0.582*	0.313
Marine Corps	-0.860***	0.104
Marine Corps X female	0.144	0.723
Constant	0.126	0.217
Pseudo R-squared	0.0426	
Number of observations	2609	

a. Omitted categories: Male, Army, age less than 18, no waiver, Enlisted in FY99, neither graduate nor terminated from ChalleNGe (expressed interest but did not enter), medium or low contact with mentor. Regressions also include indicators of ChalleNGe program.

b. * indicates statistical significance at the 10-percent level.
   ** indicates statistical significance at the 5-percent level.
   *** indicates statistical significance at the 1-percent level.

c. Difference between "graduate" and "terminated" is statistically significant at the 1% level.

Total (unconditional) 36-month attrition

This equation models the probability that a ChalleNGe participant who enlists will leave the Service any time during the first 36 months. (table 24).

Table 24. Regression results, 36-month unconditional attrition[a]

Variable	Coefficient[b]	Standard error
Female	0.266	0.35
Asian-Pacific Islander	-0.437	-1.59
Hispanic	-0.513**	0.184
Age >= 18	-0.244***	0.070
Age >= 18 X female	0.040	0.240
AFQT	-0.0082***	0.0022
AFQT X female	0.0031	0.34
Physical fitness measure	-0.262**	0.089
Physical fitness measure missing	0114	0.098
Require a waiver	0.219	0.163
Enlisted FY00-FY01	-0.221*	0.126
ChalleNGe graduate	-0.202*[c]	0.116
ChalleNGe non-graduate (terminated)	0.369	0.237
High contact with mentor	-0.183**	0.081
Navy	0.357***	0.096
Navy X female	-0.611***	0.263
Air Force	0.123	0.123
Air Force X female	-1.13***	0.333
Marine Corps	-0.459***	0.098
Marine Corps X female	0.373	0.564
Constant	0.630***	0.204
Pseudo R-squared	0.0434	
Number of observations	3,423	

a. Omitted categories: Male, Army, age less than 18, no waiver, Enlisted in FY99, neither graduate nor terminated from ChalleNGe (expressed interest but did not enter), medium or low contact with mentor. Regressions also include indicators of ChalleNGe program.

b. * indicates statistical significance at the 10-percent level.
   ** indicates statistical significance at the 5-percent level.
   *** indicates statistical significance at the 1-percent level.

c. Difference between "graduate" and "terminated" is statistically significant at the 1% level.

We also tested several alternate specifications of our attrition models. We included variables indicating whether the ChalleNGe program was located on an active-duty military installation, a National Guard training facility, or another location. We estimated our models including only the most recent data (FY02-FY04). Finally, we estimated our models excluding the small number of ChalleNGe graduates who completed ChalleNGe before 1999 but enlisted during FY99 or later. None of these alternations changed our results in a substantive manner.

References

[1] *National Guard Youth ChalleNGe Program, 2004 Performance and Accountability Highlights.* 2nd ed. (AOC Solutions) [Accessed March 2005: http://www.defenselink.mil/ra/documents/ 2004AnnualReportFinalversion4-27-05.pdf]

[2] Janice H. Laurence, Peter F. Ramsberger, and Jane Arabian. *Education Credential Tier Evaluation,* Sep 1996 (Human Resources Research Organization Final Report 96-19, FR0EADD-96-19)

[3] Janice H. Laurence. *Education Standards for Military Enlistment and the Search for Successful Recruits,* Feb 1984 (Human Resources Research Organization Final Report 84-4, FR-PRD-84-4)

[4] Janice H. Laurence, Jennifer Naughton, and Dickie A. Harris. *Attrition Revisited: Identifying the Problem and Its Solutions,* Jan 1996 (United States Army Research Institute for the Behavioral and Social Sciences, ARI Research Note 96-20)

[5] Federico E. Garcia et al. *Evaluation of the Pilot Program for Home School and ChalleNGe Program Recruits,* Jul 2004 (CNA Research Memorandum D0004598.A4)

[6] Jennie W. Wenger and Apriel K. Hodari. *Final Analysis of Evaluation of Homeschool and ChalleNGe Program Recruits,* Jan 2004 (CNA Research Memorandum D0009351.A2)

[7] J. Toomepuu. *Soldier Capability—Army Combat Effectiveness (SPACE), Volume I: Main Report,* Apr 1981 (Fort Benjamin Harrison, IN: U.S. Army Soldier Support Center, ACN64024; cited in [3])

[8] James Heckman and Yona Rubinstein. "The Importance of Noncognitive Skills: Lessons From the GED Testing Program." *American Economic Review* May 2001, 91(2): 145-9

[9] Pedro Carneiro and James Heckman. "Human Capital Policy." In James Heckman and Alan Krueger (Benjamin M. Freidman, ed.), *Inequality in America: What Role for Human Capital Policies?* Cambridge, MA: MIT Press, 2004

[10] John H. Tyler, Richard J. Murnane, and John B. Willett. "The Devil is in the Details: Evidence from the GED on the Role of Examination System Details in Determining Who Passes," Apr 2000 (NCSALL Reports #16, The National Center for the Study of Adult Learning and Literacy)

[11] Brian Jacob. "Getting Tough? The Impact of High School Graduation Exams." *Educational Evaluation and Policy Analysis* 23(2), 2001: 99-121

[12] General Education Development Testing Service. *Who Took the GED Tests?* (Washington, DC: American Council on Education, statistical reports from various years up to 2001)

[13] General Education Development Testing Service. *Who Passed the GED Tests?* (Washington, DC: American Council on Education, statistical reports from 2002 and 2003)

List of figures

List of tables