An Evaluation of ChalleNGe Graduates' DOD Employability

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January 2018

Photography Credit: The Oregon National Guard Youth Challenge Program (OYCP) Cadet Color Guard team, for class 2011-12, reports during their class graduation ceremony in Redmond, OR, Dec. 14. The primary mission of the OYCP is to intervene in, and reclaim the lives of 16-18 year old at-risk youth. Program graduates receive instruction in values, self-discipline, education, and life skills necessary to succeed as productive citizens, in addition to earning a G.E.D. (Photo by Sgt. Zach Holden, 115th Mobile Public Affairs Detachment).

Approved by: **January 2018**

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Abstract

In this study, we evaluate the feasibility of increasing the number of graduates from the National Guard Youth ChalleNGe Program (ChalleNGe) who could be employable in one of the four military services. Because of the Department of Defense's (DOD's) and the services' quality goals, this requires that a significant portion of ChalleNGe graduates have high school diplomas and score in the upper 50th percentiles on the Armed Forces Qualification Test (AFQT). Our methodology is three pronged: (1) we interviewed program directors, (2) we developed a test linking that allows us to predict AFQT scores based on ChalleNGe cadets' scores on the Test of Adult Basic Education (TABE, a registered trademark of Data Recognition Corporation), and (3) we analyzed the test scores and attrition behavior of those ChalleNGe graduates who joined the services. We ultimately determine that increasing DOD employability would require changes to the ChalleNGe program; the program directors would have to carefully consider whether such changes align with the program's philosophy and mission.

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Executive Summary

The National Guard Youth Challenge Program (ChalleNGe) is a quasi-military, 22-week residential program designed to serve 16- to 18-year-old high school dropouts, as well as students at risk of dropping out (i.e., students who have earned far fewer credits than expected are considered at risk of dropping out). The program also includes a 12-month post-residential mentoring component. During this time, cadets and their mentors report back to the program about the cadets' status—whether they are employed, in school, or serving in the military. The overall goal of ChalleNGe is to help improve cadets' cognitive and noncognitive skills by increasing their education levels, self-confidence, life skills, and, ultimately, employment potential. Currently, there are 35 ChalleNGe locations in 27 states, Washington, D.C., and Puerto Rico.

Depending on the program attended, cadets may have one of three educational options on successful completion of the ChalleNGe program: a high school diploma, recovered high school credits with which to return to one's home high school and complete the degree (called credit recovery), or proof of passing the General Education Development (GED) test. Those leaving ChalleNGe with a GED certificate are increasingly less employable, both in the civilian world and in the military, because employers' demand for traditional high school diplomas has risen. The Department of Defense (DOD), in particular, requires that 90 percent of accessions be Tier 1 recruits (typically traditional high school degree holders) and that 60 percent score in the upper 50th percentiles on the Armed Forces Qualification Test (AFQT). Many ChalleNGe graduates, at present, do not meet these requirements. In this light, CNA was asked to evaluate the feasibility of increasing the DOD employability of ChalleNGe graduates (a) by increasing the percentage of cadets taking the diploma or credit recovery options and/or (b) by increasing the percentage of cadets capable of scoring 50 or above on the AFQT on graduation.

We took a three-pronged approach to answering this question. First, we interviewed all 35 program directors to gather their views on the likelihood of increasing ChalleNGe graduates' DOD employability. Second, using the ChalleNGe programs' data, we created a predictive linking between scores on the Test of Adult Basic Education (TABE) and the AFQT, allowing us to predict AFQT scores—and the percentage of cadets who can be expected to score in the upper 50th percentiles. Finally, using data from the Defense Manpower Data Center (DMDC), we analyzed the test scores and attrition rates of those ChalleNGe graduates who *have* joined the military over the course of the past decade.

The findings from all three efforts are supportive of the same general conclusion: the ChalleNGe program should carefully weigh the trade-offs inherent in making the necessary changes to prioritize creating more Tier 1 graduates and high-quality graduates, where high-quality graduates are those with Tier 1 education credentials who *also* score within the upper 50th percentiles on the AFQT. Many programs face significant barriers to offering credit recovery or high school diploma options and feel that meeting the necessary requirements to add these options would limit the programs' abilities to offer non-classroom, personal-development-related activities. In addition, increasing graduates' AFQT scores would require significant changes in the classroom curricula and perhaps imposing academic requirements for program admission—changes that would not effectively serve the at-risk population that the program was designed to help. Our test-linking results revealed that 18 percent of ChalleNGe graduates, on average, can be expected to score in the upper 50th percentiles on the AFQT. This suggests that obtaining a significant increase in this percentage *would* in fact require a revamping of curricula and the academic skills being prioritized in the classroom. Finally, analysis of DMDC data reveals that those ChalleNGe graduates who have enlisted have traditionally had significantly lower AFQT scores than other recruits. There *is* suggestive evidence that an increase in ChalleNGe graduates with Tier 1 credentials could decrease their overall attrition rates (for those who go on to enlist), but it is unclear whether the policy and programmatic changes that would be necessary to make military service feasible for more ChalleNGe graduates align with the programs' current philosophy and mission.

If, for example, a minimum TABE score were required for ChalleNGe admission, this could have positive, long-term impacts for ChalleNGe graduates. Our previous work has shown that cadets with higher initial reading and applied math TABE scores are more likely to complete ChalleNGe. In addition, those graduates who begin ChalleNGe with higher TABE scores and ultimately go on to enlist will likely have more choice in their military occupational specialty (due to higher AFQT scores). Having greater choice in their military occupational specialty would likely result in greater job satisfaction, perhaps ultimately lowering ChalleNGe graduate attrition. Another policy option for increasing ChalleNGe's population of Tier 1 and high-quality recruits would be to increase the age restriction. Increasing the minimum age from 16 to 17 could increase the number of cadets able to earn their high school diplomas while at ChalleNGe. In turn, this could increase the number of ChalleNGe graduates who are immediately able to enlist in the services, thus making the ChalleNGe program more of a direct accession pipeline. Although current policy and data do not bode well for dramatically increasing the number of Tier 1 and high-quality ChalleNGe graduates, it could be feasible with the right policy changes. Regardless of what changes are ultimately considered, ChalleNGe will need to carefully weigh whether increasing the number of potential Tier 1 and/or high-quality recruits jeopardizes the program's mission or philosophy in any way.

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Glossary

AFQT	Armed Forces Qualification Test
ASVAB	Armed Services Vocational Aptitude Battery
CAT	Category
ChalleNGe	National Guard Youth ChalleNGe Program
DMDC	Defense Manpower Data Center
DOD	Department of Defense
FTE	Full-Time Equivalent
GE	Grade Equivalent
GED	General Education Development
HiSET	High School Equivalency Test
TABE	Test of Adult Basic Education

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Introduction

The National Guard Youth ChalleNGe Program (ChalleNGe) is designed to provide a second chance to high school dropouts (ages 16 to 18) and support for those at risk of dropping out. The program has two components: a 5-month residential portion, followed by a 12-month mentoring phase. ChalleNGe has a quasi-military structure: participants live in barracks, wear military-style uniforms, and perform activities typically associated with military training (e.g., marching, drills, and physical training). Participation in the program, however, is voluntary. Although participants are referred to as cadets, they have no subsequent requirement for military service. The goal of ChalleNGe is to help "young people improve their self-esteem, self-confidence, life skills, education levels, and employment potential" [1].

There are currently 35 ChalleNGe academies operating in 27 states, Puerto Rico, and the District of Columbia. These sites are funded jointly by the Department of Defense (DOD) and the states. The National Guard Bureau is responsible for management and oversight of ChalleNGe. That said, each site is given discretion in how it structures its program. As a result, the academic goals of the ChalleNGe sites vary. Some seek to have cadets pass the General Education Development (GED) test, whereas others award alternative high school diplomas. Some ChalleNGe sites provide credit recovery so that cadets can earn high school credits and return to their original high schools after completing the program. There also are some ChalleNGe sites that are equivalent to high schools and award state-certified high school diplomas. In many cases, sites offer more than one of these options.

The type of program the ChalleNGe graduates attend and the resulting credentials they attain have important implications for their future employability. Those who ultimately earn traditional high school diplomas are more employable than those earning a GED because employers value the cognitive and noncognitive skills that are developed during the pursuit of a traditional high school diploma. They are more employable not only in the civilian labor market but also in the military. The DOD, for example, requires that 90 percent of incoming recruits be Tier 1, the majority of whom have traditional high school diplomas.[1] In addition, DOD limits the number of

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[1] It is possible to classify as a Tier 1 recruit *without* a traditional high school diploma, but it requires a minimum of 15 semester-hour college credits.

recruits who have lower mental aptitudes. Specifically, there is a DOD goal that at least 60 percent of accessions score in the upper 50th percentiles on the Armed Forces Qualification Test (AFQT). Many services, however, strive for even higher quality goals. Because of this, participation in ChalleNGe has not traditionally been a pipeline to military service for those cadets who are interested. Since recruiters are incentivized to meet all quality benchmarks that their services' impose, they may not view the ChalleNGe population as part of their recruitable pool. Thus, many ChalleNGe graduates are not immediately DOD employable on completion of the program.

In this light, the Office of the Assistant Secretary of Defense for Reserve Integration asked CNA to determine whether ChalleNGe graduates, on average, are DOD employable and, if not, what it would take to make them DOD employable. We take a three-pronged approach to answering this question. First, we conducted interviews with each of the ChalleNGe program directors to gather their inputs on the feasibility of producing Tier 1 and high-quality recruits out of the ChalleNGe program, where high-quality recruits are those with Tier 1 education credentials who *also* score within the upper 50th percentiles on the AFQT.[2] Second, using available data on the cadets' scores on the Test of Adult Basic Education (TABE) and AFQT, we create a predictive linking between the TABE and the AFQT. This allows us to predict cadets' AFQT scores based on what they scored on the TABE and thus provide estimates of the percentage of ChalleNGe graduates expected to score within the upper 50th percentiles on the AFQT. This analysis, combined with information on the number of programs that offer a high school diploma option, allows us to evaluate the overall DOD employability of ChalleNGe graduates.

The remainder of this report is organized as follows. In the next section, we provide detailed information on our data and methodology. This includes a description of our interviews with the ChalleNGe program directors as well as the methodology used to create our test score predictive linking and the data employed. In the next section, we summarize the program directors' inputs regarding the feasibility of increasing the DOD employability of ChalleNGe graduates. Then we summarize our findings from the test-score conversions. In the following section, we compare ChalleNGe graduates who enlisted in the military with other nontraditional recruits (namely, Tier 2 and 3 recruits) to gauge how their test scores and attrition rates differ. We conclude by discussing the implications of these findings for the ChalleNGe Program.

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[2] Per DOD's three-tiered education system, implemented in 1987 and most recently updated 2014, Tier 1 recruits are regular high school graduates, adult diploma holders, and nongraduates with at least 15 semester hours of college credit [2]. Tier 2 recruits are those with alternative high school credentials, primarily GED certificates, and Tier 3 recruits are those with no secondary school credentials.

Data and Methodology

In this study, we took a three-pronged approach to determining the feasibility of increasing the number of Tier 1 and high-quality recruits produced by ChalleNGe. First, we interviewed each of the 35 ChalleNGe program directors (and, in some cases, also their deputies). Then, we turned to the data to evaluate the feasibility of ChalleNGe graduates scoring 50 or above on the AFQT. We also compare the test-score distributions of ChalleNGe graduates who joined the military with other recruits. Finally, we compare the probability that these ChalleNGe graduates will attrite during the first year of service with the probability of attrition for other recruits with nontraditional educational backgrounds (e.g., GEDs). Such analysis required data from ChalleNGe programs as well as the Defense Manpower Data Center (DMDC). Each ChalleNGe program provided data on recent classes of ChalleNGe cadets, including their TABE and AFQT test scores.[3] The number of years of available data varied by site (as shown in Appendix A), as did the completeness of those data. This variation was due simply to the available data at each site; all available data were used in our analysis. In order to analyze test-score and attrition differences by recruit type, we also collected data from DMDC on FY09–FY16 active-duty, non-prior-service accessions. Merging these two datasets allows us to track ChalleNGe graduates who entered the services.

Interviews with ChalleNGe directors

In these discussions, we collected information on the sites' current and expected challenges in producing Tier 1 and high-quality recruits. That is, we focused on what would be necessary to have more ChalleNGe graduates attain high school diplomas and how likely it is that they could score in the upper 50th percentiles on the AFQT. Specifically, we asked the following questions:

- What are the education options offered by your program (e.g., degree granting, credit recovery, GED)? To the best of your knowledge, how did your program determine which options would be offered?

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[3] While at ChalleNGe, all cadets take both the TABE and AFQT, administered by each program.

- For those programs not granting high school diplomas and/or offering the credit recovery option:

  o Why is obtaining a high school diploma or participating in credit recovery not an available option at your program? What factors make these options infeasible?

  o What would be necessary to add the options of a high school diploma and/or credit recovery at your program?

- At the end of the ChalleNGe program, how would you characterize cadets' ability to perform well on standardized tests? How likely do you think it is that they could score 50 or above on the AFQT? What would be necessary to increase the probability of higher score attainment?

- Does your program currently provide test preparation activities specifically designed to improve cadets' TABE scores at the end of the program? What are the methods for doing so? Do you think these methods would work for improving AFQT scores as well?

Developing a test-score conversion methodology

A primary objective of ChalleNGe's academic component is to allow participants to improve on the TABE and ultimately pass the GED test or obtain a high school diploma. ChalleNGe sites currently collect data on participants' TABE scores at the beginning of training (pre-TABE), and at least one time after ChalleNGe training has started (post-TABE). To determine whether the program's training enables participants to score high enough on the AFQT to be eligible for military service, we set out to predict ChalleNGe graduates' scores on the AFQT based on their TABE scores. This requires a *linking* between TABE and AFQT scores.[4]

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[4] To the best of our knowledge, no one has linked TABE and AFQT scores before. As background for our linking study, we requested a copy of the *TABE 9/10 Norms Book and Technical Manual* from Data Recognition Corporation (DRC), the owner of all proprietary rights in and to the TABE 9/10 Assessment. As a condition of providing us those publications, DRC asked that the following disclaimer be used in our report: "DRC granted permission to allow research data of DRC's proprietary TABE product for use in this research study. DRC strongly recommends the use of TABE according to product guidelines in order to preserve the integrity of test interpretation. DRC is not responsible for the design, methodology, or findings of this study. Use of the DRC proprietary materials in any way that does not conform to product guidelines, including score interpretation, is not the responsibility of DRC."

The three types of links that can possibly be developed [3] follow:[5]

1. **Predictive linking:** The goal of this method is to predict a score from one test based on the score on another test. This method is comparatively weak because it does not require that the tests measure the same attribute.

2. **Scale aligning:** The objective of scale aligning is to "transform the scores from two different tests onto a common scale" ([3], p. 3). This linking method is stronger than predictive linking because it requires that the two tests measure the *same* attribute.

3. **Equating:** The goal of equating is to "produce a linkage between scores on two test forms such that the scores from each test form can be used as if they had come from the same test" ([3], p. 3). This form of linking is the strongest because it requires that the tests meet five very stringent requirements: the two tests must measure the *same* attribute, be equally reliable, and show symmetry, equity, and population invariance.[6]

We conducted considerable analysis to determine which of these three types of linking are most appropriate for our dataset and precisely how the linking should be conducted. Specifically, we needed to determine the following:

1. Is predictive linking, scaling, or aligning most appropriate for our dataset?

2. Should we use pre-TABE or post-TABE scores in our linking?

3. Are data from all ChalleNGe sites suitable for inclusion in the linking analysis?

4. Do adjustments need to be made for the extra days of ChalleNGe instruction that occur *after* the pre-TABE but *before* the AFQT?

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[5] There is a rich literature on the subject of linking scores on different tests. The interested reader is invited to examine references [3-8] on the subject.

[6] The word *symmetry* means that "mapping the scores of Y to those of X should be the inverse of the equating transformation for mapping the scores of X to those of Y" ([3], p. 5), which disqualifies regression methods from being a form of test equating. *Equity* means that examinees should be indifferent to which of the two tests they take. *Population invariance* means that the linking function should be the same regardless of the subpopulation(s) from which it is developed.

In Appendix B, we discuss in detail the analysis conducted to answer these questions. We ultimately determined that, first, a predictive linking is most appropriate for our data since the TABE and the AFQT do not measure the same academic abilities. As we explain fully in Appendix B, there are two types of predictive linking: linear and equipercentile. The equipercentile method is preferable here because the two tests are scored on different metrics. This means that the relationship between the two scores would contain a small nonlinear component that could distort the linear linkage. Second, pre-TABE is used in the linking owing to its higher correlation with AFQT scores and the fact that post-TABE scores will be influenced by programmatic differences, whereas pre-TABE scores should not.[7] Third, we do find that *all* ChalleNGe sites are suitable for inclusion in the analysis. That is, we find no evidence of extreme outliers. And finally, we do *not* find evidence that any adjustments need to be made for the extra days of instruction in between the pre-TABE and the AFQT because the number of days of instruction is not statistically significantly correlated with final AFQT scores. For the interested reader, greater detail on all of these points can be found in Appendix B.

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[7] If some programs place greater emphasis on TABE improvements, this could be reflected in their (presumably higher) post-TABE scores. Thus, the post-TABE will be influenced by such program-level differences, whereas the pre-TABE is taken early enough to be free from the influence of such differences.

Program Director Inputs

To gain the programs' perspectives regarding the feasibility of and challenges to increasing the number of ChalleNGe graduates whom the military would classify as Tier 1, we conducted phone interviews with each of the 35 program directors. We began the interviews by reviewing what educational options (high school diploma, credit recovery, and/or GED/High School Equivalency Test (HISET)) the program offers and asking the directors how the current options were selected. We then focused the rest of the discussion on the two main avenues for increasing the number of ChalleNGe graduates that qualify for Tier 1 status (referred to herein as "Tier 1 ChalleNGe graduates"): (1) increasing the number of programs that offer credit recovery and/or high school diploma options (and thus the number of graduates returning to high school or with a diploma in hand) and (2) increasing the number of GED holders who are able to score 50 or better on the AFQT portion of the Armed Services Vocational Aptitude Battery (ASVAB).

In the remainder of this section, we summarize the program directors' inputs. We begin by reviewing the education options offered at the different programs and how the decisions to offer these options were made. The reasons provided for why programs offer different combinations of programs were enlightening and often, in themselves, highlighted potential challenges to increasing the prevalence of credit recovery and high school diploma options. We also asked the GED-only programs *why* they offer neither credit recovery nor the high school diploma options and what would be necessary to add one or both of these options to their programs. After reviewing these inputs, we move to a discussion of the directors' thoughts regarding the feasibility of increasing the number of high-quality graduates via improvements in their AFQT scores (to 50 or above). As part of this discussion, we review (1) their inputs on cadets' abilities to perform on standardized tests in general, (2) how much (if any) and what kind of test preparation is provided by their program and if this preparation might be effective in increasing AFQT scores, and (3) what would be necessary to increase the probability of higher score attainment.

Education options offered

Each ChalleNGe program offers some combination of three education options: preparing for the GED (or HiSET), credit recovery, and earning a high school diploma.

In some states, when a cadet passes the GED or HiSET, the state automatically awards him or her a high school diploma. The military services, however, do not consider these diploma holders to be Tier 1 recruits; the services reserve that status for traditional high school diploma holders. Thus, for the purpose of classification, we consider any program that offers a high school diploma to those who can pass the GED or HiSET to be a GED-only program. The majority of ChalleNGe programs, as Figure 1 shows, offer all three options, credit recovery and GED, or GED only. Thirteen of the programs offer only the GED option, nine programs offer the GED and credit recovery, and nine programs offer the GED and a high school diploma.

Figure 1.   Education options offered by the ChalleNGe programs
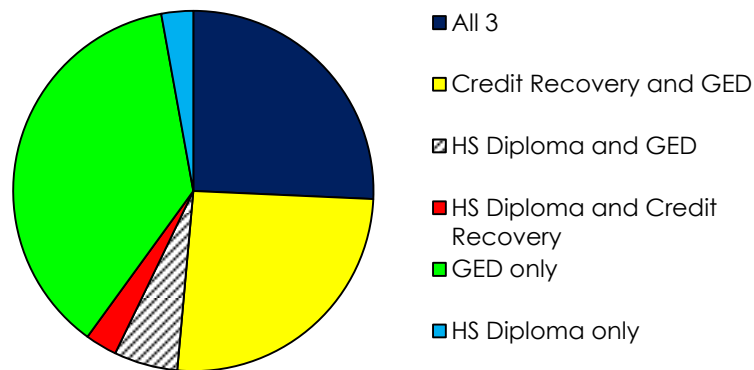
Source: Data collected via interviews with all 35 program directors.

All programs have the same ultimate goal: to best prepare their cadets for post-residential placement. The four main reasons why some programs offer certain education options that others do not are resources, differences in philosophy, relationships with the state and local departments of education, and reasons related to recruiting. We heard a general consensus that the value of the GED has been decreasing over time. Some programs cited this as the reason why they started offering credit recovery or a high school diploma; others said it was the reason they switched from the GED to the HiSET or the reason they partnered with local community colleges—so that their graduates would leave ChalleNGe with both a GED and some college credit. As one director explained, those who are on a GED track and then fail the GED at the end of the program are left with no tangible benefit, but there is no such risk for those leaving with a high school diploma. One director noted that the primary reason he felt the switch from the GED to a high school diploma better served students was because his graduates could immediately enroll in a four-year college—no need for intermediary steps (such as community college).

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Many of the directors of GED-only programs noted that their graduates would be better off leaving the program with a high school diploma or, at a minimum, returning to high school. However, the programs remain GED-only because of other barriers (such as lack of accreditation, resource constraints, and lack of agreement with the local school districts and department of education). In some cases, there are legislative barriers. A few program directors noted the role of recent changes to state law mandating that a teenager cannot drop out of high school before age 18. This made it infeasible for some programs to only offer the GED option; becoming an accredited high school then became their only option. Allowing cadets to also pursue a GED at ChalleNGe would require legislative changes so that 16- and 17-year-olds could attend ChalleNGe and not be considered dropouts. In some states, the extra requirements that would be imposed on the programs were they to offer high school credits and/or a diploma are quite burdensome—including special education requirements, testing requirements, a required total 180 hours of seat time per academic "year," and second language program requirements. Many of the students arrive at ChalleNGe at low levels of reading comprehension, writing, and basic math; they simply are not ready to acquire a second language. In addition, program directors noted that the seat time (and classroom time) required to meet these requirements would come at the expense of other activities—activities that may be more important for improving cadets' noncognitive skills and preparing them for employment. These directors noted that, not only is there not enough cadet time, there also aren't enough employees or sufficient resources to meet the accreditation requirements.

Another significant challenge to offering high school diplomas or credit recovery is posed by the fact that many cadets arrive at low academic levels (sometimes, for example, reading at the fifth grade level). In addition, many cadets are also "credit deficient." They are far behind their high school peers as a result of failing courses and dropping out. Many directors stated that there simply is not enough time to recover the credits necessary to grant them diplomas in a 5.5-month period.

Another significant barrier cited was the lack of local support. All directors of programs granting high school diplomas stressed the importance of relationships with local school districts and/or the state Department of Education. Some programs, for example, were successful in establishing credit recovery only after convincing the local school districts that the ChalleNGe graduates would be motivated, disciplined students when they return to high school (even though they likely were not before they left high school). These are precisely the types of role models a high school

should be happy to have among its student body.[8] Some programs have established partnerships with local schools that allow them to share staff as well. Without some sort of agreement between the ChalleNGe program and the local school district, in *addition* to the support of the state Department of Education, it is unlikely that any of the current GED-only programs could adopt the credit recovery or high school diploma options. Program directors emphasized that these relationships are especially important in minimizing the extent to which other high schools view ChalleNGe as a source of competition, especially for full-time-equivalent (FTE) funding. Credit recovery may be a more tenable option than granting high school diplomas for FTE funding reasons: when ChalleNGe cadets ultimately *return* to their home high schools, the FTE dollars follow them. In addition, the high schools' dropout rates ultimately fall. The schools can not only transfer their dropouts to the ChalleNGe program but also get credit for graduations when the cadets return.

Other directors voiced more philosophical concerns. One noted, for example, that the main aim of the ChalleNGe program is behavior intervention, *not* to serve as a school. Thus, this director felt that if there were a need (or mandate) for increased focus on academics, it would be at the expense of the program's ability to mitigate impulsive behavior and otherwise prepare these cadets for a successful, independent adulthood. Similarly, another director noted that character development, service to community, and other core elements of the ChalleNGe program would have to be sacrificed to increase the academic focus. Another director noted that these youth have already been failed by the traditional school system, so transforming ChalleNGe into a program more focused on granting high school diplomas and getting the cadets back into their home high schools would essentially turn ChalleNGe into another traditional setting. In addition, programs that do not need to focus on state-mandated graduation requirements (often in the form of passing various tests) are able to focus more on the cadets' individual needs. Some directors were concerned that the program's current, effective framework would be replaced by one with greater emphasis on teaching to the test. Thus, these directors felt that the best way to serve their populations was to maintain their focus as GED-granting programs.

One director whose program had transitioned from GED only to offering a high school diploma *and* credit recovery noted that there were definite benefits from being GED only. Namely, the extra flexibility in scheduling afforded them the opportunity to expose their cadets to a wider range of opportunities since they did not have to be in the classroom Monday through Friday. This director also

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[8] In other cases, directors noted that not all principals are eager to commit to eventually accepting these students back into their schools; this has made the establishment of the credit recovery option challenging.

recognized, however, that the cadets' career paths were limited in the long term by having only a GED.

Finally, some directors said that they arrived at their current mix of education options at least partially because of recruiting concerns. A director of a program offering all three options expressed the desire for as many adolescents as possible to attend the program and the belief that offering the most options is the most effective way to attract the largest population. Another director remarked that, previously, when the program was GED only, the teenagers arriving at ChalleNGe were becoming increasingly "rougher"—more gang-affiliated, more criminal history. This director felt that the best way to reverse that trend was to increase the options available, thus making the program more attractive to those who want to earn their high school diplomas and potentially even attend college.

Cadets' general ability on standardized tests

After discussing with program directors the feasibility of increasing the number of cadets who complete ChalleNGe with a high school diploma or with sufficient credits recovered to return to their home high schools, we turned to the other avenue for increasing the DOD employability of ChalleNGe graduates: improving AFQT scores. We first asked program directors about their cadets' overall test-taking abilities when they arrive at ChalleNGe and then discussed the feasibility of cadets' scoring 50 or above on the AFQT as well as the programs' current test-preparation efforts (to the extent that they use any).

In terms of cadets' overall test-taking abilities, the one theme that emerged from nearly all interviews was that there is significant improvement from the beginning to the end of ChalleNGe. When the cadets first arrive, they often have a defeatist attitude and, given their history of failure in the school environment, a fear that they will continue to fail academically. This manifests itself in the form of severe test anxiety and often an unwillingness to fully apply themselves. It is generally easier to accept failure when little effort has been applied. If one does not aim to achieve success and ultimately fails, this cannot be interpreted as a lack of ability. It is not surprising that, when cadets first arrive at ChalleNGe, many of them refuse to put forth their best effort on the pre-TABE and other tests. As a result, it is difficult to gauge cadets' *true* academic and testing abilities on these early tests. At many programs, however, the cadets are taught test-taking strategies and how to approach testing with less fear and anxiety. Testing barriers can also be broken down at programs where a significant number of tests are administered at the start of the program (e.g., TABE placement testing); within the first few weeks at ChalleNGe, testing becomes part of their regular routine. The cadets' increased comfort with testing, combined with the improvements in academic skills made over the course of

the program, ultimately means that they are much better test takers at the end of the program than at the beginning.

The gains that can be made at ChalleNGe, however, are partially determined by the cadets' abilities on arrival. The cadets arrive with a wide distribution of academic skills: one program director noted that his program has some cadets functioning at the 1st or 2nd grade level and others at the 11th or 12th grade level on arrival. Although all cadets may become more comfortable with testing by the end of the program, their knowledge of basic academic skills will also be an important determinant of how well they test. Some directors noted that the academic improvements made over the course of ChalleNGe will depend partially on how the program structures its classrooms. Some, for example, place the students in different classrooms depending on their incoming academic abilities. Others, however, have classrooms with mixed-ability levels. In these settings, one director noted, it can be challenging to simultaneously teach those at the 4th grade level and those at the 11th or 12th grade level. Thus, the ultimate test improvements made may partially depend on the classroom structure and the extent to which cadets are able to receive the individualized attention they need.

Directors also commented that cadets' overall testing abilities—both at the beginning and end of ChalleNGe—depend on other incoming characteristics as well, not just their incoming academic skills. Those cadets, for example, who come from households with little constructive parenting, who are from relatively poor socioeconomic backgrounds, or who speak English as a second language (if at all) will have more to overcome in improving their testing abilities. Realistically, the ChalleNGe instructors and staff have only a 22-week period to work with cadets, and the improvements that can be made over that period will depend on the "state" of the cadet on arrival. The directors did note that, on average, testing is difficult for their cadets. Many said that the top 20 or 25 percent of the cadets in any given class may be comfortable test takers. That said, the large majority do not perform well on standardized tests. This suggests that even in cases of large and significant test-score improvements, cadets will still fall below national averages for their ages and grade levels.

Feasibility of cadets' scoring 50 on AFQT

After discussing cadets' overall ability to perform well on standardized tests, we asked the program directors to specifically comment on the feasibility of their cadets scoring 50 or above on the AFQT. Specifically, we asked the directors, "At the end of the ChalleNGe program, how would you characterize cadets' ability to perform well on standardized tests? How likely do you think it is that they could score 50 or above on the AFQT?" They were asked to classify the likelihood of cadets scoring 50 or above at the end of ChalleNGe as very likely, somewhat likely, not likely, or can't say.

Figure 2 illustrates the directors' responses: 9 percent found it very likely that cadets could score 50 or above on the AFQT, 37 percent found it only somewhat likely, and 43 percent found it not likely. The remaining 11 percent were unable to say. Thus, the directors, overall, asserted that they do not expect the majority of ChalleNGe cadets to be able to score 50 or above. In fact, many directors indicated that it certainly would be possible for some, but only for a minority—specifically, 20 to 25 percent—of the cadets to score in that range.

Figure 2.   Distribution of responses to: "How likely is it that cadets could score 50 or above on the AFQT at the end of ChalleNGe?"[a]
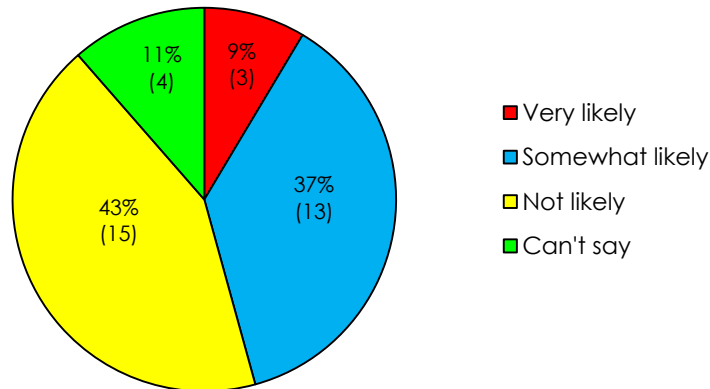
Source: CNA tabulations of program-director interview data.

[a.] Numbers in parentheses reflect the number of directors who responded accordingly.

As the directors noted, most of their cadets have AFQT scores below 50. They noted two possible reasons for these low scores and why they might not reflect the highest scores those cadets *could* achieve. First, many cadets not interested in military service fear that they will be recruited if they perform well on the AFQT. Thus, they are incentivized to *not* apply themselves and to score low, to guarantee that recruiters will not be contacting them based on their scores. One director noted that, when cadets who previously had no interest in military service later decide they are interested in enlisting and retake the ASVAB, he has observed notable score differences. Second, some programs administer the ASVAB within cadets' first few weeks at ChalleNGe. They recognized that the cadets' scores might be higher if they waited until closer to the end of the program when (1) cadets have less test anxiety and (2) enough time has passed for the classroom curriculum to improve their academic skills.

We asked the directors to opine on what might be necessary to increase cadets' test scores. A few directors stressed the importance of presenting the ASVAB to cadets as not just a test necessary for military enlistment, but also a way to help them determine what career fields would be a good fit for them and identify where there strengths lie. That is, if the ASVAB were introduced as a general battery assessment, as opposed to a test aimed at determining whether they qualify for military service or specific military occupations, the cadets might be more willing to apply themselves and perform at their personal best levels.

The directors also noted that, at present, achieving higher AFQT scores is possible for those cadets with initiative. That is, for the few cadets who are interested in military service, they study for the test throughout their time at ChalleNGe (on their own time) and opt to retake the ASVAB to try to improve their scores. Even for these kids, however, the directors stated that more resources and more study materials are needed. At present, there simply is not enough time for sufficient test preparation. As a result, they felt that some elements of the current curriculum would have to be sacrificed if ASVAB test preparation efforts were to become a priority.

Finally, a number of directors suggested that, to achieve a goal of higher AFQT scores, there would have to be changes to the cadets accepted into the program. They noted, for example, that cadets would need better academic skills at intake than is true of the current population since those with a more established academic base on which to build would be more capable of scoring 50 or better on the AFQT. Similarly, one director mentioned that cadets have become increasingly younger in recent years. The director felt that this trend would have to be reversed if higher scores were to be achieved since older cadets arrive with more credits and a more established academic background, enabling them to score higher on tests.

Programs' current test preparation efforts

Finally, after getting a sense of the program directors' opinions regarding their cadets' general test-taking abilities and the likelihood of cadets scoring over 50 on the AFQT, we asked the directors what their programs currently offer by way of TABE test preparation and whether these methods could be applied to increasing AFQT scores. Most directors informed us that there is no specific TABE-preparation offered. In fact, one director noted that the instructors intentionally aim *not* to "teach to the test"; they teach the cadets the material necessary to improve their fundamental skills and catch them up on material they may have missed in high school. Although much of the course content will ultimately be aligned with TABE content—and in that way attending class is a form of TABE preparation—they do not focus specific efforts on maximizing cadets' post-TABE scores or overall TABE growth. There was, however, *one* director whose program does focus somewhat on specifically preparing the cadets for the TABE because of state law that requires a

TABE score of 9 or higher to take the GED. For the most part, however, the only TABE preparation the cadets receive is through the curriculum.

There are a number of program initiatives to improve cadets' overall test-taking abilities, and, to the extent that these can improve performance in *any* testing situation, they could also be viewed as a form of TABE preparation. These include teaching the cadets how to approach learning without memorizing, how to pace themselves on exams to ensure that they have sufficient time for all sections, and how to reduce test anxiety. A couple of directors noted that the most effective way to help cadets overcome their fear of testing is to expose them to frequent and different tests. These directors said that, with sufficient practice and exposure to a wide range of test formats, cadets' confidence in their ability to approach any test notably increases.

We then asked the directors to opine on whether any of their current test-preparation efforts (whether general or specific) might be effective in increasing the likelihood that cadets could score 50 or above on the AFQT. A few directors did not think there was anything they could do in-house to help with AFQT preparation and that spending time on AFQT preparation would not really benefit the cadets. Some even felt that any time spent on AFQT preparation would be detrimental—taking away from other valuable aspects of the program. Others noted that any test-preparation efforts that help improve testing skills in general should also help improve AFQT scores, even though they may not have specifically prepared the cadets for the AFQT content.

Some directors mentioned ASVAB/AFQT preparation tools already at the cadets' disposal, including available ASVAB tutors, ASVAB books and study guides (some computer based), and ASVAB study groups directed by the National Guard. In addition, the cadets can prepare for the ASVAB during study hall and attend other voluntary preparation sessions. In all of these cases, however, the initiative rests with the cadet. These resources are at their disposal, but cadets have to initiate obtaining a tutor, attending study groups, and using the available study guides and computer programs. In one case, the ASVAB is taken only by cadets who express interest in joining the military because the test is administered only at the nearest Military Entrance Processing Station. It seems unlikely that any of the currently available resources or test preparation efforts will be effective in increasing the cadets' AFQT scores unless the cadets are motivated to prepare and fully apply themselves to the test. We learned that one director's program uses ASVAB scores as one factor in determining which cadets get scholarships for continuing education. If more programs were able to make the test have meaning for the cadets (perhaps in terms of helping them to determine which career fields they are best suited to), it could provide an additional incentive for all cadets to apply themselves and strive to achieve the best score possible, even if they are not interested in joining the military.

Other challenges to matriculating high-quality recruits

Most ChalleNGe directors lamented that, even if the majority of ChalleNGe graduates were able to score 50 or above on the AFQT or had a high school diploma, it would still be difficult to place most of them in a productive post-ChalleNGe environment (whether in the military, in other employment, or in college). As the directors noted, military recruiters are hesitant to write waivers unless they are necessary for meeting accession missions, and the ChalleNGe graduates often have multiple characteristics or behavioral patterns that would make a waiver necessary for enlistment. Many ChalleNGe graduates, for example, are disqualified from service for tattoos, behavior modification medications (such as Ritalin for ADHD), asthma, eyeglass prescriptions, a history of recreational drug use, or a history of criminal activity. In addition, only 17 and 18 year olds can enlist, and the 17 year olds would need parental approval; many of the ChalleNGe cadets come from broken homes and lack the necessary parental support.

The ChalleNGe graduates' ages are problematic not only for military enlistment but also for finding civilian-sector employment. As the directors explained, most employers are not willing to hire 16- or 17-year-olds, owing to either legal constraints or previous experiences with unreliable minors. As one director put it, "These kids need instruction on job readiness—how to [not only] find but also *keep* a job." ChalleNGe graduates are also affected, of course, by variation in the state and regional labor markets. A few directors noted that job opportunities in their particular areas are slim to nonexistent, making it difficult for the ChalleNGe graduates to reintegrate themselves as successful members of society. Other employment challenges include transportation (most graduates do not have a driver's license), visible tattoos, and criminal history.

Finally, college enrollment is also a challenge. Four-year colleges or universities will not admit students who are under 18 years of age (or until their cohort has graduated from high school). Thus, if the ChalleNGe graduates complete the program *prior* to when they would have graduated from high school and are not yet 18 years old, they will not be able to enroll in a four-year school. In addition, one director noted that many colleges and universities will not accept ChalleNGe graduates because they did not attend a traditional, brick-and-mortar high school. Overall, the directors said that age was the most significant barrier to successfully placing their graduates. Their 16- and 17-year-old graduates are unable to find employment, unable to enroll in college, and unable to enlist.

Test-Score Conversion Results

Equipercentile linking

As discussed, we use the standard equipercentile method for linking the pre-TABE and the AFQT. Each score on one test is matched, or linked, to a score on the other test that has the same cumulative frequency.[9] Figure 3 illustrates this procedure. To link a score on Test 1 to a score on Test 2, start at test score A in Figure 3. Move up vertically until you intersect the Test 1 cumulative percent curve at point B. Move horizontally until you intersect the Test 2 cumulative percent curve at point C. Then, move down vertically to intersect the test score axis at point D. In this way, you select a test score A on Test 1 that has the same cumulative percentile in the sample as test score D on Test 2. These two scores, A and D, are then said to be linked.

Figure 3.   Graphical schematic of equipercentile linking procedure

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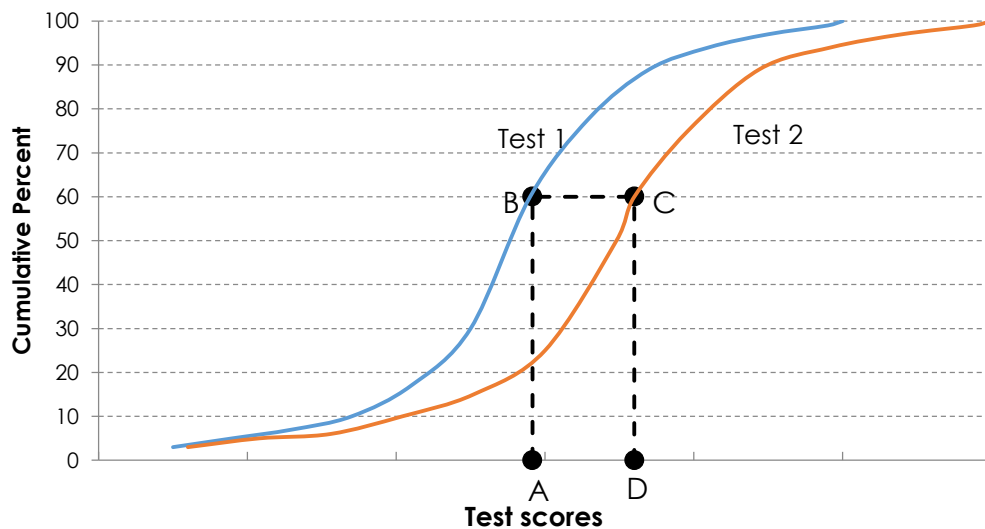
[9] Our program uses a five-point moving average procedure to smooth the cumulative frequencies and interpolation of values as necessary.

We applied this procedure to the AFQT and pre-TABE scores in the linking sample of ChalleNGe cadets. Table 1 shows our results. For example, a cadet with a pre-TABE score of 580 would be expected to score about 50 on the AFQT. Similarly, a cadet with a pre-TABE score of 542 would be expected to score about 30 on the AFQT.

Table 1.   Equipercentile equating of AFQT and pre-TABE

| TABE	AFQT	TABE	AFQT	TABE	AFQT	TABE	AFQT
< 318	1	531-532	25	579-581	50	630-631	76
318-363	2	533-534	26	582-583	51	632-633	77
364-397	3	535-536	27	584-584	52	634-636	78
398-425	4	537-538	28	585-586	53	637-638	79
426-442	5	539-540	29	587-588	54	639-641	80
443-455	6	541-542	30	589-590	55	642-645	81
456-465	7	543-543	31	591-592	56	646-649	82
466-473	8	544-545	32	593-594	57	650-653	83
474-481	9	546-547	33	595-596	59	654-655	84
482-486	10	548-550	34	597-598	60	656-658	85
487-490	11	551-553	35	599-600	61	659-662	86
491-494	12	554-555	36	601-603	62	663-665	87
495-497	13	556-557	38	604-604	63	666-671	88
498-500	14	558-559	39	605-606	64	672-675	89
501-504	15	560-561	40	607-609	66	676-680	90
505-508	16	562-563	41	610-611	67	681-687	91
509-512	17	564-565	42	612-613	68	688-695	92
513-515	18	566-567	43	614-616	69	696-702	93
516-517	19	568-569	44	617-619	70	703-709	94
518-520	20	570-571	45	620-621	71	710-716	95
521-523	21	572-573	46	622-623	72	717-722	96
524-525	22	574-574	47	624-625	73	723-728	97
526-527	23	575-576	48	626-627	74	729-740	98
528-530	24	577-578	49	628-629	75	> 740	99

Source: CNA analysis of ChalleNGe program data.

[a.] This analysis is based solely on those cadets in the linking sample.

Having obtained predicted AFQT scores based on pre-TABE scores, we now evaluate the percentage of ChalleNGe cadets who, based on our equipercentile equating predictions, would be expected to score in the upper 50th percentiles on the AFQT.

This is shown by the light blue bars in Figure 4. As Figure 4 illustrates, the program-wide average is 18 percent, but there is significant variation across the ChalleNGe sites. Those programs with the highest predicted percentage of cadets who will earn 50 or more on the AFQT are Alaska (AK) (30 percent), Arkansas (AR) (26 percent), California-Grizzly Youth (CAGY) (21 percent), and Montana (MT) (22 percent), whereas the lowest predicted percentages are at Georgia-Fort Gordon (GAFG) (6 percent), Hawaii-Hilo (HIHI) (7 percent), and Maryland (MD) (7 percent). Note that these are *predicted* differences, due largely to program-level differences in cadets' pre-TABE scores. We also show the percentage of cadets who *actually* scored 50 or greater on the AFQT while at ChalleNGe (dark blue bars). Although there is variation by program in how closely the predicted and actual bars align, it is noteworthy that, for the program as a whole, the bars are close—18 percent predicted and 18 percent actual (after rounding).

Figure 4. Percentage of cadets predicted to earn 50 or more on the AFQT[a,b,c]
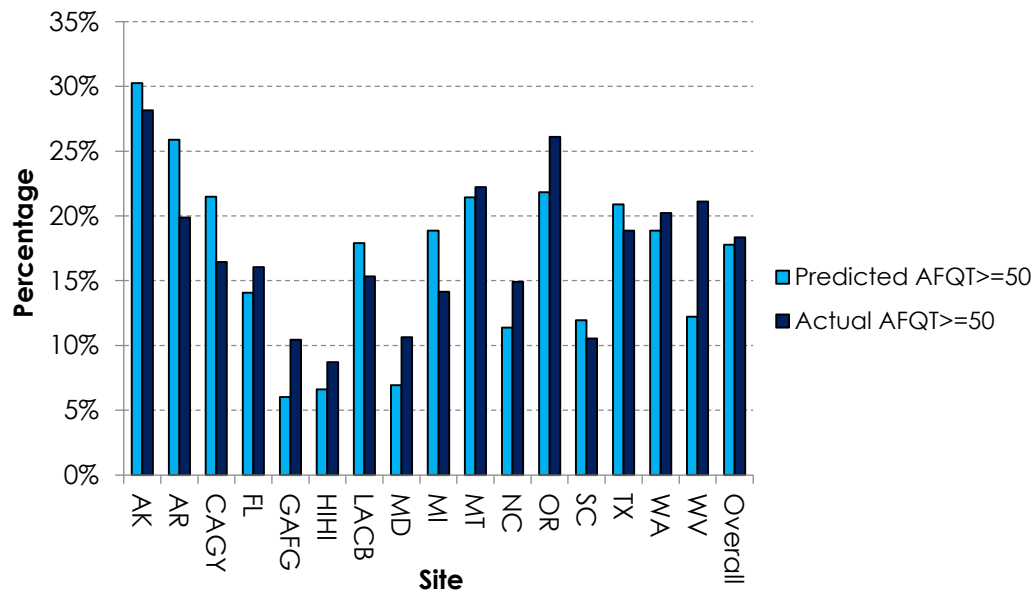
Source: CNA analysis of ChalleNGe program data.

[a.] This analysis is based solely on the verification sample. Both analysis samples (the linking sample, used to construct the actual linking, and the verification sample, used to verify those results) are described in detail in Appendix B.

[b.] Because we could not use linking sample observations in these calculations, many programs did not have sufficient remaining data to allow us to calculate these percentages. Consequently, only a subset of the ChalleNGe programs are included in the verification sample and shown here.

c. LACB stands for Camp Beauregard (Louisiana).

Verification of linking results

Finally, it is important to verify that our results are valid in general and also apply to cadets who are *not* in our linking sample. As we show in Table 3 in Appendix B, there is not much overlap of sites in the linking and verification samples. Thus, if there were any site-specific peculiarities in our linkage results, they would likely result in poor agreement between the *actual* AFQT distribution in our verification sample and the *predicted* AFQT distribution in our linking sample. We verify our results by using the Table 1 results to estimate AFQT scores based on cadets' pre-TABE scores; we then compare them to the actual AFQT scores of the same cadets.[10] Figure 5 shows the distributions.

Figure 5.   Actual and predicted AFQT scores[a,b]
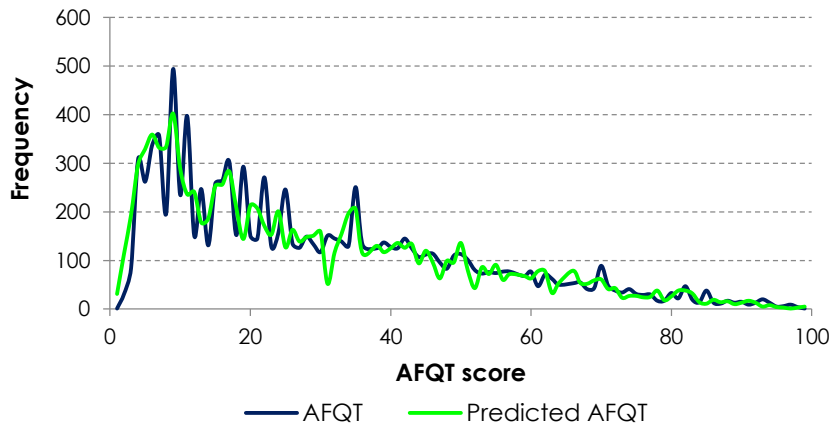
Source: CNA analysis of ChalleNGe program data.

[a.] This analysis is based solely on cadets in the verification sample.

[b.] The AFQT scores shown by the dark blue line are those attained while taking the AFQT *at ChalleNGe*. They are not necessarily reflective of AFQT scores used to enlist in the military.

As the figure illustrates, the AFQT distribution predicted from pre-TABE scores closely aligns with the actual AFQT distribution for the ChalleNGe cadets in the verification sample. This indicates that the linkage results presented in Table 1 can be used with confidence to estimate AFQT scores for ChalleNGe cadets using their pre-TABE scores.

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[10] These AFQT scores are the scores attained while still enrolled in the ChalleNGe program and taking the AFQT. They are *not* the AFQT scores attained after leaving ChalleNGe.

We also explore how well the AFQT scores attained at ChalleNGe and our predicted AFQT scores align with actual enlistment AFQT scores for those cadets who went on to join one of the services. In this smaller sample—restricted to those cadets who ultimately enlisted—we still see that our predicted AFQT aligns fairly well with the ChalleNGe AFQT. Figure 6 displays these results. In addition, our predicted AFQT distribution aligns fairly well with the distribution of *enlistment* AFQT scores; in those cases where the two distributions diverge, our prediction is lower than the enlistment score, suggesting that our predicted AFQT scores can be viewed as a lower bound. It is not surprising that our predictions align fairly well with enlistment AFQT scores or that we *underestimate* the AFQT scores when there is a divergence. First, roughly half of all ChalleNGe cadets who enlisted in the military had the *same* ChalleNGe and enlistment AFQT scores, suggesting that they did not retest. Thus, since our predicted distribution aligned well with the ChalleNGe AFQT distribution, it also aligns well with the enlistment distribution. Second, the possible range of scores for our predicted distribution and the enlistment distribution are different; because our predicted distribution is based on ChalleNGe AFQT scores, it ranges from 1 to 99. The enlistment distribution, however, ranges only from 31 to 99 since a minimum score of 31 is required for enlistment. Thus, by design, the enlistment distribution will be shifted "right" of the prediction distribution, meaning that there will be a greater percentage of enlistees concentrated in the higher AFQT scores.

Figure 6.   Actual (ChalleNGe and enlistment) AFQT and predicted AFQT scores[a,b]

Source: CNA analysis of ChalleNGe programs' and DMDC data.

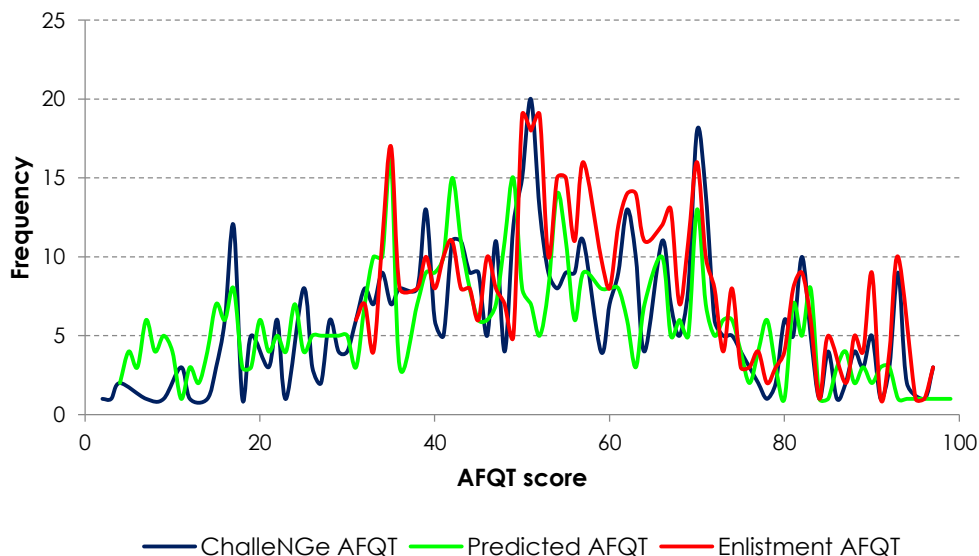[a.] This analysis is based on cadets in the verification sample who went on to enlist in one of the services.

[b.] The red line begins at 31 because this is the minimum AFQT score for enlistment.

Finally, in Figure 7, we show a histogram of the estimation errors using the verification sample. The mean error is 1 AFQT point and the standard error of the distribution is 14 points (meaning that two-thirds of the errors will be within 14 points of our mean error of 1). This means that the results shown in Table 1 underestimate the actual AFQT by about 1 point in an out-of-sample prediction. This level of accuracy should be adequate for estimating the likelihood that a cadet achieves the desired score of 50 or above on the AFQT.

Figure 7.   Histogram of estimation errors[a]
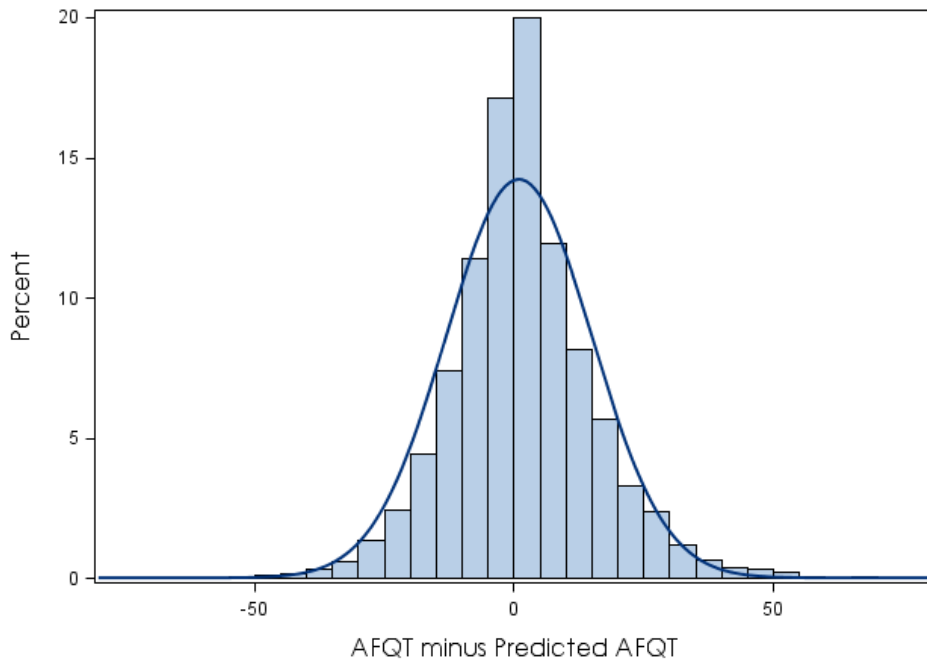
Source: CNA analysis of ChalleNGe program data.
[a.] This analysis is based solely on cadets in the verification sample.

Comparing ChalleNGe Graduates With Other Recruits

In this section, we compare the AFQT scores and attrition probabilities of ChalleNGe graduates with those of other enlisted servicemembers. Although we begin this discussion by comparing enlisted ChalleNGe graduates with *all* other enlisted servicemembers, we ultimately focus the comparison on Tier 2 and Tier 3 recruits since these are other groups of enlistees who typically have lower test scores and a higher propensity to attrite, likely because of their nontraditional educational backgrounds.

In Figure 8, we display the AFQT category distributions of three populations: all ChalleNGe graduates (green bars), enlisted ChalleNGe graduates (red bars), and all enlisted servicemembers (blue bars). A few notable trends emerge from this figure.

Figure 8.   Comparison of AFQT score categories among enlisted servicemembers, ChalleNGe graduates, and enlisted ChalleNGe graduates
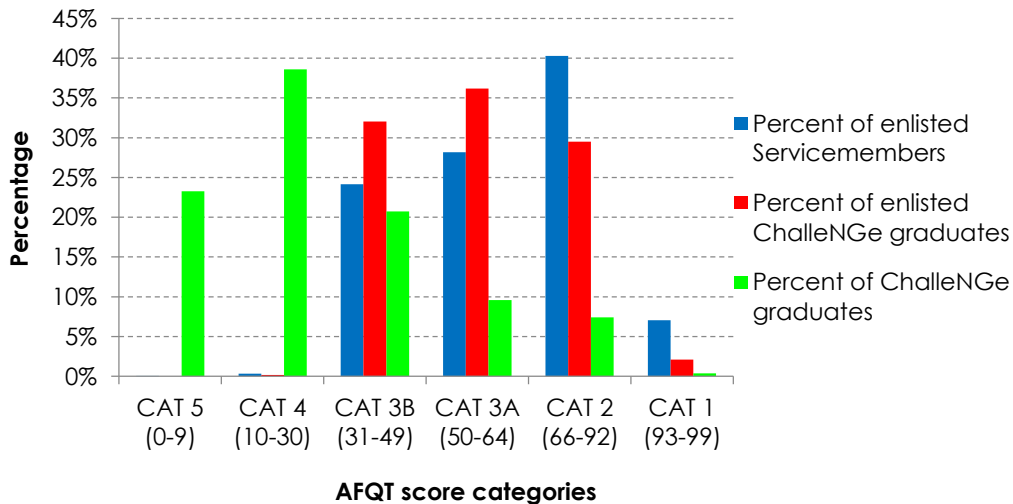
Source: CNA analysis of ChalleNGe programs' and DMDC data.

First, Category (CAT) 4 (AFQT scores 10-30) and CAT 5 (0-9) are effectively populated by the ChalleNGe graduates only, since DOD policy is that CAT 4 recruits comprise at most four percent of all recruits and no CAT 5 applicants are eligible to enlist. Therefore, the distributions of enlisted servicemembers (ChalleNGe graduates or not) are necessarily shifted to the right as compared to the distribution of all ChalleNGe graduates. Second, among enlisted servicemembers, ChalleNGe graduates are notably more likely to score in the CAT 3A (50-64) and CAT 3B (31-49) ranges than their non-ChalleNGe counterparts. Finally, the group most likely to have the highest AFQT scores—in CATs 1 and 2—are the non-ChalleNGe enlisted.

Having shown that both ChalleNGe graduates and enlisted ChalleNGe graduates have lower AFQT scores, on average, than other servicemembers, we now compare ChalleNGe graduates with other servicemembers by their education tier. Figure 9 shows the results.

Figure 9.   AFQT score categories of enlisted ChalleNGe graduates, as compared to the Tier 1, Tier 2, and Tier 3 enlistees
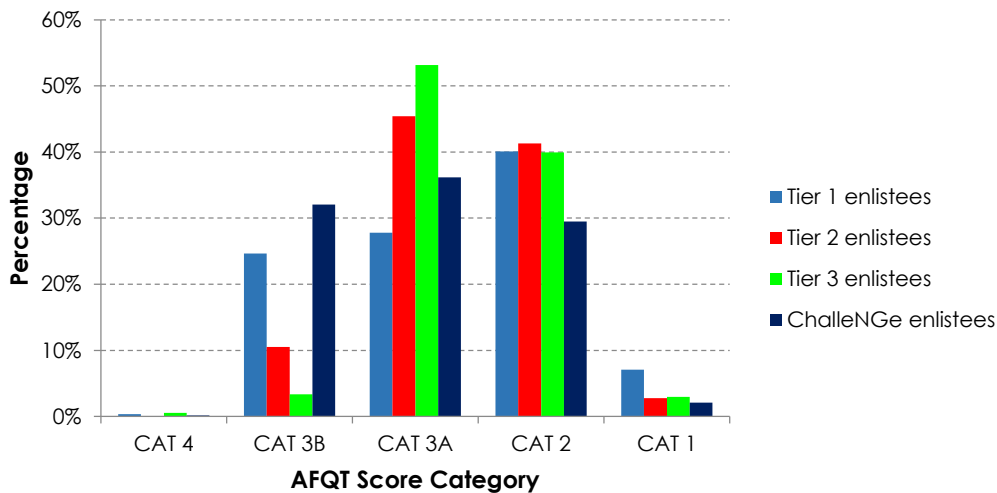
AFQT CATs 1 and 2 have lower percentages of ChalleNGe graduates than Tier 1, 2, or 3 servicemembers, suggesting that these highest AFQT categories are predominantly populated by *non*-ChalleNGe servicemembers. Similarly, a greater percentage of ChalleNGe graduates score in the CAT 3B range than their counterparts in any of the tiers (the lowest AFQT range that qualifies one for service). The relationships are not as clearly unidirectional for those with CAT 3A AFQT scores. Specifically, there is a *greater* percentage of ChalleNGe graduates with CAT 3A scores than their Tier 1 counterparts, but a *lower* percentage of ChalleNGe graduates with CAT 3A scores than their Tier 2 and 3 counterparts. This is not surprising since the services tend to

require higher AFQT scores of recruits with lower education credentials—namely, less than a high school diploma. As a result, Tier 2 and 3 recruits are less likely to access with CAT 3A scores (typically the lowest qualifying category) than are Tier 1 recruits, who do not have an additional test score requirement levied on them. CAT 3A starts at 50, which implies that ChalleNGe enlistees are less likely than their Tier 2 and 3 counterparts to score in the upper 50th percentiles on the AFQT. To the extent that those servicemembers with lower AFQT scores are more likely to attrite—which has been shown historically—the services may not be willing to take the attrition risks inherent in accessing ChalleNGe graduates.

Finally, we compare the attrition rates of ChalleNGe graduates with other enlistees in all three education tiers. Because of the small sample of ChalleNGe graduates who have enlisted (a total of 1,140) and the fact that most ChalleNGe programs were able to provide data only on the most recent classes, we are able to analyze only 6- and 12-month attrition rates. The number of ChalleNGe enlistees who have served for 24 or 36 months is not sufficient to make longer term attrition analysis feasible.

As Figure 10 illustrates, we find that ChalleNGe graduates are somewhat less likely than their Tier 1 and Tier 2 counterparts to make it to the 6- or 12-month point. Within the Tier 1 population, 9 percent of ChalleNGe enlistees had attrited by 6 months, as had 7 percent of non-ChalleNGe enlistees. Among Tier 2 enlistees, roughly 20 percent of the ChalleNGe enlistees had attrited by 6 months, versus 9 percent of the non-ChalleNGe enlistees. The corresponding ChalleNGe and non-ChalleNGe 12-month attrition rates are 12 and 8 percent, respectively, for Tier 1 and 19 and 11 percent for Tier 2.

The ChalleNGe/non-ChalleNGe differences shown in Figure 10 are simply a comparison of means, but they hold even after controlling for service, age, race, ethnicity, and gender. Overall, this figure shows significant but relatively small differences between ChalleNGe and non-ChalleNGe Tier 1 attrition rates, but it shows substantial differences between ChalleNGe and non-ChalleNGe Tier 2 attrition rates. In addition, the ChalleNGe Tier 2 enlistees are much more likely to attrite than non-ChalleNGe Tier 3 enlistees. Thus, the attrition risks are much greater from accessing a ChalleNGe Tier 2 recruit than a non-ChalleNGe Tier 2 or Tier 3 recruit. To the extent that increasing the number of ChalleNGe graduates who have military service as a realizable option is a priority, it may be worth increasing the number of ChalleNGe programs that offer credit recovery and high school diploma options. If more ChalleNGe cadets were afforded the opportunity to earn Tier 1 education credentials, those choosing and successfully completing this option—based on the evidence—should be less likely to attrite than those ultimately earning Tier 2 credentials.

Figure 10. Percentage of ChalleNGe and non-ChalleNGe enlistees who attrite by 6 and 12 months, by education tier[a]
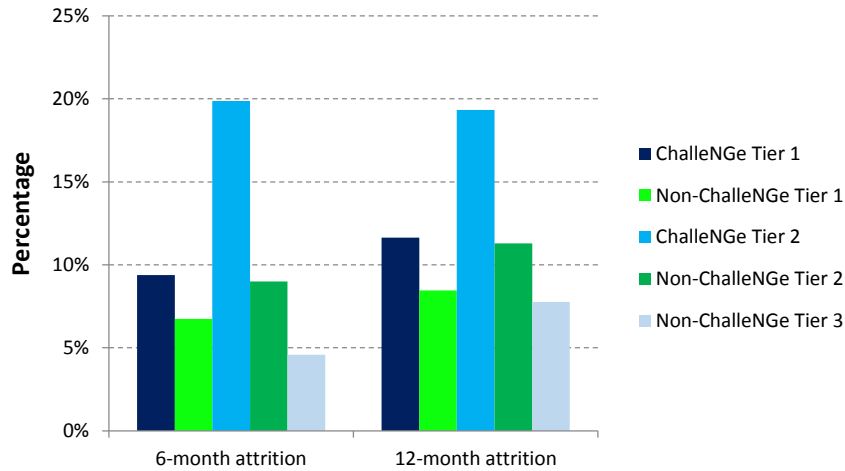
Source: CNA analysis of DMDC data.

[a.] These are uncontrolled means. The ChalleNGe Tier 1 average attrition rates, at both 6 and 12 months, are statistically significantly different from the non-ChalleNGe Tier 1 average attrition rates at the 5-percent level or better. The same is true when comparing the ChalleNGe and non-ChalleNGe Tier 2 rates. No comparison can be made among Tier 3 enlistees because there are no ChalleNGe Tier 3 enlistees.

Conclusion

In this report, we have evaluated the likelihood of ChalleNGe graduates becoming successful military enlistees, which—owing to DOD's and the services' focus on accessing Tier 1 and high-quality recruits—requires a traditional high school diploma and an AFQT score of 50 or higher. We used a three-pronged approach, gathering inputs from program directors, conducting a test-score equating (based on pre-TABE scores) to determine the percentage of ChalleNGe graduates that could be expected to score above 50 on the AFQT, and evaluating the test scores and early performance of those who joined the military. Our findings indicate that ChalleNGe is not likely to become a more prominent accession source for the services.

ChalleNGe program directors voiced real and important concerns regarding the program's ability to produce more Tier 1 and/or high-quality recruits. The primary mechanism for making more ChalleNGe graduates eligible for Tier 1 status would be to matriculate more cadets with high school diplomas or via the credit recovery option, which allows them to return to their home high schools and complete their education. Many cadets, however, arrive at ChalleNGe with insufficient high school credits or TABE scores to be eligible for the credit recovery or high school diploma options; they simply cannot get to the necessary academic levels to receive a diploma or successfully return to high school by the end of the 22 weeks at ChalleNGe.

Many programs do not offer high school diploma or credit recovery options. Directors of these programs expressed significant barriers to adding these educational options, including the necessary agreements with local schools and departments of education and what the directors characterized as burdensome state requirements (a minimum number of seat-time hours, a second-language program, etc.). Meeting these requirements, the directors felt, would begin to turn ChalleNGe into a traditional school, precisely the environment in which the cadets do not have great trust or a history of positive experiences. Reaching an objective of higher AFQT scores for a majority of cadets would require fundamental changes to the program, and perhaps more stringent requirements on incoming academic performance—changes the directors felt would conflict with the program's mission and philosophy.

Our test-score conversion results and analysis of ChalleNGe graduates who *have* enlisted reveal that AFQT scores of 50 and above are currently out of reach for the majority of ChalleNGe graduates. Specifically, we predict that only 18 percent of ChalleNGe graduates, program wide, have the academic knowledge and testing

abilities to achieve such scores. It is likely that this is partially because the ChalleNGe programs' instruction tends to be TABE-centric (i.e., the immediate goals are to develop the more basic and fundamental skills that many of the cadets lack) and partially because the academic content on the TABE and AFQT is not perfectly aligned. The TABE-AFQT misalignment is revealed by the fact that significant TABE gains are made by cadets over the course of the program, but time in the program has a very small effect on AFQT score. If the ChalleNGe program were to adopt an objective of increasing AFQT scores, the current curriculum construct would need to be reevaluated. Such program changes, however, would need to be considered carefully to ensure that they are not made at the expense of the cadets' overall personal growth and the programs' ability to prepare them to be successful, independent adults. In addition, if the test-score conversion results are going to be used to predict the percentage of cadets who qualify for military service or who can score 50 on the AFQT, it will have to be updated to reflect any changes made in the programs' objectives.

Our analysis of ChalleNGe graduates who *have* gone on to enlist in the military reveals that they have struggled to make the transition to becoming successful servicemembers. Compared with other servicemembers, we find that ChalleNGe graduates' incoming AFQT scores are noticeably lower. In addition, ChalleNGe Tier 1 enlistees attrite by 6 and 12 months at somewhat higher rates than their non-ChalleNGe counterparts, while ChalleNGe Tier 2 enlistees attrite at roughly double the rates for their non-ChalleNGe counterparts. An important caveat to these findings is that we suspect that the cadets choosing the credit recovery option and ultimately receiving a diploma from their home high schools appear in the DMDC data as regular high school graduates. If those graduates have lower attrition rates than other ChalleNGe graduates, that could skew our results. Moving forward, it is therefore essential that DMDC and ChalleNGe determine appropriate education coding for such recruits. Our reported attrition rate differences suggest that an increase in the number of ChalleNGe graduates enlisting with Tier 1 education credentials could lower their overall attrition rates. However, as the program directors note, it would likely require a significant revamping of the ChalleNGe program, with significant shifts in the program's focus, for cadets to become a more sizable and successful accession source. The decision to prioritize the number of Tier 1 ChalleNGe graduates—thus making ChalleNGe a more viable accession source—is one that will have to be carefully weighed, taking into consideration whether such a shift is contradictory to the program's mission and current goals.

That said, these findings are based on current and historical data, and a prioritization of Tier 1 and high-quality ChalleNGe graduates would likely come with other policy changes. If, for example, a minimum TABE score were required for ChalleNGe admission, this could have positive, long-term impacts for ChalleNGe graduates. Our previous work has shown that cadets with higher initial reading and applied math TABE scores are more likely to complete ChalleNGe. In addition, those

graduates who go on to enlist will have more choice in their military occupational specialty. Many occupations have a minimum AFQT requirement, and ChalleNGe cadets admitted to the program with higher TABE scores would be more likely to reach this minimum by the program's end. Having greater choice in their military occupational specialty would likely result in greater job satisfaction, perhaps ultimately lowering ChalleNGe graduate attrition. In addition to a TABE score minimum, another policy option for increasing ChalleNGe's population of Tier 1 and high-quality recruits would be to increase the age restriction. At present, the ChalleNGe program serves 16- to 18-year-olds. Increasing the minimum age to 17 could increase the number of cadets able to complete their high school diplomas while at ChalleNGe. In turn, this could increase the number of ChalleNGe graduates who are immediately able to enlist in the services. If DOD wants the ChalleNGe program to become more of a direct accession pipeline, raising the minimum age could help achieve this. Thus, although current policy and data do not bode well for dramatically increasing the number of Tier 1 and high-quality ChalleNGe graduates, it could be feasible with the right policy changes. The specifics of these changes will likely require further analysis.

We do recommend that the ChalleNGe program consider standardizing when the cadets take the AFQT as well as how the AFQT is being presented to them. On one hand, if the programs are using the AFQT as an aptitude test and career-counseling tool—to identify the areas in which the cadets have strengths and in which they can develop achievable career goals—the test should be given *early* in the program, to inform the goals set for cadets throughout the rest of the program. If the test is to be used in this way, it should be presented to cadets accordingly so that they understand how they will benefit by performing to the best of their abilities. On the other hand, if the test is presented as a possible recruiting tool and as a way to determine whether the cadets will qualify for military service and what military occupational choices might be available to them, cadets may have an incentive to *underperform* on the AFQT. Those who have no interest in military service and do not want to be contacted by military recruiters, for example, might intentionally score low. The test scores might be more accurate reflections of cadets' abilities, and more useful for research, if cadets were incentivized to perform at their best.

Appendix A: Number of Graduates per ChalleNGe Site, by Year

In Table 2, we show the number of graduates for whom we had data from each ChalleNGe site, by year.

Table 2.   Number of ChalleNGe graduates, by site and year (2010-2016)

Site[a]	2010	2011	2012	2013	2014	2015	2016
AK	292	305	291	309	281	278	118
AR	0	0	0	166	181	195	160
CAGY	0	0	234	420	413	433	0
CASB	0	0	0	189	391	376	0
DC	0	0	0	50	96	69	26
FL	0	0	0	0	402	407	0
GAFG	0	0	0	0	0	392	181
GAFS	0	0	0	0	388	385	214
HIBP	248	237	241	109	248	248	0
HIHI	0	113	108	83	84	130	0
ID	0	0	0	0	195	210	0
IL	0	0	503	990	813	700	0
IN	0	0	0	0	0	80	92
KY	0	0	0	73	192	190	0
LACB	0	0	0	0	281	470	0
LACM	0	0	0	203	428	420	209
LAGL	0	0	0	348	714	728	0
MD	0	0	97	222	184	191	65
MI	0	0	0	117	243	213	0
MS	552	514	0	537	516	275	0
MT	0	0	51	154	107	69	0
NC	0	0	0	235	268	245	0
NJ	0	0	0	168	267	293	0
NM	0	0	0	73	179	218	100

Site[a]	2010	2011	2012	2013	2014	2015	2016
OK	0	0	0	0	206	230	98
OR	310	312	315	315	317	312	156
PR	0	0	228	442	411	444	0
SC	0	0	0	0	175	269	145
TX	0	0	0	0	145	266	0
TXE	0	0	0	0	0	84	0
VA	0	0	0	341	273	271	0
WA	234	275	288	257	264	292	0
WI	322	340	300	320	338	323	0
WV	0	0	0	210	351	356	0
WY	0	0	41	132	102	122	0

Source: CNA analysis of ChalleNGe-program data.

[a.] ChalleNGe sites listed in the first column that are not standard two-letter Postal Service abbreviations follow:

CAGY	**=**	Grizzly (California)
CASB	=	Sunburst (California)
GAFG	=	Fort Gordon (Georgia)
GAFS	=	Fort Stewart (Georgia)
HIBP	=	Hawaii—Barbers Point
HIHI	=	Hawaii—Kulani
LACB	=	Camp Beauregard (Louisiana)
LACM	=	Camp Minden (Louisiana)
LAGL	=	Gillis Long (Louisiana)
TXE	=	Texas (East Texas)

Appendix B: Development of Our Test-Score Conversion Methodology

In this appendix, we provide the full details on the analysis and decision-making behind the development of our test-score conversion methodology. In most linkage analyses, the dataset is specifically collected for the purpose of linking, with careful attention paid to ensuring that all test takers have equal motivation and preparation on both tests. In practice, this means that both tests should be administered on the same day and should measure similar things. In this analysis, however, we are limited to the available data, which was *not* specifically collected for linkage purposes. As a result, we must closely examine the data to determine the most appropriate approach to the linkage analysis. Specifically, we consult the data to determine the following:

1. Should pre-TABE or post-TABE scores be used in our analysis?

2. Do adjustments need to be made for the extra days of ChalleNGe instruction that occur *after* the pre-TABE but *before* the AFQT?

3. Which of the three linking types (predictive linking, scaling, or equating) are appropriate for our data?

4. Are data from all ChalleNGe sites suitable for analysis?

Before describing the analysis conducted to answer these questions, we provide an overview of the data used in our test-score conversions. In Table 3, we show the distribution of our data across the 35 ChalleNGe sites. These data were provided to us by the ChalleNGe sites. Sites sent the data they had available; some programs archive more classes' data than others, so there was significant variation in the number of classes and thus the number of years for which we received data from each site. Although some programs were able to provide data as far back as 2009 or 2010, the majority had data to send for 2014 through 2016 only. All available data were used in our analysis.

For the purposes of this analysis, we divided the data into three mutually exclusive groups: a linking sample, a verification sample, and the remainder ("other"). By using an independent verification sample, we help ensure that our results are generally applicable to all ChalleNGe cadets—not just the sample that generated the results:

- The *linking* sample contains the most complete set of variables without missing data. This data sample contains only cadets who completed the ChalleNGe program. In addition, for cadets in this sample, we have data on their AFQT scores, pre-TABE scores, post-TABE scores, class start dates, and all test dates. This is, therefore, the dataset in which we have the highest confidence, as it is the most complete.

- The *verification* sample contains cadets with pre-TABE, post-TABE, and AFQT scores, but who are missing class start or test dates. All cadets in this sample completed the ChalleNGe program. We use these data as an independent sample to verify our linkage results. We also have a high degree of confidence in this dataset.

- Finally, the sample labeled "other" contains all other cadets. They are missing pre-TABE scores, post-TABE scores, AFQT scores, test dates, or some combination thereof. This sample includes those cadets who did not complete the ChalleNGe program. It also includes data from the Puerto Rico program. The Puerto Rico program uses the Spanish version of the TABE, whereas the AFQT is offered only in English. This causes concern that the Spanish TABE scores may not link to English AFQT scores in the same manner as English TABE scores. Because of the missing data and the issues with scores from the Puerto Rico program, this sample was not used in either our linking or our verification analyses.

Table 3.   Number of cadets in each sample, by ChalleNGe site

Youth ChalleNGe Program/Academy	Site code	Linking sample	Verification sample	Other	Total
Alaska	AK	752	767	355	1,874
Arkansas	AR	0	533	169	702
Grizzly (California)	CAGY	0	1,350	145	1,495
Sunburst (California)	CASB	933	1	22	956
Capital Guardian (District of Columbia)	DC	0	89	152	241
Florida	FL	0	661	148	809
Fort Gordon (Georgia)	GAFG	0	565	8	573
Fort Stewart (Georgia)	GAFS	695	15	277	987
Hawaii—Barbers Point	HIBP	749	5	577	1,331
Hawaii—Kulani	HIHI	0	333	185	518
Idaho	ID	322	0	83	405
Lincoln's (Illinois)	IL	1617	2	1,387	3,006
Hoosier (Indiana)	IN	0	0	172	172

Youth ChalleNGe Program/Academy	Site code	Linking sample	Verification sample	Other	Total
Bluegrass (Kentucky)	KY	0	0	455	455
Camp Beauregard (Louisiana)	LACB	0	737	14	751
Camp Minden (Louisiana)	LACM	582	0	677	1,259
Gillis Long (Louisiana)	LAGL	1,202	2	585	1,789
Freestate (Maryland)	MD	0	432	327	759
Michigan	MI	0	106	467	573
Mississippi	MS	1,765	9	620	2,394
Montana	MT	166	126	89	381
Tarheel (North Carolina)	NC	0	650	98	748
New Jersey	NJ	441	0	285	726
New Mexico	NM	467	0	97	564
Thunderbird (Oklahoma)	OK	434	3	97	534
Oregon	OR	0	1,502	535	2,037
Puerto Rico	PR	0	0	1,525	1,525
South Carolina	SC	0	427	162	589
Texas	TX	0	244	163	407
Texas (East Texas)	TXE	0	42	42	84
Virginia Commonwealth	VA	273	2	602	877
Washington	WA	0	1,405	204	1,609
Wisconsin	WI	1,194	0	749	1,943
Mountaineer (West Virginia)	WV	157	540	220	917
Cowboy (Wyoming)	WY	391	0	6	397
Total		12,140	10,548	11,699	34,387

Source: CNA analysis of data provided by ChalleNGe programs.

In Table 4, we show the body of test data available for our linking sample and how the timing of tests often varies. All cadets in this sample will have an AFQT score and two TABE scores, denoted as pre-TABE and post-TABE. The TABE battery consists of a number of subtests. Throughout this document, we use TABE to denote the TABE Total Battery Score. Note that only those cadets for whom we have all three test scores and all three test dates are included in the linking sample and are shown in this table. Months in the program are defined as follows:

- Month 1 = 0 to 30 days

- Month 2 = 31 to 60 days, etc.

Both the pre-TABE and the post-TABE are administered by ChalleNGe personnel. From Table 4, we see that the pre-TABE is usually administered during the first month in the ChalleNGe program, but is sometimes administered in the second or third month. Table 4 also reveals that the post-TABE is usually administered near the end of the program, most commonly during the fourth or fifth month. However, small numbers of post-TABE tests are seen to have been administered *throughout* the ChalleNGe program. Thus, it is not the case that the pre-TABE and post-TABE are taken in the same month of instruction at all sites. Similarly, the AFQT, which is administered by independent contract test administrators who work with service recruiters, is administered *throughout* the program, most commonly in the fourth month. The scattering of test administration over time is a particular challenge for our analysis because, ideally, the TABE and AFQT would be given on the *same day*.

Table 4.   Number of cadets in the linking sample, by month in the ChalleNGe program

| Test | Month in the ChalleNGe program (linking sample) | | | | | | All |
	1	2	3	4	5	6	
Pre-TABE	11,119	961	60	0	0	0	12,140
Post-TABE	0	167	583	3,381	7,225	784	12,140
AFQT percentile	1,167	1,234	2,286	5,708	1,518	227	12,140

Source: CNA analysis of ChalleNGe program data.

In the remainder of this appendix, we will closely examine the data samples, addressing four important issues:

1. Which of the three types of linking does our data permit?

2. Should we use pre-TABE or post-TABE scores in the linking analysis?

3. Do we need to account for extra instruction days in between the pre-TABE and the AFQT?

4. Are data from all ChalleNGe sites suitable for inclusion in the linking analysis?

Which of the three types of linking does our data permit?

The nature of our dataset is such that the two tests do *not* measure exactly the same attribute. The TABE total battery score is constructed from adding the average of two

math subtests and two verbal subtests in standard score form [9]. As a result, it has a math content of 33 percent. The AFQT score is constructed from adding two math subtests and two verbal subtests in standard score form [10]. As a result, it has a math content of 50 percent. Since the AFQT is 50 percent math and the TABE is only 33 percent math, the two tests do not measure exactly the same attribute, and, according to Dorans et al. [3], we can only develop a *predictive* linking, not a scaling or equating.

The two basic methods for doing a predictive linking of the two tests are the equipercentile method and the linear method.[11] As we describe in the main body of this research memorandum, the equipercentile method links each score on the TABE to a score on the AFQT that has the same cumulative frequency; the linear method links scores using the standard linear equation to predict one score from the other. We rule out the linear method because of the differing structure of metrics used by TABE and AFQT. Specifically, TABE scores are in terms of standard scores, whereas AFQT scores are in terms of percentile scores. This means that the relationship between scores on the two tests will contain a small nonlinear component, which could distort a linear linkage at very high and very low values of the scores. This can be seen in the scattergram of AFQT and pre-TABE scores in the linking sample, shown in Figure 11. A linear estimation would capture well all those observations within the blue lines. The linear linkage would be distorted, however, by the lower (near zero) and higher (above 80) AFQT scores outside this range. This provides part of our justification for using the equipercentile equating method. In addition, as we previously noted, AFQT and TABE do not measure exactly the same construct. We can avoid these obstacles by using the equipercentile method, which is more generally applicable.

There are two common data designs for equipercentile linking: single group and equivalent groups. In the single group design, all subjects take both test A and test B. This is usually done in counterbalanced order; that is, half of the sample takes test A first followed by test B, and the other half of the sample takes test B first followed by test A. The counterbalanced order is intended to equalize any fatigue effects from same-day testing. Because of the structure of our data, we must use the single group design, but without the counterbalancing. There should be no fatigue problem, however, because of the interval of days (or weeks) between the administration of pre-TABE and AFQT. In the other data design—equivalent groups—one group takes test A at the same time that another randomly selected group takes test B.

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[11] See references [3-8] for an extensive discussion of the methodology.

Figure 11.   Scattergram of individual cadets' scores on the AFQT and pre-TABE[a]
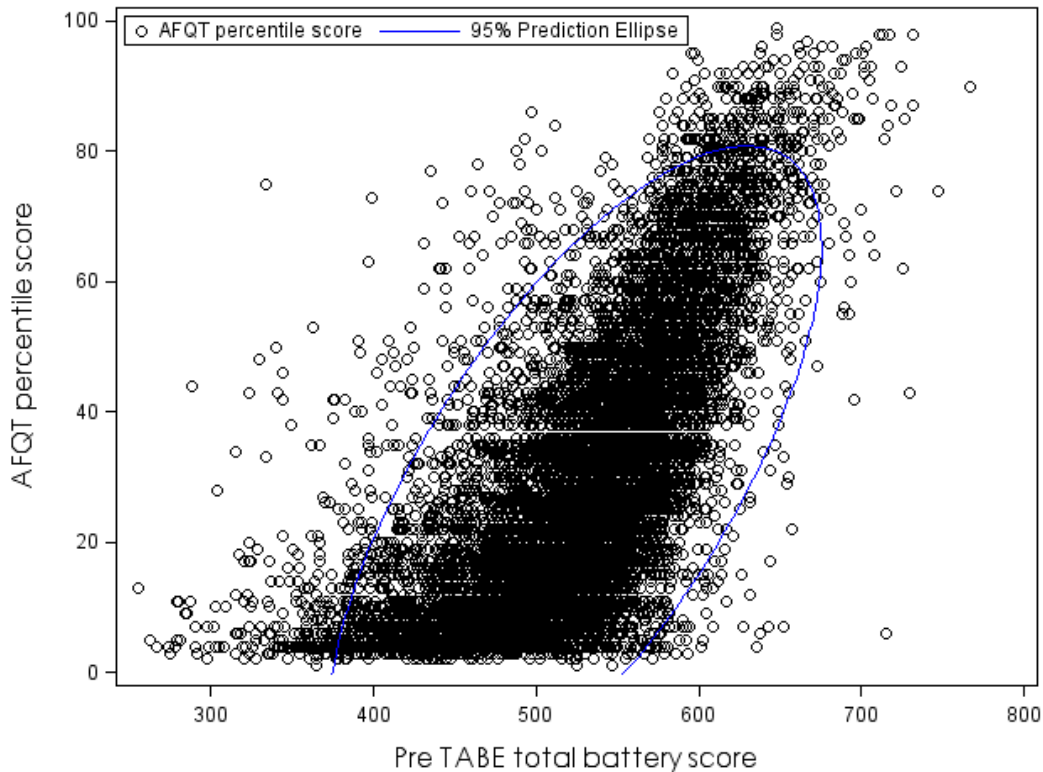
Source: CNA analysis of ChalleNGe program data.

[a.] This figure includes data from the linking sample only. The visible horizontal white "lines" in the data—areas of no observations—are scores that are unattainable on the AFQT, namely, 37, 58, and 65.

Should we use pre-TABE or post-TABE scores in the linking analysis?

To answer this question, we first examine the correlations among the three test scores. These are shown in Table 5. Note that the pre-TABE has the highest correlation with the AFQT (0.70), suggesting that the best linking will be between these two tests. Although the size of this correlation is lower than desirable for scaling, which transforms the scores on a common scale, or for an equating, which treats the two scores as if they came from the same test, it is satisfactory for test-score linking. In fact, the modest correlation may well be because the TABE has somewhat less math content than the AFQT.

Table 5.   Correlations between AFQT, pre-TABE, and post-TABE scores
(linking sample)

| Test	AFQT	Pre-TABE	Post-TABE
AFQT	1.00	0.70	0.61
Pre-TABE	0.70	1.00	0.69
Post-TABE	0.61	0.69	1.00

Source: CNA analysis of ChalleNGe-program data.

Table 5 also reveals a lower-than-expected correlation between the pre-TABE and the post-TABE, at 0.69. This is not entirely surprising. It suggests that the ChalleNGe program is having significant impacts on the cadets' academic and testing abilities. The likely reason is that ChalleNGe is a residential instruction program—one in which the cadets are required to go to class and do their homework; that is, it can have a significant impact on a cadet's academic growth. It is not surprising, therefore, that we observe improvements in cadets' test-taking skills and/or academic performance. There are other factors that could be reducing the correlation between the pre- and post-TABE, including the fact that some programs allow students to stop taking the post-TABE once they achieve a high enough score to attain a GED. In addition, program management varies by site, which may include sites' emphasis on TABE score-improvement and the degree to which their curricula are structured around TABE elements.

Further evidence of test-score gains between the pre-TABE and post-TABE are illustrated in Figure 12 and Figure 13. We see in Figure 12 that cadets at a few sites (HIHI, MI, and TXE) show only modest score gains of around 15 TABE points. Other sites, however, such as CASB, MD, and MS, show gains in the range of 70 to 85 points. These differences could reflect superior instruction at some sites or differences in the initial aptitude of the sites' cadets, or they may have other causes (e.g., cadets may not take the first administration seriously enough, causing their performance to not be a full reflection of their academic capabilities). In an effort to better understand these differences, we also examine the increase in grade equivalent (GE) levels, by site, as shown in Figure 13.[12]

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[12] The GE levels can be interpreted as follows: the number before the decimal point represents the year of schooling corresponding to the test performance, and the number after the decimal point represents the month of schooling. For example, a GE level of 9.2 indicates performance at the 2nd month of the 9th grade.

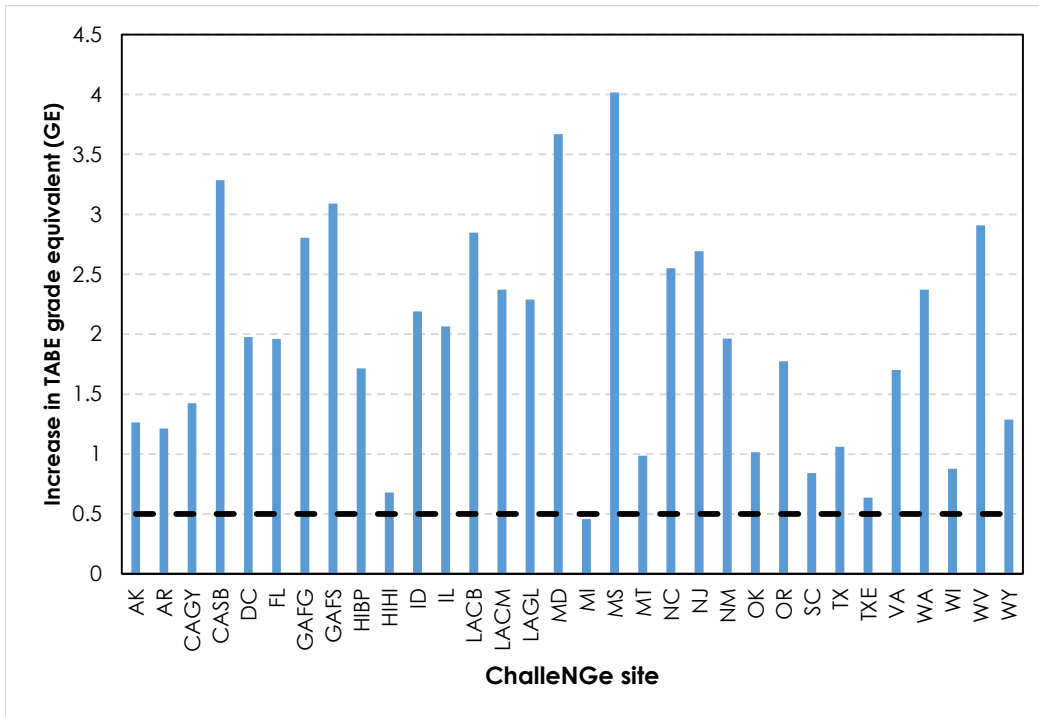Figure 12.   Average score increases between pre-TABE and post-TABE, by site[a]
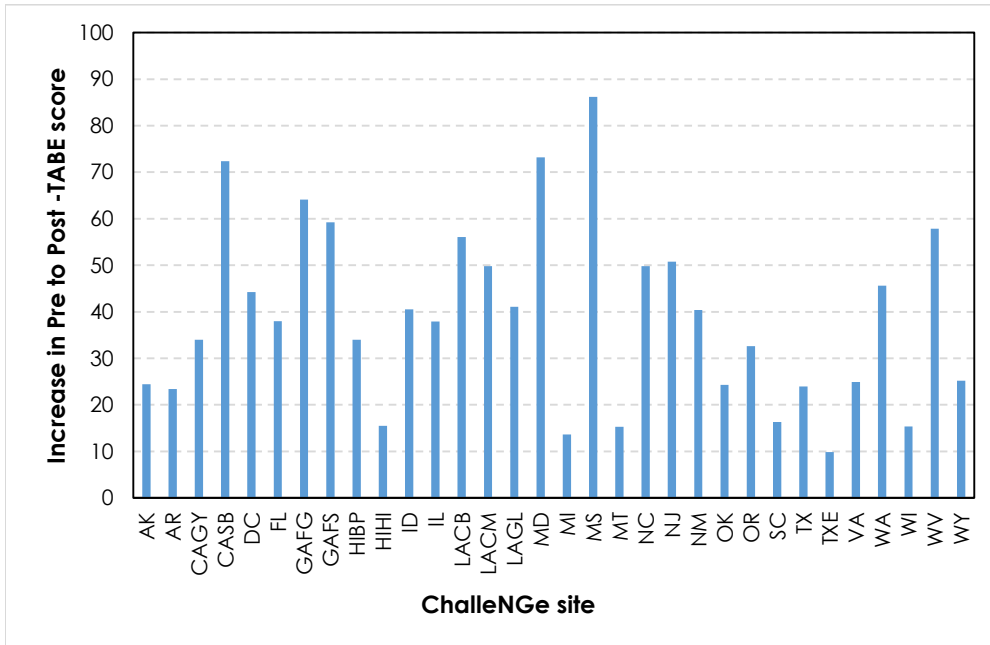
Source: CNA analysis of ChalleNGe-program data.

[a.] This figure includes data from both the linking and verification samples.

Figure 13 shows that there are large differences in GE-level gains across the various ChalleNGe sites. The dashed horizontal line at 0.5 indicates the expected gain in GE for a notional five-month period—the length of the ChalleNGe program—after the pre-TABE. This would be the gain expected from five months in a typical educational setting. We see in the figure that only a few sites (HIHI, MI, and TXE) make GE gains at or near this expected level. In contrast, most sites show GE gains of at least one full year of schooling and some (CASB, MD, and MS) show gains of three to four years. To make gains in five months that public schools make in three to four years is truly remarkable. It suggests that some ChalleNGe sites are extraordinarily successful at teaching the math and verbal concepts measured by the TABE. Some sites may be using the Item Analysis Report and TABE Instructional Study Plan encouraged by McGraw Hill [11]. It may be that some ChalleNGe sites use this material to greatly improve scores on the post-TABE, while others do not use the plan effectively or do not use it at all. In addition, we cannot rule out the possibility that there are differential site-specific pressures to perform well on the post-TABE. Finally, there could be differences in the programs' emphasis on noncognitive skill development, and—to the extent that noncognitive skills improve test-taking abilities—this could lead to site differences in post-TABE scores. Conversely, the AFQT and pre-TABE should be relatively free from site-specific issues: the AFQT is independently

administered, and the pre-TABE is given early in the program when there should be less pressure to perform well. In any event, given that there are differences in the score improvements we observe by ChalleNGe site, the use of post-TABE scores in a linking analysis could introduce undesirable, site-specific effects into the resulting linking. So, it appears prudent to base our linking on AFQT and *pre*-TABE scores.

Figure 13.   Increase in GE level, by ChalleNGe site[a]

[a.] This figure includes data from both the linking and verification samples.

Do we need to account for extra instruction days in between the pre-TABE and the AFQT?

Having determined that the pre-TABE is the more appropriate test to link to the AFQT, we are left with one last consideration in finalizing our methodology—whether we need to account for the extra days of instruction that cadets have *after* taking the pre-TABE and *before* they take the AFQT. On average, cadets have 75 extra days of math and verbal instruction after the pre-TABE and before the AFQT, which, in general, would be expected to result in higher AFQT scores than pre-TABE scores.

When evaluating the effect of extra days of instruction on AFQT scores, however, the results are only marginally significant, as shown in Table 6.[13] That is, the variable "extra days" is not significant at the usual reference level of 0.05; therefore, we consider it to be *not* statistically significant. If, however, we relax the cutoff of statistical significance to 0.10, thus concluding that extra days are statistically and significantly correlated with AFQT scores, we would calculate the average impact to be relatively small (i.e., (0.0057) * (75days) = 0.43 AFQT point).[14] We suspect that the reason that additional days of instruction are not leading to significantly higher AFQT scores may be that the ChalleNGe teachers' prioritize teaching math computation over math reasoning. Unlike math computation, which focuses on computing numeric operations, math reasoning is a more abstract skill and requires the ability to *apply* learned math skills to word problems. Math computation, however, is not one of the math skills directly measured by the AFQT.[15] When we examine pre-TABE to post-TABE gains on the TABE subtests for all sites combined, we find that the average gains are greatest on math computation (74 points), followed by applied math (48 points), reading (36 points), and language (35 points). Of all components of the TABE, deficiencies in math computation may be the easiest to identify, so math computation is likely the area in which teachers and cadets will experience rapid and rewarding gains. This may incentivize teachers to focus their instruction more heavily in this area. In addition, it is the component of the TABE that is *least* like the material and academic constructs tested on the AFQT. As a result, the extra days of ChalleNGe instruction do not correlate to higher AFQT scores. No matter the reason, because we find that AFQT scores do not increase significantly with additional days of training, we do not need to explicitly include "extra days of training" in our linking analysis.

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[13] The "extra days" variable is measured as the date of the AFQT minus the date of the pre-TABE.

[14] Since the AFQT is scored in whole numbers, this would round down to an increase of 0 AFQT point.

[15] The two math components of the AFQT are Arithmetic Reasoning and Math Knowledge; Arithmetic Reasoning consists of word problems, whereas Math Knowledge is the knowledge of high school math principles (different from direct computation).

Table 6.   Summary results from regression of AFQT on pre-TABE and extra days of instruction (linking sample)[a]

| Parameter	Estimate	Standard error	T-value	Probability level
Intercept (A)	-97.69	1.24	-78.74	< .0001
Pre-TABE	0.2406	0.0022	107.98	< .0001
Extra days of instruction	0.0065	0.0040	1.60	0.1097

Source: CNA analysis of ChalleNGe program data.

[a.] This estimation is based on the linking sample, in which there were 12,140 observations and an R-squared of 0.49.

Are data from all ChalleNGe sites in the linking and verification samples suitable for analysis?

Finally, we look at the relationship between the AFQT and the pre-TABE at the site level. This examination is important for removing any clearly aberrant sites from the sample. However, the distributions shown in Figure 14 look reasonable. Sites with cadets who score low on the AFQT also have a higher concentration of cadets who score low on the pre-TABE, and vice versa. There is an expected amount of variation from site to site due to different aptitude levels in the different regions served. We therefore find no indication that any of the sites are extreme outliers that should be removed from the analysis.

Figure 14.   Mean AFQT versus pre-TABE, by ChalleNGe site[a]
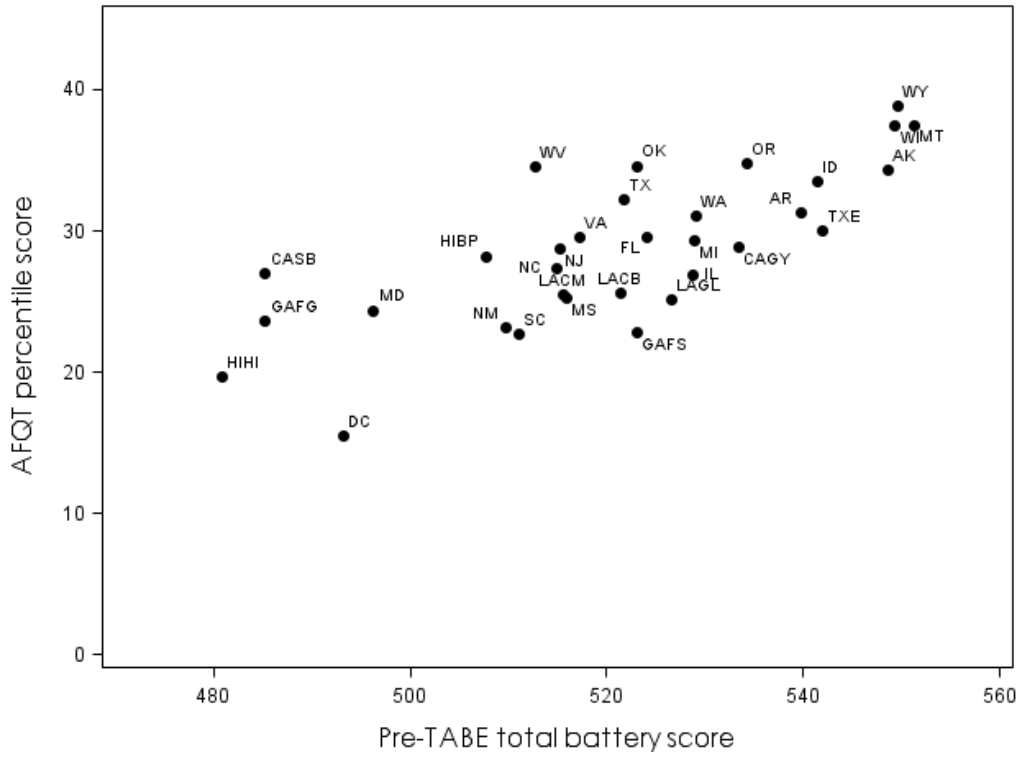
Source: CNA analysis of ChalleNGe-program data.
[a.] This figure includes data from both the linking and verification samples.

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