An Empirical Assessment of the U.S. Army's Enlistment Waiver Policies

An Examination in Light of Emerging Societal Trends in Behavioral Health and the Legalization of Marijuana

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This report documents an analysis of the performance of U.S. Army recruits who receive waivers, as well as those with a documented history of marijuana, attention-deficit/hyperactivity disorder (ADHD), depression, or anxiety. The authors also examine the extent to which increasing the share of recruits who receive waivers or have a documented history affects the overall performance of that accession cohort.

RESEARCH QUESTIONS

- Does the Army need to improve the screening of waivered recruits and of those with a documented history of marijuana, ADHD, depression, or anxiety, and, if so, how?
- How should Army waiver and screening policy respond, if at all, to the increasing legalization of marijuana?
- Does Army waiver policy need to better distinguish between applicants with a history of different types of behavioral health issues, such as ADHD versus mental health conditions?
- Does substantially increasing the share of recruits receiving waivers in a given year significantly hurt the overall effectiveness of that accession cohort?

KEY FINDINGS

Waivered recruits do not always perform worse and sometimes perform better than similar nonwaivered recruits

- Contrary to expectations, waivered recruits and recruits with a documented history of marijuana or behavioral health conditions are not uniformly riskier across all dimensions. In some cases, they are historically more likely to perform better. The results that most closely conform to expectations are in

cases of recidivism, in which accessions with a specific characteristic are more likely to have negative outcomes associated with that characteristic. For example, if a recruit fails to complete the first term, recruits with a documented history of marijuana and recruits with a drug and alcohol waiver are more likely than other recruits to separate because of drug abuse.

- The performance of an accession cohort would change relatively little if waivers were increased. The same is true with an increase in the share of accessions with a documented history of marijuana or behavioral health conditions.

- The legalization of marijuana has not resulted in worse recruit outcomes, and there is no strong evidence that changes in marijuana legislation have substantially changed recruit outcomes.

- The Army likely could do more to offset cases of adverse outcomes among waivered recruits and recruits with a documented history of marijuana or behavioral health conditions. In general, having higher aptitude test scores, having Tier 1 education status (i.e., a high school diploma), or being older (age 22 or older) often fully or partially mitigated the higher likelihood of adverse effects related to performance and misconduct.

To Do

RECOMMENDATIONS

- Recast the message about what a waiver means. The term waiver is not well understood by policymakers and the press, and the term is often mistakenly interpreted as meaning that the Army is lowering standards and enlisting unqualified soldiers. The Army should create, disseminate, and use a clear definition that highlights that all waivered recruits are qualified and eligible to enlist, even if they do not meet every enlistment standard, and that the enlistment standards allow for waivers.

- To mitigate the higher likelihood of adverse performance-related outcomes, require that waivered recruits and those with a documented history of marijuana or behavioral health issues have Tier 1 education status, have Armed Forces Qualification Test (AFQT) scores in categories I–IIIA, or be age 22 or older.

- To mitigate the share of adverse health-related outcomes that comes with an increase in the share of accessions in a cohort who have a weight or medical waiver or a documented history of behavioral health issues increases, require that cohort to also have a higher share of Tier 1, AFQT category I–IIIA, or older (age 22 or older) recruits.

- Distinguish between recruits with only a documented history of marijuana and those who also have misconduct offenses. The adverse effects of having a documented history of marijuana can be less acute if recruits do not also have misconduct offenses (such as the sale of marijuana). The implication is that the Army should continue to carefully screen recruits with a documented history of marijuana but should be less concerned with these recruits if they have no misconduct offenses.

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Preface

This report documents research and analysis conducted as part of a project entitled *Strengthening and Optimizing the Army's Policies on Enlistment Waivers*, sponsored by the Office of the Assistant Secretary of the Army (Manpower and Reserve Affairs). The purpose of the project was to recommend improvements to the Army's enlistment waiver policy, thereby improving recruiting efficiency.

This research was conducted within RAND Arroyo Center's Personnel, Training, and Health Program. RAND Arroyo Center, part of the RAND Corporation, is a federally funded research and development center (FFRDC) sponsored by the United States Army.

RAND operates under a "Federal-Wide Assurance" (FWA00003425) and complies with the *Code of Federal Regulations for the Protection of Human Subjects Under United States Law* (45 CFR 46), also known as "the Common Rule," as well as with the implementation guidance set forth in DoD Instruction 3216.02. As applicable, this compliance includes reviews and approvals by RAND's Institutional Review Board (the Human Subjects Protection Committee) and by the U.S. Army. The views of sources utilized in this study are solely their own and do not represent the official policy or position of DoD or the U.S. Government.

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Motivation

Army enlistment standards are intended to ensure that applicants are able to perform military duties successfully and to select those who are the most trainable and adaptable to service life. However, these standards might also inadvertently screen out individuals who could have had successful careers if mitigating factors had been considered. Waiver authority provides the Army with the ability to reconsider initially disqualified applicants and make them eligible to enlist. The Army wants to use this authority judiciously and to ensure that it is informed by analysis so that its waiver policies do not result in poorer future soldier outcomes and lower readiness.

Changes in Army waiver policy are often newsworthy and an area of concern among policymakers because of the perception that it reflects a lowering of enlistment standards and, ultimately, substandard military performance. Such scrutiny of Army waiver policy leads to questions about whether the concerns are merited and are supported by evidence and whether the Army more generally could do a better job of granting waivers.

Questions about Army waiver policy also arise because of recent societal trends. In particular, marijuana legalization at the state level has expanded dramatically over the past two decades, leading to concerns that potential applicants could be more likely to have a history of marijuana. Army standards continue to stipulate that applicants who test positive for marijuana require a waiver to be eligible for enlistment. Furthermore, some recruits with a history of marijuana use also have misdemeanors or even more-serious legal offenses. However, little is known about how the outcomes of these recruits differ from the outcomes of other recruits.

Another trend concerns the rising prevalence of attention-deficit/hyperactivity disorder (ADHD), anxiety disorders, and depression among children. Similar to those with a history of marijuana, applicants with a history of these conditions will not meet enlistment standards and might not even qualify for a waiver, depending on their specific case.

To provide information on how it can strengthen its waiver policy, especially in light of these societal trends, the Army requested that RAND Arroyo Center conduct empirical analyses of the performance of recent recruits who receive waivers, including, but not limited to, those with a documented history of marijuana, ADHD, or depression/anxiety. The Army was also interested in the extent to which increasing the share of recruits who receive waivers (or who have a documented history of marijuana, ADHD, or depression/anxiety) affects the overall performance of that accession cohort.

This report documents the results of our analyses.

Defining a Documented History of Marijuana, ADHD, or Depression/Anxiety

Our analysis is the first (to our knowledge) to make use of waiver workflow data from the U.S. Army Human Resources Command. These records include information used to determine any areas of potential disqualification (i.e., failure to meet enlistment standards), whether an applicant receives a waiver, and the authority levels that reviewed and approved or disapproved the waiver.

We use these data to identify applicants with a *documented history* of marijuana, ADHD, or depression/anxiety (we also refer to ADHD, depression, and anxiety collectively as *behavioral health conditions*). These individuals have a reference to marijuana or behavioral health conditions somewhere in these data, irrespective of whether they receive a waiver for it.

For marijuana, we use the phrase *documented history of marijuana* to include all documented encounters with marijuana prior to enlistment, whether such encounters involve use (which is determined by testing positive for marijuana); possession (which is determined by a court); a conviction for sale, distribution, or trafficking (also determined by a court); or the individual's self-admitted involvement with marijuana (a disclosure that would occur during the enlistment process).

For ADHD and depression/anxiety, individuals with a documented history have the relevant International Classification of Diseases code or codes in these data. These data do not provide information on the severity of these conditions.

Key Findings

Contrary to expectations, waivered recruits and recruits with a documented history of marijuana or behavioral health conditions are not uniformly riskier across all dimensions. Our empirical analysis shows that, historically, recruits with waivers or with a documented history of marijuana or behavioral health conditions do not have a higher likelihood than similar recruits of adverse outcomes across all dimensions. In some cases, they are historically more likely to perform better.

The results that most closely conform to expectations are in cases of *recidivism*, in which accessions with specific characteristics are more likely to have negative outcomes associated with that characteristic. For example, if a recruit fails to complete the first term, recruits with a documented history of marijuana and recruits with a drug and alcohol waiver (i.e., those who test positive for the presence of drugs or alcohol) are more likely than other recruits to separate because of drug abuse. Similarly, recruits with a weight or health-related waiver, including recruits with a documented history of behavioral health conditions, are more likely to separate for health-related reasons.

The performance of an accession cohort would change relatively little if waivers were increased. The same is true with an increase in the share of accessions with a documented history of marijuana or behavioral health conditions. Our projections of the aggregate effects of increasing the share of accessions with waivers of all types, or with a documented history of marijuana or behavioral health conditions, are relatively small for the accession cohort as a whole and, in some cases, the effects are improvements, not reductions, in performance. These projections are attributable to the correlation between having a waiver (or these documented histories) and other characteristics that are associated with outcomes, either

because of Army policy to recruit individuals with offsetting characteristics or because the recruits have underlying traits that are beneficial to performance. Furthermore, any changes are relatively small, even when we simulate an extremely large change in the share receiving waivers or with a documented history of marijuana or behavioral health conditions. The implication is that, according to historical relationships in the data that we use, we project relatively little change in aggregate outcomes if waivers are increased or if the share with documented histories increased.

The legalization of marijuana has not resulted in worse recruit outcomes. We considered whether Army recruits who enlisted in states where marijuana has been legalized performed differently than those from other states performed; our analyses considered medical and recreational marijuana legalization separately. Although we find some indications that legalization could be associated with an improvement in outcomes, these results are not robust. Notably, however, we do not find evidence that outcomes have worsened. The key conclusion, then, is that there is no strong evidence that changes in marijuana legalization have substantially changed recruit outcomes.

The Army likely could do more to offset cases of adverse outcomes among waivered recruits and recruits with a documented history of marijuana or behavioral health conditions. We find that there are recruit traits that likely can help mitigate the higher likelihood of adverse outcomes where they do occur. Because of the Army's interest in easily implemented rules of thumb, we focused on whether recruits were higher aptitude in terms of having Armed Forces Qualification Test (AFQT) scores in categories I–IIIA, having Tier 1 education status (i.e., a high school diploma), or being older (age 22 or older). In general, we find that these three traits often fully or partially mitigate the higher likelihood of adverse effects related to performance and misconduct. However, we find that these three characteristics are less successful at mitigating adverse health–related outcomes, at least at the individual recruit level.

Whether sufficient numbers of individuals with these characteristics are willing to join the Army will depend on whether the Army is sufficiently attractive relative to other opportunities these individuals could pursue, the raw number of individuals in the population with these characteristics, their tastes for military service, and Army policy to attract such recruits.

Recommendations

In lights of these findings and implications, we offer the following recommendations to the Army to strengthen its waiver policies.

Recast the message about what a waiver means. The term *waiver* is not well understood by policymakers and the press, and the term is often confused to mean that the Army is lowering standards and enlisting unqualified soldiers. The Army should create, disseminate, and use a clear definition that highlights that all waivered recruits are qualified and eligible to enlist, even if they do not meet every enlistment standard, and that the enlistment standards allow for waivers. The messaging should highlight that increasing waivers has historically had little impact on the overall performance of an enlistment cohort and that, at the individual level, waivered recruits do not always perform worse and sometimes perform better than similar nonwaivered recruits.

To mitigate the higher likelihood of adverse performance-related outcomes, require that waivered recruits and those with a documented history of marijuana or behavioral

health issues are either Tier 1, AFQT category I–IIIA, or age 22 or older. Waivered recruits typically are in AFQT categories I–IIIA or older, but we find that being a Tier 1 recruit also often mitigates, at least partially, the adverse performance outcomes associated with waivers and with having a documented history of marijuana or behavioral health issues.

To mitigate the share of adverse health-related outcomes when the share of accessions in a cohort with either a weight or medical waiver or who have a documented history of behavioral health issues increases, require that cohort to also have a higher share of Tier 1, AFQT category I–IIIA, or older (age 22 or older) recruits. We find that these characteristics are less successful at the individual level in mitigating the higher likelihood a given recruit with either a weight or medical waiver or with a documented history of behavioral health conditions has a subsequent adverse health outcome. However, these characteristics can be mitigating at the overall cohort level. This recommendation, as well as the previous one, presumes that the Army can cost-effectively attract sufficient numbers of individuals in the population with these offsetting characteristics.

Distinguish between recruits with only a documented history of marijuana and those who also have misconduct offenses. The adverse effects of having a documented history of marijuana can be less acute if recruits do not also have misconduct offenses. For example, separation for drug abuse is less likely for recruits with only a documented history of marijuana without any misconduct offenses, and (unlike those who also have misconduct offenses) they are no more likely to have a suspension of favorable person status than any other recruit. Furthermore, we find no evidence of substantially worse performance among a cohort of recruits who have a greater share with a documented history of marijuana or evidence of worse performance in states where legalization of marijuana has occurred. The implication is that the Army should continue to carefully screen recruits with a documented history of marijuana but should be less concerned with these recruits if they have no misconduct offenses.

Acknowledgments

Abbreviations

ADHD	attention-deficit/hyperactivity disorder
AFQT	Armed Forces Qualification Test
AR	Army Regulation
ASVAB	Armed Services Vocational Aptitude Battery
CBT	cognitive behavioral therapy
CDC	Centers for Disease Control and Prevention
CDRS-R	Children's Depression Rating Scale-Revised
DEP	Delayed Entry Program
DoD	U.S. Department of Defense
DoDI	Department of Defense Instruction
DSM	Diagnostic and Statistical Manual of Mental Disorders
FY	fiscal year
GED	General Educational Development
GPA	grade point average
HRC	U.S. Army Human Resources Command
ICD	International Classification of Diseases
MDD	major depressive disorder
MTF	Monitoring the Future
NASEM	National Academies of Sciences, Engineering, and Medicine
NHIS	National Health Interview Survey
NSCH	National Survey on Children's Health
NSDUH	National Survey on Drug Use and Health
PTSD	posttraumatic stress disorder
RA	Regular Army
RRR	relative risk ratio
RST	Recruit Selection Tool
SD	standard deviation
SPD	Separation Program Designator

TAPDB	Total Army Personnel Data Base
THC	delta-9-tetrahydrocannabinol
YRBS	Youth Risk Behavior Survey

Introduction

The Army's Enlistment Standards and Waiver Process

The purpose of military enlistment standards is to ensure that applicants are able to perform military duties successfully and to select those who are the most trainable and adaptable to service life (U.S. Department of Defense [DoD], 2015). The Army has established enlistment standards for individuals seeking to join its active and reserve components with regard to several characteristics, including age, citizenship status, education, aptitude, medical condition, dependency status, character and conduct, and drug and alcohol use (Army Regulation [AR] 601–210, 2016). Although these standards are meant to help the Army screen for applicants who are more likely to be successful, they could also inadvertently screen out individuals who could have had successful careers if mitigating factors had been considered. Given the considerable cost of Army recruiting (see, for example, Knapp et al., 2019), the Army does not want to unnecessarily disqualify applicants who could be successful.

Waiver authority, therefore, provides the Army with the ability to reconsider "disqualified" applicants and allow them to enlist. If an applicant requests and is granted a waiver, they become "eligible to enlist," even if they were initially disqualified because of a failure to meet one or more specific enlistment standards.

AR 601–210 states that the Army "will apply the 'whole person' concept" when considering these requests (AR 601–210, 2016, p. 31). Although general guidance is given to assess whether the applicant "has overcome his or her disqualifications for enlistment," no formal definition of the whole person concept is provided (AR 601–210, 2016, p. 31). In practice, individuals with the authority to approve waivers make an assessment as to whether applicants demonstrate other offsetting characteristics that indicate likely success in the Army. A higher level of authority and a greater level of scrutiny is required to make assessments about more-serious disqualifications, such as those requiring a serious misconduct waiver. The Army also wants to use this authority judiciously and to ensure that it is informed by analysis so that its waiver policies do not result in poorer future soldier outcomes and lower readiness.

Table 1.1 provides an overview of the current criteria for waivers for Regular Army (RA) nonprior-service enlistments. Issues and traits that require a waiver can be identified at any stage of the application and enlistment processes. Initially, applicants are interviewed and pre-screened by recruiters to identify potentially disqualifying traits and behaviors. For each applicant, recruiters fill out form DD 1966, *Record of Military Processing*.[1] Applicants also must fill

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[1] A description of the Army's enlistment process is provided in AR 601–210. Form DD 1966 is found at Executive Services Directorate, 2020.

Table 1.1
Overview of Current Waiver Criteria for Regular Army Nonprior-Service Applicants

Category	Criteria
Age	Individuals who have passed their 35th birthday
Physical	Individuals who do not meet physical fitness standards of AR 40–501
Dependents	Married individuals with three or more dependents under the age of 18
	Married individuals with a spouse serving in the U.S. Armed Forces and a dependent under the age of 18
	Unmarried individuals who are required to pay child support for three or more dependents
Conduct and drug	Individuals who confirmed positive for the presence of drugs or alcohol at time of original physical examination
	Individuals with five or more civil convictions for minor non-traffic offenses
	Individuals with two to five civil convictions for a misconduct offense
	Individuals with five civil convictions for a combination of minor non-traffic and misconduct offenses
	Individuals with a conviction for driving while intoxicated, driving under the influence, or driving while impaired
	Individuals with a conviction for possession of marijuana or drug paraphernalia
	Individuals with a conviction for solicitation of prostitution or for prostitution
	Individuals with a conviction for domestic violence/battery against a non-Lautenberg victim
	Individuals with a conviction for a major misconduct offense or felony

SOURCE: AR 601–210, 2016.

out SF 86, *Questionnaire for National Security Positions* (U.S. Office of Personnel Management, 2016), and they are prescreened regarding their medical history, police record, and records regarding civil or criminal convictions. Recruiters must gather certifying materials as part of this process, including birth and marriage records, citizenship documents, education transcripts, and so forth. The applicant's package of documents is reviewed by the Army recruiting command and, if approved, is sent to the Military Entrance Processing Station, where the applicant undergoes aptitude testing and a medical exam, including drug testing. If, during this application process, the applicant is found to be disqualified in terms of one or more enlistment standards, the applicant can request a waiver.

Army waiver policy is often a flashpoint topic among policymakers, observers, and the press. Articles in the press usually highlight changes in waiver policy and often lead to consternation among experts and concern among policymakers about the lowering of enlistment standards in the Army and the potential for a "hollow force" that is significantly less effective and is reminiscent of the early years of the all-volunteer force. For example, in fiscal year (FY) 2018, the Army's policy toward granting waivers to applicants with a history of behavioral health issues resulted in considerable controversy (see, for example, Vanden Brook, 2017b; and Myers, 2018a). The result is that increasing the use of waivers can lead to "bad optics" for the Army.

Although waivers receive considerable attention, as Table 1.2 shows, only 14.7 percent of RA accessions received any waiver from FY 2001 to FY 2018. Table 1.2 also shows the per-

Table 1.2
Tabulations of Regular Army Waivers

Waiver category (DoD Instruction [DoDI] code[s])	Percentage of FY 2001 to FY 2018 Accessions	Percentage of Waivers in FY 2001 to FY 2018 Accessions
Serious traffic offense (DB)	0.2%	1.4%
Non-traffic offense (DA, DC, DD, DE, DF)	4.7%	32.0%
Drug and alcohol (FA, FB, FC, FD)	0.8%	5.4%
Weight (HB)	0.3%	2.0%
Non-weight health condition (HC)	7.4%	50.3%
Other non-health waiver (all remaining codes)	1.3%	8.8%
Total	14.7%	100%[a]

SOURCE: Authors' calculations using RA Analyst recruiting data.
[a] Total does not sum to 100 because of rounding.

centage of waivers attributable to each category.[2] About half of waivers during the FY 2001 to FY 2018 period were for health reasons or medical conditions other than weight, while 2 percent of those receiving waivers received them for being either under or over the weight standard. The other major category over this period were for "non-traffic offenses" (i.e., character or misconduct issues other than serious traffic offenses), accounting for about 32 percent of waivers during this period.

Figure 1.1 shows that the use of waivers, measured as a percentage of all accessions, has varied over time. As this figure shows, the use of waivers increased during the "surge" in Army operational tempo from FY 2004 to FY 2008, peaking in FY 2008 at about 20 percent. Waivers were less prevalent thereafter, reaching a low of 11 percent in FY 2012. Since FY 2012, the use of waivers has generally been increasing, reaching just less than 15 percent in FY 2018. Figure 1.1 also shows how waivers in each broad category varied over time. Since FY 2006, waivers for medical reasons other than weight have become more prevalent and accounted for just less than 10 percent of all accessions in FY 2018. In contrast, non-traffic offenses have declined since FY 2007 and accounted for about 2 percent of all accessions in FY 2018.

It is important to note that enlistment standards change occasionally over time. For example, in 2015, DoD loosened standards with respect to tattoos. Similarly, the Army's decision to grant waivers could change over time. As shown in Figure 1.2, the percentage of Army accessions receiving any waiver varied inversely with the unemployment rate for civilians ages 16–19, suggesting that waivers were more likely to be granted when recruiting became more difficult as civilian job opportunities for potential recruits improved. The implication is that similar applicants can have a different waiver status depending on when they enlisted.[3]

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[2] The full list of waiver codes was provided by the Army and is replicated in Table A.1 in Appendix A.

[3] Throughout this report, we discuss enlistment standards and the waiver process, including changes over time, in more detail.

Figure 1.1
Army Waivers as Percentage of Accessions, by Fiscal Year

SOURCE: Authors' calculations using RA Analyst recruiting data.

Figure 1.2
Army Waivers as Percentage of Accessions and the Civilian Age 16–19 Unemployment Rate, by Fiscal Year

SOURCES: Authors' calculations using RA Analyst recruiting data for waivers and Bureau of Labor Statistics for civilian unemployment rates (U.S. Bureau of Labor Statistics, undated).
NOTE: Civilian unemployment rate for each fiscal year is an average of monthly rates from October to September.

Army Context and Emerging Societal Trends

A complicating factor in making assessments about the suitability of an applicant who requests a waiver is that the likelihood of success in the Army and the specific dimensions of success differ by waiver category. Furthermore, it is unclear which, if any, other recruit characteristics are effective at mitigating the riskiness associated with different waiver types. For example, Orvis et al., 2018, finds that Army accessions with and without weight waivers have similar outcomes in terms of first-term attrition, personnel actions (such as a bar to reenlistment), and separation for such reasons as physical condition and poor conduct. On the other hand, Army accessions with a drug and alcohol waiver (i.e., those who test positive for the presence of drugs or alcohol) are more likely to separate because of drug abuse or a serious offense, are more likely to have an adverse personnel action, and are more likely to fail to complete the first enlistment term than are similar accessions without a drug and alcohol waiver.

Malone, 2014, finds that, across the services, the riskiness of waivered recruits in terms of attrition and promotion varied significantly by waiver type, though the effects differed by service. Because the success of waivered recruits differs by type of waiver, a one-size-fits-all set of criteria for assessing the suitability of applicants seeking waivers is unlikely to be effective. In the case of the Army, Malone, 2014, finds that characteristics that could compensate for a higher risk of attrition among waivered recruits include higher Armed Forces Qualification Test (AFQT) scores, higher entry pay grade, and longer time in the Delayed Entry Program (DEP).

Other complicating factors are the broader societal trends that potentially affect the extent to which American youth will meet enlistment standards. In particular, the number of states that have legalized marijuana for medical and recreational uses has been increasing, yet Army standards stipulate that applicants who test positive for marijuana are disqualified from enlistment and require a waiver to be eligible for enlistment. Furthermore, some recruits with a history of marijuana use also have misdemeanors or even more-serious legal offenses, so their disqualifications are arguably more serious. Yet little is known about how the outcomes of these recruits differ from the outcomes of other recruits.[4]

Similarly, diagnoses of attention-deficit/hyperactivity disorder (ADHD) and depression among adolescents have been increasing, yet applicants with current diagnoses of these conditions are disqualified. Army enlistment policy currently categorizes both ADHD and mental health conditions as "behavioral health conditions," but the Army outcomes of recruits with a history of these conditions could differ.[5] More generally, these broader societal trends could cause the Army to revisit and refine its waiver policies for these standards.

To assist with its waiver assessments in terms of whether a waiver should be granted, especially in light of these societal trends, the Army requested that RAND Arroyo Center provide information to help determine how best to provide waivers and, particularly, to answer the following policy questions:

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[4]   These issues are discussed and explored in more detail in Chapter Four.

[5]   A detailed assessment of these issues is in Chapter Five.

- Does the Army need to improve the screening of waivered recruits and of those with a documented history of marijuana, ADHD, depression, or anxiety, and, if so, how?[6]
- How should Army waiver and screening policy respond, if at all, to the increasing legalization of marijuana?
- Does Army waiver policy need to better distinguish between applicants with a history of different types of behavioral health issues, such as ADHD versus mental health conditions?
- Does substantially increasing the share of recruits who receive waivers in a given year significantly hurt the overall effectiveness of that accession cohort?

This report summarizes the results of the analyses we conducted to address these questions.

Overview of Research Questions and Approach

The key objective of our analysis is to provide the Army with information on how it can strengthen its waiver policy by answering the questions above. Our approach involves identifying where and how screening might be improved and providing contextual information on the extent to which waivers hurt the overall performance of an entry cohort. To provide the requested information, our research focused on the following questions:

1. In what ways, if any, do waivered recruits or those with a documented history of marijuana or behavioral health conditions have worse or better early career outcomes and performance than do other recruits? To what degree do these outcomes reflect the inherent riskiness of these recruits? Are there rules of thumb the Army can use in terms of other characteristics, such as aptitude or education, to offset or mitigate the riskiness of these recruits?
2. How might increasing the prevalence of different types of waivers among recruits affect the aggregate performance of an enlistment cohort in a given year? Are waivered recruits a sufficiently small population, or are any adverse effects on performance sufficiently offset by other characteristics?
3. How have recruit outcomes changed as legalization of marijuana has increased?

To address these questions, we developed a database of all RA enlistments from FY 2001 to FY 2012. The data provide information on each recruit, including characteristics measured during the application and enlistment process. These data were merged with Army personnel records through FY 2018 to allow us to track the subsequent career outcomes of each recruit. We addressed the first question by comparing outcomes of those with and without a waiver, as well as those with and without a documented history of marijuana or behavioral health conditions. We also conducted a regression analysis, which allowed us to estimate the relationship between waivers and outcomes, holding other observable factors constant that could be correlated with waivers. We addressed the second question by extending the Recruit Selection Tool (RST) built by Orvis et al., 2018. The RST allows us to consider how increasing

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[6] Chapter Two provides formal definitions of what we consider to be a *documented history* of marijuana, ADHD, and depression/anxiety.

waivers among an entry cohort of enlistees affects the subsequent performance of that cohort. The RST focuses on an entire cohort and allows other characteristics to vary that might be correlated with waivers. To address the final question, we reviewed the available literature on marijuana use and conducted a regression analysis that compares the before and after outcomes of recruits enlisting in states that legalized marijuana with those in states that have not legalized marijuana or that legalized marijuana at a later date. Using the analyses addressing these questions, we then developed recommendations to strengthen the Army's waiver policy.

Layout of the Report

We describe our methods and findings in the remainder of the report. In Chapter Two, we describe data development and methods. We then organize the presentation of the results in terms of topic area. In Chapter Three, we show results pertaining to the broad waiver categories identified in Table 1.1. In particular, we review previous literature findings and present regression results and analyses using the extended RST. In Chapter Four, we show similar results pertaining to recruits with a documented history of marijuana and also present our analysis of the extent to which legalization is associated with recruit outcomes. In Chapter Five, we show results pertaining to behavioral health conditions, focusing on recruits with a documented history of ADHD or depression/anxiety. In Chapter Six, we discuss characteristics the Army could use to offset or mitigate the adverse relationship between waivers and outcomes. In Chapter Seven, we present the implications of our findings and provide recommendations for how the Army can strengthen its waiver policy.

For the interested reader, we also provide several appendixes with more details. Appendix A lists the waiver codes provided to us by the Army. In the next two appendixes, we provide the details of our empirical analyses, including descriptive statistics and regression results (Appendix B) and our RST results (Appendix C). In Appendix D, we present a narrative review of trends in marijuana legalization and use, as well as the current state of scientific evidence of the effects on outcomes relevant to productivity and labor market outcomes. Finally, we present a comparable review for ADHD, depression, and anxiety in Appendix E.

Data and Analytic Approach

Data

To conduct our analyses, we developed a comprehensive record on each recruit who entered the Army from FY 2001 to FY 2012. These records track individuals through FY 2018, from the application waiver screening process through enlistment until either separation (at or before the end of the first term or reenlistment) or reenlistment.

The following personnel data files from the U.S. Army Human Resources Command (HRC) were merged to develop each record:

- **Waiver workflow data on the waiver details associated with all Army applicants.** As described in Chapter One, applicants are screened by the Army to identify any areas of disqualification or failure to meet enlistment standards. Each disqualification generates a waiver workflow record, and applicants may have multiple waiver workflow records. These records include information on the specific disqualifications as well as the authority levels that reviewed and approved or disapproved the waiver. We limited our analysis to include only applicants who ultimately enlist (e.g., contracts and accessions) and not applicants who did not enlist during our data period. In the cases in which applicants had multiple waiver workflow records, we summarized these records by creating variables that indicate whether the applicant ever had a disqualification of a given type during the application process (discussed in more detail below). We also summarized cases in which applicants had multiple waiver codes.
- **RA Analyst data on Army contracts and accessions.** These data include information on recruit characteristics and the features of the enlistment contract, such as term of service, waiver category, and entry grade.
- **Total Army Personnel Data Base (TAPDB) data on all RA enlisted personnel that show the status of Army personnel each month.** These data were used to track soldier characteristics during the first term and first-term reenlistment, as well as any transition to the officer corps.

By merging these files, we are able to measure recruit characteristics at entry and assess the extent to which these characteristics are associated with subsequent Army outcomes.

Entry Characteristics

Box 2.1 lists the characteristics we included in our analyses. Most of them are self-explanatory, but several require additional explanation, as follows:

Box 2.1
Recruit Characteristics Included in Analyses

- Male
- Age at time of contract
- Married with children
- Married with no children
- Formerly married with children
- Formerly married with no children
- Single with children
- Asian
- African American
- Hispanic
- Other nonwhite non-Hispanic
- Some college
- Graduated college
- AFQT category I–IIIA
- Education Tier 2
- Prior military service
- Three-year term
- Five-year term
- Six-year term
- Months scheduled to be in the DEP
- Enlistment waiver category: traffic offense
- Enlistment waiver category: non-traffic offense
- Enlistment waiver category: drug/alcohol
- Enlistment waiver category: weight
- Enlistment waiver category: medical (not weight)
- Enlistment waiver category: other waiver
- No medical waiver, but PULHES = 3 (significant limitation)
- During screening process: ever disqualified for marijuana
- During screening process: ever received misconduct offense code for selected offenses
- During screening process: ever received ICD-9 code for ADHD
- During screening process: ever received ICD-9 code for anxiety, depression
- Year of contract or accession
- Month of contract or accession

NOTE: ICD-9 refers to the International Classification of Diseases, Ninth Revision. In the waiver workflow data, the variables are titled "ICD-9," but the variable values are taken from the ICD-10 in some cases. In our analysis, we use codes from both the ICD-9 and ICD-10, as relevant; for simplicity, we call them ICD-9 codes.

- **AFQT category I–IIIA.** This range indicates that the recruit's AFQT score is in the top half of the national distribution of aptitude among American youth.
- **Education Tier 2.** Recruits who are a General Educational Development (GED) graduate or equivalent are considered Tier 2 recruits.
- **Enlistment waiver category.** These categories are the same as those listed in Table 1.1. Some recruits receive a waiver at the time they sign a contract, called a *DEP waiver*, and/or at the time of accession, called an *accession waiver*. We follow Army convention and label the waiver as the final one on the enlistment record. That is, if the recruit received both a DEP and an accession waiver, the final waiver is the accession waiver. If the recruit only received a DEP waiver but no accession waiver, the final waiver category is no waiver.[1]
- **No medical waiver, but PULHES = 3.** PULHES is an acronym that refers to the six areas of medical outcomes: Physical, Upper extremities, Lower extremities, Hearing, Eyes, and "Stability" or psychiatric. Recruits with a significant limitation in any of these categories receive a score of 3 or 4 (in our data, virtually no recruit received a 4). In our

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[1] Our regression analysis and RST analysis include variables indicating the month and year of contract. For recruits whose waiver codes were generated at the time of the contract, we control for month and year of medical exam. But our analyses do not control for the date of medical exam for recruits who later receive an accession waiver that differs from the contract waiver.

analysis file of FY 2001 to FY 2012 accessions, 2.1 percent of accessions had a PULHES score of 3 but no health waiver. It could be the case that the Army chose not to require a health waiver despite the findings of the Chief Medical Officer at the Military Entrance Processing Station indicating a significant limitation on one of the six dimensions. Alternatively, it is possible that, by the date of accession when the recruit entered the Army, the condition resolved itself and a waiver was unnecessary. Whatever the reason, we include an indicator for these cases.[2]

Because our analysis is the first (to our knowledge) to use the waiver workflow data from the applicant screening process, the variables constructed from these data require more-detailed explanation. Table 2.1 shows examples of the records in these data for five recruits. The first line (Recruit 1) shows the record for a recruit who accessed into the Army in FY 2009. The screening process uncovered that the individual had a history of a single offense of marijuana possession. The enlistment of the applicant was approved with a waiver workflow result code of DDA (law violation of misconduct offense). In our analysis, the variable "during screening process: waiver workflow waiver for non-traffic offense" would equal 1 for this recruit, since DDA is a non-traffic offense waiver code. Further, the variable "during screening process: ever disqualified for marijuana" would equal 1. This latter variable would also equal 1 for Recruit 3 because this recruit also has a history of marijuana use and possession. In fact, Recruit 3 has multiple records indicating this history, but the variable we constructed would still only equal 1 for this recruit because our criterion is that the recruit has one or more records for which he or she was disqualified for marijuana. Recruit 3 was also given a misconduct offense code of 37, meaning that this recruit had multiple offenses of possession of marijuana. So, for Recruit 3 (but not for Recruit 1), the variable "during screening process: ever received misconduct offense code for marijuana" would also equal 1.

The second recruit in the table received a waiver workflow result code of HCB, meaning a medical issue other than weight. The individual has multiple waiver workflow records, no doubt reflecting the additional screening that occurred for this recruit. In the process of screening, it was uncovered that the individual had a psychiatric issue in their history (workflow medical failure = 40): specifically, ADHD (ICD-9 code 90.9). The variable "during screening process: ever received ICD-9 code for ADHD" would equal 1 for this recruit, even though the recruit has more than one waiver workflow record indicating ADHD. Recruit 4 has a history of anxiety (ICD-9 code 300), so "during screening process: ever received ICD-9 code for depression/anxiety" would equal 1 for this recruit. Recruit 5 has multiple records, which reflect a documented medical history (ICD-9 code 296, indicating episodic mood disorders) and a documented history of marijuana possession. For this recruit, variables indicating depression and marijuana disqualification during the waiver process would both equal 1.

Although the waiver workflow data provide a rich source of information about disqualifying factors and waiver details, the data reflect the real-time screening process and were not designed to be used for analysis. Importantly, *applicants can receive a code indicating a disqualifying factor that is later found not to require a waiver*. The codes reflect the need to investigate

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[2]   We also investigated whether these recruits received a waiver other than a medical waiver, but we found that only 6.5 percent of the cases received a different category of waiver. Of these 6.5 percent, approximately 30 percent were recruits who received a weight waiver.

the recruit's qualifications further. Consequently, an important caveat of our use of these data is that they are imperfect measures of the disqualifying history of recruits.

The difference between the recruit's history in the waiver workflow data and the waiver received can be seen by comparing the accession and DEP waivers received with the information in the waiver workflow data in Table 2.1. Recruits 1–3 all received an accession waiver code of YYY, meaning no condition currently exists that requires a waiver, but there could be administrative conditions that exist. All five recruits in the table received a DEP waiver, but the DEP waiver code is not always the same as the waiver workflow result waiver code, as shown in the final row for Recruit 5. Because the final waiver code is YYY for Recruits 1–3, these recruits are coded as having no "final" waiver. Recruit 4 received a health or medical waiver (HCB) at the time of contract (e.g., a DEP waiver), and this was carried forward as an accession waiver. So, this recruit would be coded as having a medical waiver. Because the ICD-9 code is 300 with a medical failure code of 40, this recruit would also be coded as having a documented history of ADHD. Recruit 5 received a DEP waiver indicating a health condition (HCB), but the waiver workflow result code was initially RWA, indicating return without action. Eventually, the HCB waiver was approved as a DEP and accession waiver, though it is interesting to note that Recruit 5 also received a DDA waiver workflow result code in the final record, indicating a non-traffic offense related to the possession of marijuana.

Defining Documented History of Marijuana, ADHD, and Depression/Anxiety

Throughout this report, we refer to individuals with a *documented history* of marijuana, ADHD, and/or depression/anxiety. These individuals have a reference to marijuana, ADHD, or depression/anxiety somewhere in their waiver workflow data, irrespective of whether they receive a waiver for it.

For marijuana, we use the phrase *documented history of marijuana* to include all documented encounters with marijuana prior to enlistment, whether such encounters involve use (which is determined by testing positive for marijuana); possession (which is determined by a court); a conviction for sale, distribution, or trafficking (also determined by a court); or the individual's self-admitted involvement with marijuana (a disclosure that would occur during the enlistment process). Specifically, we categorize recruits as having a documented history of marijuana if the disqualification code equals

- possession of marijuana—single offense
- possession of marijuana—two or more offenses
- drug marijuana 1st offense (positive test)
- drug marijuana 2nd offense (positive test)
- drug involvement marijuana—self admitted.

For recruits who have these codes, we also set the variable "during screening process: ever disqualified for marijuana" to 1.

There are also misconduct offense codes related to marijuana, and we categorize recruits as having a documented history of marijuana if the waiver workflow offense code equals

- 37: possession of marijuana (multiple offenses)
- 316: possession of marijuana or drug paraphernalia
- 436: sale, distribution, or trafficking of cannabis (including intent).

Table 2.1
Examples of Waiver Workflow Records

Recruit	Accession FY	Accession Waiver Code	DEP Waiver Code	Waiver Workflow Result Code	Waiver Disqualification Code	Workflow Waiver Status Code	Workflow Misconduct Offense Code	Workflow Medical Failure Code	Workflow PULHES	ICD-9
Recruit 1	2009	YYY	DDA	DDA	Possession of Marijuana Single Offense	Approved				
Recruit 2	2017	YYY	HCB	HCB	Medical	Returned Without Action				
Recruit 2	2017	YYY	HCB	HCB	Medical	Returned Without Action		40		90.9
Recruit 2	2017	YYY	HCB	HCB	Medical	Approved		40	111111	90.9
Recruit 3	2009	YYY	DEA	DEA	Possession of Marijuana— Two or More	Returned Without Action				
Recruit 3	2009	YYY	DEA	DDA	Possession of Marijuana Single Offense	Returned Without Action				
Recruit 3	2009	YYY	DEA	DEA	Possession of Marijuana— Two or More	Returned Without Action				
Recruit 3	2009	YYY	DEA	FDA	Drug Marijuana 2nd Offense (Positive Test)	Returned Without Action				
Recruit 3	2009	YYY	DEA		Possession of Marijuana— Two or More	Returned Without Action				
Recruit 3	2009	YYY	DEA	DEB	Possession of Marijuana— Two or More	Approved	37			
Recruit 4	2010	HCB	HCB	HCB	Medical	Returned Without Action		40		300
Recruit 5	2018	HCB	HCB	RWA	Possession of Marijuana Single Offense	Returned Without Action				
Recruit 5	2018	HCB	HCB	RWA	Possession of Marijuana Single Offense	Returned Without Action				
Recruit 5	2018	HCB	HCB	HCB	Medical	Approved		40	111111	296
Recruit 5	2018	HCB	HCB	DDA	Possession of Marijuana Single Offense	Approved				

Table 2.1—Continued

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NOTE: PULHES codes are the scores for each of the six areas of medical outcomes.

WAIVER codes:

DDA = law violations of adjudicated serious non-traffic offense waiver granted by the highest authority level.

DEA = law violations of adjudicated serious non-traffic offense waiver granted by the U.S. Army Battalion.

DEB = law violations of adjudicated serious non-traffic offense waiver granted by the recruiting command headquarters level.

FDA = drug involvement not considered a law violation with drug and alcohol test positive waiver granted by the highest authority level.

HCB = medical disqualification disease classification (ICD-9) waiver granted by the recruiting command headquarters level.

YYY = no condition currently exists requiring a waiver, but there could be administrative conditions that exist.

Recruits with these codes were given a value of 1 for the variable "during screening process: ever received misconduct offense code for selected offenses."

For ADHD and depression/anxiety, an individual has a documented history of these conditions if the relevant ICD-9 code or codes are in their waiver workflow data. Specifically, an individual has a documented history of ADHD if they have an ICD-9 code beginning with 314 (hyperkinetic syndrome of childhood) or an ICD-10 code beginning with F90 (attention-deficit hyperactivity disorders). An individual has a documented history of depression/anxiety if they have an ICD-9 code that begins with 296 (episodic mood disorders) or 300 (anxiety, dissociative, and somatoform disorders) or if they have any of the following ICD-10 codes: beginning with F32 (major depressive disorder, single episode), F33 (major depressive disorder, recurrent), F41 (other anxiety disorders), F42 (obsessive-compulsive disorder), or F91.3 (oppositional defiant disorder).[3]

Overview of Entry Characteristics

In Appendix B, we summarize the entry characteristics of all recruits in our analytic data for FY 2001 to FY 2012 entry cohorts (Table B.1). As examples, across these accession cohorts, 16.7 percent of accessions were female, 17.4 percent were African American, and 10.7 percent were Hispanic. The average age was 21.3 years, and 76.1 percent of accessions were single with no dependents. The percentage of accessions in AFQT categories I–IIIA was 65.2 percent, and the percentage that were not Tier 1 was 13.7 percent. During these years, 8.9 percent of accessions had prior service, 46.6 percent enlisted for a three-year term, and 34.6 percent enlisted for a four-year term.

From the waiver workflow data, we find that 0.1 percent of accessions had a documented history of ADHD, and 0.2 percent had a documented history of anxiety or depression. We find that less than 0.1 percent had a misconduct code associated with marijuana, and 0.2 percent of accessions had a documented history of marijuana.

Outcomes

We tracked individuals through their first enlistment term, allowing us to measure the outcomes listed in Table 2.2. The outcomes we analyzed are listed in the table together with the number of observations and mean value of the outcomes for the FY 2001 to FY 2012 entry cohorts. We first considered attrition during the time between contract and accession (i.e., DEP attrition), as well as attrition during the first enlistment term, conditional on accession. We also examined the incidence (conditional on accession) of demotion, suspension of favorable person status, and the transition to commissioned officer or warrant officer.

We examined the reasons for separation, conditional on failure to complete the first term, grouping them into major categories, as shown in Table 2.3.[4] The Army data indicate the

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[3] We note that our definition of depression/anxiety includes ICD-9 and ICD-10 codes associated with bipolar disorder, which is a separate condition from depression and anxiety. In our analysis file, cases with bipolar disorders accounted for only 18 observations. We also note that an alternative definition of depression would include ICD-9 code 311 (depressive disorder, not elsewhere classified). Inclusion of this code would have resulted in more observations with a documented history of depression. We conducted sensitivity analyses by including and excluding ICD-9 and ICD-10 codes for a more precise definition of depression; the estimates are qualitatively similar throughout this report, and the conclusions are unaffected.

[4] Our analysis focuses on the major reasons for early separation that together account for 94 percent of all SPD codes. The remaining 6 percent of reasons are largely attributable to hardship, pregnancy/childbirth, or parenthood-related issues. In exploratory analyses, we found these reasons to be statistically unrelated to waivers.

Table 2.2
Outcomes Included in Our Analyses, Number of Observations, and Means, FY 2001 to FY 2012 Accession Cohorts

Outcome	Observations	Mean
Failure to complete DEP	952,551	0.113
Conditional on accession		
Failure to complete first term	863,231	0.343
Suspension of favorable person status	863,231	0.484
Demotion	863,231	0.141
Transition to warrant officer	863,231	0.030
Transition to commissioned officer	863,231	0.011
Conditional on failure to complete first term		
Separation for health-related reasons	219,737	0.335
Separation for performance-related reasons	219,737	0.180
Separation for misconduct but not drugs	219,737	0.160
Separation for misconduct: drug abuse	219,737	0.096
Separation because of a court martial or in lieu of a court martial	219,737	0.079
Conditional on completing 36 months		
PULHES physical condition = 3	603,904	0.018
PULHES psychiatric condition = 3	603,904	0.006
Conditional on completing first term		
Barred from reenlistment	567,032	0.317
Reenlist, conditional on not being barred from reenlistment	387,474	0.596
Promoted to E5 before completion of term, conditional on completing 4-year term	185,651	0.367

SOURCES: Authors' tabulations of RA Analyst and TAPDB data.

NOTE: The DEP attrition sample includes recruits who contracted from FY 2001 to FY 2011. FY 2012 contracts were excluded because some contracts could be scheduled to access during FY 2013, outside our window. The remaining samples exclude two-year term soldiers, unlike the DEP attrition sample, because we wanted to focus on those who completed at least a three-year obligation.

Table 2.3
Grouping of Reasons for Separation Before Completion of First Term Included in the Analysis

Reason	SPD Codes Included in Grouping
Separation for health-related reasons	• Physical standards (FT) • Condition, not a disability (FV) • Failure of medical or physical standard (FW) • Personality disorder (FX) • Weight control failure (CR)
Separation for performance-related reasons	• Entry-level performance and conduct (GA) • Unsatisfactory performance (HJ)
Separation for misconduct but not drugs	• Pattern of misconduct (KA) • Misconduct: Absent without leave (KD) • Misconduct: Commission of a serious offense (KQ) • Other misconduct (KZ)
Separation for misconduct: drug abuse	• Misconduct: Drug abuse (KK)
Separation because of a court martial or in lieu of a court martial	• In lieu of trial by court martial (FS) • Court martial conviction: Other (JD)

reason for separation in the form of Separation Program Designator (SPD) codes. The table shows the codes and the specific reason attached to each one.

We also considered whether recruits received a medical profile or PULHES indicating significant limitation related to their physical capability or stability during the first 36 months of service. Finally, we considered whether soldiers were promoted more quickly than their peers to E5, conditional on completing a four-year enlistment; these individuals are considered better performers because they were promoted faster than their peers. We conducted the analysis only on those who have completed their four-year enlistment term to control for the retention decision.[5]

Note that the means shown in Table 2.2 are conditional on recruits achieving certain milestones, such as completion of the first term. This allow us to isolate how waivers are related to outcomes such as reenlistment at the end of the first term from their relationship to attrition and whether the recruit completed the first term. Thus, the means of the outcomes in the regression analyses differ from those in Table B.1. Means for the regression analyses are shown in subsequent tables in Appendix B.

Analytic Approach

Our analytic approach involves two methods. The first is a regression analysis, building on Orvis et al., 2018, that estimates the relationship between waivers and outcomes, holding constant individual recruit and contract characteristics, measured at entry. The second method, which involves extending the RST, a tool recently developed by Orvis et al., 2018, focuses on the performance of an entry cohort of enlistees as the number of entrants with a waiver increases.

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[5] Past research shows that retention and promotion are jointly determined, so that those who stay are also those who are more likely to be promoted (Buddin et al., 1992).

Because waivered recruits are individuals who were disqualified for one or more reasons, recruits who require a waiver or who have a documented history of marijuana or behavioral health issues are considered riskier in terms of their likely success in the Army, and one might expect their subsequent career outcomes to be worse (on average) than for similar recruits who did not require a waiver. However, as AR 601–210 specifies, recruits requiring waivers undergo additional screening to ascertain whether they have demonstrated other traits or actions to indicate likely success in the Army. The net result is that the Army outcomes of recruits who received a waiver will reflect the combined effects of three factors:

1. the underlying behavior of waivered recruits and those with a documented history of marijuana or behavioral health conditions, independent of Army policy or screening
2. other characteristics that are correlated with waiver status (or a documented history of marijuana or behavioral health conditions) and that might also be correlated with outcomes
3. the Army's additional screening process, which might include screening for these other characteristics.

First, to provide the Army with information on how outcomes of waivered and nonwaivered recruits differ and how recruits with and without a documented history of marijuana or behavioral health conditions differ, we compute the mean differences in our data, recognizing that these differences reflect all three factors. The means are shown in Appendix B. Second, to provide the Army with an understanding of the first factor (underlying behavior) for recruits with different types of waivers and documented histories and the third factor (Army waiver policy), we estimate the relationship between waivers and Army outcomes, holding constant other observable characteristics of recruits by conducting a regression analysis and, in some cases, conditional on reaching certain milestones, such as completion of the first term (or attrition during the first term). The regression analysis allows us to compare the outcomes of recruits who receive a waiver or who have a documented history of marijuana or behavioral health conditions with recruits who are similar in terms of all other observable characteristics. This analysis also allows us to identify characteristics the Army could use to mitigate the higher likelihood of an adverse relationship between waivers and outcomes. Finally, we show how outcomes are projected to change as the Army changes its waiver policy using the RST. The RST allows for correlations between waivers and other characteristics (the second factor), unlike the regression analysis. The advantage of the RST is that it can provide the Army with information on how changing waivers could affect the aggregate characteristics and outcomes of an entry cohort, rather than only looking at the individual recruit level.

There are several important caveats to our analyses. First, in the regression analysis, we cannot control for all of the effects of the Army's decision process or all other observable characteristics. Further, our empirical strategy is not designed to estimate a causal effect of changing waiver policies on recruit outcomes. Instead, the results show the estimated relationships between waivers granted to recruits and the subsequent outcomes of recruits relative to similar recruits without a waiver. Put differently, we cannot entirely identify the first factor listed above as separate from the other two.

Second, recruits might not report to a recruiter, or a recruiter might choose not to report information heard from the recruit, about a history of marijuana or past or current behavioral health conditions. Consequently, the data likely understate the number of applicants with a past history of marijuana or behavioral health issues. Such *errors in variables* will result in

underestimates of the relationship between these variables and outcomes. Thus, our analysis provides conservative estimates of the relationship between a history of marijuana or behavioral health conditions and outcomes insofar as applicants hide information on these conditions.[6]

Third, the RST analysis makes projections using historical data. In particular, the projections reflect the correlations between waivers and characteristics observed in the past. To some degree, these correlations reflect Army policy, such as Army policy to minimize waivers among prior-service recruits. Insofar as Army policy changes, the inherent riskiness of waivered recruits changes, or the correlation between waivers and characteristics changes, projections would be affected.

Finally, to track outcomes of recruits through the first enlistment term, including for recruits who enlist for six years, the last enlistment cohort we can consider is the FY 2012 cohort, given that our data end in FY 2018. To the extent that enlistment cohorts have changed since then, our projections and regression results could be affected.

Regression Analysis

We estimate binomial logistic regression models for each of the outcomes in Table 2.2. The regression model for each outcome takes the form of

$$\Pr[Y_i = 1] = \frac{e^{\beta X_i}}{1 + e^{\beta X_i}},$$

where

- Y_i is the outcome for recruit i
- X_i is the vector of recruit characteristics for individual i in Box 2.1
- β is a vector of coefficients to be estimated.

Of particular interest for our study is the set of coefficient estimates for the waiver variables and the waiver workflow variables capturing the recruits' final waivers and disqualifying documented histories.

Studies typically report estimates of $\hat{\beta}$ or, alternatively, $e^{\hat{\beta}}$. The latter gives an estimate of the odds ratio for a given X_i. For ease of interpretation, we report instead the estimated risk ratio for each X_i. The relative risk ratio (RRR) is the probability of the outcome for a recruit with the indicated characteristic X_i (e.g., female) relative to that of a recruit with the reference group characteristic (e.g., male). The RRR can be computed from the estimated odds ratio, $e^{\hat{\beta}}$, according to the following formula (in which we use the variable *female* as an example):

$$RRR_{female} = \frac{\Pr[Y_i = 1 \mid female]}{\Pr[Y_i = 1 \mid male]} = \frac{e^{\beta_{female}}}{1 - \Pr[Y_i = 1 \mid male] + \left(\Pr[Y_i = 1 \mid male] \times e^{\beta_{female}}\right)}.$$

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[6] It is possible that recruits hide positive information that could be correlated with the adverse information. For example, recruits with a documented history of marijuana or health issues might be determined to turn their life around and embark on a new life course. In either case, hidden information leads to an error in variables problem that leads to underestimated coefficient estimates. A discussion of errors in variables for binary regression models, such as those that we use in our regression analysis, is provided in Carroll et al., 1984.

Note that the estimated RRR for each waiver category in the regressions provides an estimate of the probability of the outcome for a recruit with a given waiver category relative to that of a recruit without that waiver category (but who is similar in terms of other characteristics). It is important to note that recruits without that waiver category could have a waiver from another category. Thus, the RRR is not a comparison of outcomes relative to recruits without *any* waiver but is relative to recruits without the given category of waiver.

Because part of our analysis focuses on potential mitigating characteristics and the joint effect of having a waiver as well as a preenlistment code for marijuana, ADHD, or depression/anxiety, we measure the total effect of two or more variables on an outcome as the RRR associated with the odds ratio of the sum of the variables. In cases for which we report the total effects in the tables in forthcoming chapters, we test for statistical significance for the sum of the coefficient estimates using a chi-squared test.

In the regression analyses, we take a somewhat different approach for the DEP attrition analysis than we do for the other analyses. The DEP attrition analysis focuses on contracts, not accessions, and includes recruits who contracted from FY 2001 to FY 2011, excluding contracts who contracted in FY 2012 because these contracts might not access until after FY 2012. The reason is that DEP attrition is defined as individuals who sign a contract to enter the Army at a later date but fail to access. Thus, we model the likelihood that an applicant who signed a contract fails to enter the Army. Also, unlike the other analyses, the DEP attrition analysis includes recruits who signed up for a two-year term; the rest of the regressions exclude two-year contracts.

Our regression approach builds on the regressions in Orvis et al., 2018. Our analysis differs insofar as we use more-updated entry cohorts through FY 2012 (rather than through FY 2011), track individuals longer (through FY 2018 rather than through FY 2016), add more recruit characteristics (in particular, the variables from the waiver workflow data), and consider additional outcomes (such as reenlistment, promotion speed, and transition to the officer corps). It also differs because we consider conditional outcomes in most cases, such as the reason for separation, conditional on attrition. This approach allows us to distinguish the association between a recruit characteristic and attrition versus the association between that characteristic and the reason for attrition.

Regression results for each outcome are shown in Appendix B. We show and discuss the estimates of RRR − 1 in the main text. To aid understanding of the relative magnitude of the estimates, we also show the results two other ways. First, Table 7.2 summarizes the regression analyses by showing the predicted outcome given each waiver category and waiver workflow documented history category related to ADHD, marijuana, and depression/anxiety. The table also shows the baseline outcome so the reader can compare the predicted outcome against the baseline. Second, Table B.7 shows the predicted outcomes out of 1,000 accessions in each waiver category and waiver workflow history category. This table allows the reader to assess the implied number of outcomes for each waiver or history type, given 1,000 accessions. As explained in the table notes to these tables, the cells are color-coded to indicate whether a waivered recruit or a recruit with a documented history of marijuana, ADHD, or depression/anxiety has a lower likelihood of an adverse outcome than do similar recruits without each waiver or history (color-coded green), a higher likelihood (red), or a likelihood that was not statistically significant at the 5-percent level or was not larger in magnitude than 10 percent (blue).

RST Analysis

The RST is a capability developed by RAND Arroyo Center to estimate the prospective outcomes and costs for different combinations of recruits' cognitive, noncognitive, demographic, physical, and behavioral attributes (Orvis et al., 2018). These outcomes include DEP, boot camp, and occupational training attrition, as well as attrition later in the first term and the incidence of adverse personnel actions (bar to reenlistment and demotion). An important aspect of the tool is that it considers the joint or combined effect, not just the isolated effects, of changing a set of attributes. By including outcomes and cost, the tool allows practitioners to consider the trade-offs between changing the characteristics of the recruit cohort—and therefore meeting recruiting goals—and the downstream outcomes and cost of doing so. One approach to meeting recruiting challenges is for the Army to loosen selection restrictions that apply to new recruits. The RST was built to allow the Army to assess how changing recruit selection criteria and characteristics, including waivers, would affect attrition, cost, and behavioral or other personnel problems down the road.

In short, the RST allows users to simulate how outcomes might change if the characteristics of the entry cohort were to change. The user specifies a target with respect to one or more characteristics, and the RST simulates how outcomes might change. Unlike the regression models, which consider the relationship between characteristics and outcomes independent of other characteristics, the RST allows correlated characteristics to change when the user specifies a targeted change. That is, when the user changes the mix of characteristics, the RST considers how other traits, correlated with those characteristics, also change, and shows the joint effect on outcomes of the changes. For example, the user might want to simulate how outcomes change if the percentage of Tier 2 recruits is increased from 5 percent of the accession cohort to 10 percent. The simulated outcomes will reflect the increase in Tier 2 recruits, as well as the changes in the characteristics that are correlated with Tier 2 status. The RST uses the same data, recruit characteristics, and outcomes as the regression analysis.

To simulate how changing entry cohort characteristics could change outcomes, the tool uses weights. In the base case, the weight associated with each observation, representing a recruit, is equal to one. The tool then computes new weights to meet the target set by the user. For example, in the Tier 2 example, the new weights for Tier 2 recruits would be 10/5, while the new weight for Tier 1 recruits would be 90/95. The RST allows the user to set targets for multiple characteristics, and the tool identifies the weights using an optimizing capability to identify the sequence of weights that meets the user's target.

We extended the RST to use data input for cohorts entering from FY 2001 through FY 2012 and tracked through FY 2018. We also modified the RST to include our extended list of recruit characteristics, including those from the waiver workflow data, as well as the extended list of outcomes, including reenlistment, promotion, and transition to officer corps. Although the RST has tremendous functionality to allow the Army to consider alternative recruit selection criteria, we focus specifically on the ability of the RST to simulate how outcomes change when changing waivers and waiver workflow variables to reflect a documented history of marijuana or behavioral health conditions.

RST simulation results are shown in Appendix C. We discuss these results in subsequent chapters.

Analysis of Army Waivers

Findings from Past Studies

Although waivers receive considerable attention from the press because they are considered to be an indication of lowered enlistment standards (see, for example, Vanden Brook, 2017a), peer-reviewed research on how waivers affect outcomes has been more limited, especially using more-recent data.

Malone, 2014, uses FY 1999 to FY 2008 data for each service and examines the relationship between waivers and early and first-term attrition and between waivers and promotion to E5. For the Army, Malone finds that waiver status is positively related to early attrition (within the first six months of service). For example, over the data period, average early attrition is 10 percent, and Malone finds that soldiers who access with an adult felony waiver are 2.3 percentage points more likely to attrite early in the first term than their nonwaivered counterparts are. The effects of drug/alcohol waivers are mixed. She finds that those with a drug/alcohol waiver are less likely to attrite early but are 13 percentage points more likely to attrite by 48 months (the mean 48-month attrition rate is 36 percent). Her results for promotion to E5 are also mixed. Recruits with a physical waiver are less likely to promote faster to E5, but those with an adult felony, serious or other waiver are more likely to promote quickly than their nonwaivered counterparts are. Further, these positive effects of waivers on promotion are large. Overall, these positive effects of waivers suggest that waivered recruits are not risky or that Army screening is highly effective.

Gallaway et al., 2013, assesses the subsequent outcomes of Army recruits who receive waivers using data from 2003 to 2008 on soldiers in two brigade combat teams. To measure subsequent outcomes, the researchers considered attrition, alcohol/drug abuse while in service, and domestic abuse while in service. The researchers found that enlistment waivers were not significantly associated with subsequent domestic abuse. However, they did find that waivered recruits (for any reason) were more likely to test positive for illicit substances or to be screened for drug/alcohol abuse later in service; this was especially the case for recruits with a drug/alcohol waiver. Furthermore, soldiers granted waivers for any reason, as well as those receiving drug/alcohol waivers, were more likely to attrite for behavioral misconduct. Interestingly, those granted waivers for non-traffic offenses were significantly less likely to separate for misconduct.

Orvis et al., 2018, provides results on the outcomes of waivered recruits using data on FY 2001 to FY 2011 accession cohorts tracked through FY 2016. The researchers find little evidence of higher attrition, negative personnel flags, or separation for entry-level performance or for physical conditions among waivered recruits. The exception is that waivered recruits are

more likely to attrite for a serious offense or drug abuse. Further, the researchers find that soldiers granted a drug/alcohol waiver are more likely to fail to complete the first term, be barred from reenlistment, and separate for a serious offense or drug abuse. These results are broadly consistent with Malone, 2014, and Gallaway et al., 2013. Again, the lack of a significant relationship between waivers and negative outcomes in general suggests that either recruits granted a waiver are not at higher risk of a negative outcome or that they are risky, but the Army has been relatively successful at screening these higher-risk recruits.

Finally, Murphy, 2019, uses data on Army accessions from 2003 to 2007 and examines the outcomes of recruits who receive moral conduct waivers, as well as the outcomes of their peers in the same Army unit. That is, Murphy examines whether the presence of soldiers with criminal backgrounds might encourage soldiers in the same unit to engage in criminal activities or general misconduct. To examine misconduct, Murphy uses demotion for serious disciplinary offenses, separation for misconduct, and attrition during the enlistment term. He finds that soldiers are more likely to commit major misconduct when assigned to units with a higher percentage of peers who received a moral conduct waiver. In short, Murphy finds evidence of a robust, adverse peer effect in the Army associated with waivers, and the adverse peer effect is concentrated among younger soldiers.

Estimated Relationships Between Waivers and Outcomes

Table 3.1 shows RRR − 1 for the estimated models shown in Appendix B.[1] Three points should be noted. First, as discussed in Chapter Two, the RRR − 1 value for joint effects, such as the "Age 22+" variable, reflects the joint effects of the age at the time of contract variables in Box 2.1. Second, the tables only show RRR − 1 values for estimates that are statistically significant from zero at the 5-percent level. Third, results are only shown for cases in which the RRR − 1 values are at least 10 percent—that is, the likelihood of an outcome is at least 10 percent higher or lower when the characteristic is present.[2] For example, Table 3.1 shows that, for serious traffic waivers, the RRR − 1 value is estimated to be 52.8 percent for separation for a serious offense. This means that the likelihood of separating for a serious offense is 52.8 percent higher for an accession with a serious traffic waiver than it is for one with similar characteristics but without a serious traffic waiver.

In the next few sections, we summarize the results by waiver category. We also summarize results for selected other characteristics: specifically, prior-service, Tier 2, and AFQT category I–IIIA recruits, and recruits who enlisted with a significant limitation in either the physical or the stability (psychiatric) domains.

Serious Traffic Waivers, Non-Traffic Offense Waivers, and Drug/Alcohol Waivers

These three waiver groups cover what is commonly called the *moral conduct* category. We find that recruits with one of these waiver categories are *less* likely to attrite from DEP, by 25.4 per-

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[1]   Table B.1 provides summary statistics of entry characteristics and outcomes of waivered and nonwaivered recruits as a percentage of accessions in FY 2001 to FY 2012.

[2]   Because the choices of 5 percent for statistical significance and 10 percent for magnitude are arbitrary, and larger or smaller values could have been used, we present all regression results, regardless of level of statistical significance or of magnitude, in Appendix B.

Table 3.1
Estimated Relative Risk Ratios for Waivers and Selected Characteristics, FY 2001 to FY 2012 Accession Cohorts

Outcome (Baseline Rate)	Serious Traffic Waiver	Non-Traffic Offense	Drug/Alcohol Waiver	Weight Waiver	Medical Waiver (Not Weight)	Tier 2	AFQT Category I–IIIA	Prior Service	Age 22+
Attrition									
DEP attrition (11.3%)	−25.4%	−25.1%	−40.6%	−59.9%		26.4%		−43.0%	122.7%
Failure to complete first term, given accession (34.3%)			29.3%			37.6%		−28.3%	−52.3%
Reason for separation, given failure to complete first term									
Health-related separation (33.5%)	−30.3%	−27.6%	−42.9%	17.2%	18.3%	−12.6%		−47.0%	118.2%
Performance-related separation (18.0%)	−37.7%	−29.7%	−41.3%					−66.8%	73.3%
Misconduct-related separation but not drugs (16.0%)	52.8%	35.8%	32.4%	−16.9%	−11.7%	18.8%	−10.4%	−83.8%	−89.8%
Misconduct-related separation, drugs (9.6%)	94.9%	79.2%	171.2%	−34.1%				24.0%	−48.5%
Court martial–related separation (7.9%)			21.0%		-20.0%	48.9%			−42.7%
Negative personnel flag									
Demotion (14.1%)	60.3%	54.0%	98.0%			45.2%	−12.7%	−98.1%	−92.3%
Suspension of favorable person status (48.4%)	12.7%	13.3%	30.8%	34.4%		44.0%	−18.2%	−10.9%	−70.4%
Bar to reenlistment, conditional on completion of first term (31.7%)			18.3%	65.2%		11.8%			−44.1%
PULHES in service, given completion of 36 months									
Significant physical limitation (1.8%)				145.7%	925.1%			16.8%	91.6%
Significant psychiatric limitation (0.6%)		30.7%	76.5%		357.4%	30.6%	−11.1%	26.2%	

Table 3.1—Continued

Outcome (Baseline Rate)	Serious Traffic Waiver	Non-Traffic Offense	Drug/Alcohol Waiver	Weight Waiver	Medical Waiver (Not Weight)	Tier 2	AFQT Category I–IIIA	Prior Service	Age 22+
Transition to officer									
Warrant (3.0%)	−38.0%	−49.7%	−71.5%	−56.0%		−70.8%	361.4%	−94.7%	−55.3%
Commissioned (1.1%)				−40.3%		−53.7%	83.6%	−95.4%	−88.7%
Reenlistment, given completion of first term and no bar to reenlistment (59.6%)								27.5%	
Promoted to E5 during 4-year term, given completion of first term (36.7%)	20.4%			−37.9%		−27.3%	26.5%	38.9%	

NOTE: The table shows (RRR − 1). Results are shown only in cases for which the RRR − 1 is greater than 10 percent and is statistically significant at the 5-percent level. See full regression results in Appendix B.

cent for those with a serious traffic waiver, by 25.1 percent for those with a non-traffic offense waiver, and by 40.6 percent for those with a drug/alcohol waiver, relative to similar recruits without each of these waivers. We also find that first-term attrition (or failure to complete the first term, given accession) is not substantively or statistically different for recruits with a serious traffic or non-traffic offense waiver but is 29.3 percent higher for those with a drug/alcohol waiver, relative to similar recruits without this waiver. Given an average first-term attrition rate of 34.3 percent, the model predicts that recruits with a drug/alcohol waiver would have a 44.4 percent attrition rate compared with similar recruits without a drug/alcohol waiver (see Table 7.2 for this calculation and for comparable calculations across waiver types and outcomes). Thus, the results imply that recruits with a drug/alcohol waiver would provide fewer years of service than would other recruits.

The results also provide insight into the reasons for attrition. Among those who attrite during the first term, those with moral conduct waivers are less likely to attrite for health-related reasons (30.3 percent for serious traffic waivers, 27.6 percent for non-traffic offense waivers, and 42.9 percent for drug/alcohol waivers). They are also less likely to separate because of performance-related reasons. However, the recruits in each of these waiver groups are more likely to separate for conduct-related reasons. A recruit with a serious traffic offense waiver is 52.8 percent more likely to separate for misconduct (not drugs) and 94.9 percent more likely to separate for misconduct related to drug abuse. As shown in Table 7.2, these results imply that we would expect 26.6 percent of recruits with a serious traffic waiver to separate for misconduct that is not related to drugs (compared with a baseline rate of 16.0 percent) and that 18.7 percent would separate for misconduct related to drugs (compared with a baseline of 9.6 percent).

Recruits with a non-traffic offense waiver or a drug/alcohol waiver are also predicted to be more likely to separate for misconduct-related reasons. Those with a drug/alcohol waiver are also more likely to separate in lieu of a court martial or for a court martial conviction (other). Specifically, these recruits are 21.0 percent more likely to separate for this reason. This implies that, of those recruits with a drug/alcohol waiver who separate, 9.6 percent are predicted to separate for court martial–related reasons, compared with a baseline of 7.9 percent (Table 7.2).

We also find that recruits with these types of waivers are more likely to have a negative personnel flag, as indicated by a higher likelihood of demotion or suspension of favorable person status. Those with a drug/alcohol waiver are also 18.3 percent more likely to be barred from reenlistment than are recruits without this waiver. With regard to a negative personnel flag, recruits with either a serious traffic waiver or a non-traffic offense waiver are less likely to transition to warrant officer status, though we find no evidence of a relationship between these waiver categories and transition to commissioned officer status.

In sum, the results indicate that recruits with a moral conduct waiver are more likely to have many adverse outcomes than are similar recruits without a moral conduct waiver and, in particular, are more likely to separate because of misconduct and are more likely to have a negative personnel flag. This suggests a type of recidivism whereby those with a history of offense, as indicated by their waiver status, are more likely to engage in misconduct at a later date.

That said, not all results are adverse. As mentioned, these recruits are less likely to attrite from DEP. We also find no substantively or statistically different rates of reenlistment, given no bar to reenlistment, or rates of failure to complete first term, at least for those with a serious traffic waiver or non-traffic offense waiver. Surprisingly, we find evidence that recruits with a serious traffic waiver who complete a four-year enlistment term are more likely to be promoted

to E5 (an indicator of good performance) than are similar recruits without this waiver. As mentioned, we also find that recruits with a moral conduct waiver are less likely to separate for health- or performance-related reasons.

We do not find evidence of a substantively or statistically different likelihood of a health limitation within the first three years of service for recruits with these categories of waiver, at least in terms of physical limitations, but we estimate that those with either a non-traffic offense waiver or a drug/alcohol waiver are more likely to have a significant psychiatric limitation (30.7 percent and 76.5 percent, respectively).

Weight and Medical (Not Weight) Waivers

We find that recruits granted a weight waiver are more likely to have health-related issues once they are in the Army. We also find evidence that they are more likely to have some negative personnel flags than are similar recruits who were not granted a weight waiver. In particular, recruits with a weight waiver are more likely to separate because of health-related reasons (by 17.2 percent). Because 33.5 percent of all recruits separate for health reasons on average, we estimate that 39.3 percent of recruits with a weight waiver would separate because of their health. They are also 145.7 percent more likely to have a significant physical limitation arise during their first three years of service; however, because this outcome is relatively rare, the implied rate of significant limitation is 4.5 percent, compared with a baseline rate of 1.8 percent. We also find that those with a weight waiver are more likely to have their favorable person status suspended (by 34.4 percent), more likely to be barred from reenlistment (by 65.2 percent), and less likely to be promoted to E5 during a four-year enlistment term (by 37.9 percent).

However, not all outcomes are more likely to be adverse for those with a weight waiver. We find no strong evidence of higher attrition during the first term or lower reenlistment (given no bar to reenlistment). Furthermore, we find evidence that recruits granted a weight waiver are less likely to separate because of misconduct-related reasons. For example, at the baseline, 16 percent of recruits who separate do so for misconduct reasons (not drug abuse). We estimate a 16.9 percent lower rate, or an implied rate of 12.1 percent, for recruits with a weight waiver.

Recruits with a medical waiver (other than weight) also are more likely to have health-related issues in the Army. We estimate that they are 18.3 percent more likely to separate because of health-related reasons, and they are far more likely to experience a significant physical limitation (by 925.1 percent) or a significant psychiatric limitation (by 357.4 percent) during the first three years of service. In terms of predicted rates, 1.8 percent of recruits receive a profile indicating a significant physical limitation during the first three years of service. Our estimates imply a rate of 18.6 percent (see Table 7.2) for recruits with a medical waiver. This could imply nontrivial health-related costs for the Army and DoD depending on the severity of conditions.[3]

Selected Other Recruit Characteristics

The regression analysis includes additional recruit characteristics. In this section, we highlight results for a selected set of recruit characteristics because they might be candidate characteristics that the Army could use to offset the adverse relationship between waivers and outcomes.

We first consider Tier 2 recruits: those who are not high school graduates. Past research studies, such as Buddin, 2005, and others, consistently find that Tier 2 recruits have higher attrition rates, and our analysis yields the same result: The likelihood of DEP attrition and of

first-term attrition is 26.4 percent and 37.6 percent higher, respectively, for Tier 2 recruits relative to similar recruits who are Tier 1. We also find that Tier 2 recruits have a higher likelihood of receiving a negative personnel flag, such as a demotion, a suspension of favorable person status, and bar to reenlistment (conditional on completion of first term). Furthermore, they are more likely to have a significant psychological limitation during the first 36 months and are less likely to transition to either warrant officer or commissioned officer status or to be promoted to E5 during a four-year enlistment term. Given that many of these results are similar to the results for recruits with a conduct waiver, they suggest that being a Tier 1 recruit could be an offsetting characteristic for those receiving such waivers.

Being a recruit in AFQT categories I–IIIA is associated with a lower likelihood of an adverse outcome for several dimensions. Higher-aptitude recruits have a lower likelihood of separation because of misconduct related to drug abuse and a higher likelihood of becoming a warrant or commissioned officer and of being promoted to E5 during the first term. We also estimate that being a high-aptitude recruit is associated with a lower likelihood of demotion or suspension of favorable person status.

We find that being a prior-service recruit is associated with many of the outcomes we considered. Prior-service recruits have a lower likelihood of attriting in DEP (by 43.0 percent) or during the first term (by 28.3 percent) than nonprior service recruits with similar other characteristics. Among those who do attrite, prior-service recruits are less likely to separate because of health-related, performance-related, or misconduct (not drugs)-related reasons. Being a prior-service recruit is associated with a lower likelihood of demotion or suspension of favorable person status (by 98.1 percent and 10.9 percent, respectively), and prior-service recruits are more likely to reenlist (by 27.5 percent) and be promoted to E5 during the first term. On the other hand, we find evidence that these recruits are less likely to transition to the officer corps and are more likely to separate because of misconduct related to drugs.

We used the age-category variables at the time of contract to construct a total RRR for those ages 22 and older for each outcome and to test for statistical significance. We find that outcomes are highly correlated with age, in both positive and negative ways. On the positive side, older recruits are less likely to attrite during the first term (by 52.3 percent) and, among those who do attrite, they are less likely to attrite because of misconduct. They are less likely to be demoted, have favorable person status suspended, or be barred from reenlistment than are young recruits with similar characteristics. These results are consistent with past research that finds that older recruits perform better on several metrics (Rostker, Klerman, and Cotugno, 2014). However, we also find that older recruits are more likely to attrite during DEP, by 122.7 percent. Older recruits are also found to have a higher likelihood of health issues during service. We find that they are 118.2 percent more likely to separate because of health-related reasons and 91.6 percent more likely to be given a significant PULHES physical limitation status during the first three years of service.

Together, these results suggest that these characteristics could potentially mitigate the adverse relationship between waivers and key outcomes but that their role in doing so might differ. Granting waivers to Tier 1, higher-aptitude, or older recruits could mitigate some of the adverse relationships between waivers and outcomes. For example, granting misconduct waivers to older recruits could mitigate the negative relationship between conduct waivers and later indications of misconduct, including negative personnel flags and separation for misconduct-related reasons. Similarly, granting weight or medical waivers to recruits who are Tier 1 could mitigate some of the negative relationship between these waivers and subsequent health-related

issues. On the other hand, being an older recruit could actually exacerbate the negative relationship between weight and medical waivers and subsequent health outcomes because older recruits are also more likely to have adverse subsequent health outcomes. We explore the role of mitigating factors in more detail in Chapter Six.

Prospective Cohort Outcomes from Changing Waiver Policy Using the Recruit Selection Tool

The regression results shown in Table 3.1 allow us to answer questions about how waivers and outcomes are related, holding fixed other characteristics. However, another question of interest to the Army is how outcomes might change for an entry cohort of recruits as a whole if the Army increased the share of recruits with waivers in that cohort. Addressing this question requires consideration of the correlation between recruit characteristics and waivers. The RST allows us to simulate how recruit characteristics of a cohort of enlistments, as well as their subsequent Army outcomes, might change if the waiver composition of the cohort were changed.

In this section, we show historic recruit characteristics and subsequent outcomes for the FY 2001 to FY 2012 Army accession cohorts. We then show simulations of the expected recruit characteristics and outcomes when we increase the share of recruits with different categories of waivers. The RST results are shown in Table 3.2. Note that the outcomes in the RST are measured as a percentage of accessions, unlike in Table 3.1, in which some of the outcomes were measured conditional on attrition or completion of first enlistment term.

Column 1 of Table 3.2 shows the historical base case. Historically, among the FY 2001 to FY 2012 accession cohorts, 0.3 percent received a serious traffic waiver, and 1.0 percent received a drug/alcohol waiver, for example. These cohorts consisted of 28.8 percent older recruits, 13.6 percent Tier 2 recruits, and 65.6 percent AFQT category I–IIIA recruits. The table also shows selected outcomes. Overall, the cohort had a first-term attrition rate of 34.3 percent and a reenlistment rate among the entry cohort of 36.6 percent. Among all accessions, 9.9 percent separated for health-related reasons, 4.9 percent for performance-related reasons, 6.3 percent for misconduct (not drug abuse), and 3.6 percent for drug-related misconduct.

To illustrate the prospective effect on the characteristics and outcomes of the cohort if waivers were increased, we simulated the effects of increasing each waiver category from the baseline to 20 percent. For example, for serious traffic waivers, the baseline share is 0.3 percent. Increasing waivers in each waiver category to 20 percent is clearly extreme, since the Army would be highly unlikely to pursue such a policy. However, we use this extreme case to highlight the predicted effects.[4]

Columns 2–4 of Table 3.2 show projected recruit characteristics and outcomes if each category of moral conduct waivers—serious traffic, non-traffic offense, and drug/alcohol waivers—were each increased to 20 percent of accessions. In the case of serious traffic waivers, recruit characteristics would change if the share of recruits with a serious traffic waiver increased to 20 percent, and the cohorts would exhibit higher-quality attributes in terms of education and aptitude. Instead of 13.6 percent Tier 2 recruits, the RST projects that fewer would be Tier 2 (12.5 percent). Further, a larger share would likely be higher aptitude; the percentage who would be in AFQT categories I–IIIA would increase from 65.6 percent to 67.9 percent.

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[4]   The choice of 20 percent was arbitrary, and other figures could have been used to illustrate extreme cases.

Table 3.2
Increasing Cohort Share with Waivers: Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

	1. Baseline	2.Serious Traffic	3. Non-Traffic Offense	4. Drug/ Alcohol	5. Weight	6. Medical
Increase		20.0%	20.0%	20.0%	20.0%	20.0%
Selected recruit characteristics						
Ages 22 and older	28.8%	33.0%	30.3%	26.6%	27.5%	29.0%
Tier 2	13.6%	12.5%	15.1%	15.4%	14.2%	13.3%
AFQT category I–IIIA	65.6%	67.9%	65.9%	65.9%	64.7%	65.9%
Serious traffic waiver	0.3%	20.0%	0.2%	0.2%	0.2%	0.2%
Non-traffic offense waiver	5.9%	4.8%	20.0%	4.8%	4.7%	5.0%
Drug/alcohol waiver	1.0%	0.8%	0.8%	20.0%	0.8%	0.8%
Weight waiver	0.5%	0.4%	0.4%	0.4%	20.0%	0.4%
Medical waiver	6.4%	5.1%	5.4%	5.1%	5.1%	20.0%
Selected outcomes						
First-term attrition, given accession	34.3%	34.0%	34.8%	36.4%	34.5%	37.2%
Separation for:						
Health-related separation	9.9%	9.5%	9.7%	9.6%	10.3%	13.5%
Performance-related separation	4.9%	4.6%	4.7%	4.7%	4.9%	5.0%
Misconduct-related separation (not drugs)	6.3%	6.3%	6.8%	7.4%	6.2%	5.9%
Misconduct-related separation, drugs	3.6%	3.8%	4.2%	5.5%	3.5%	3.4%
Court martial–related separation	2.9%	3.0%	3.1%	3.7%	2.8%	2.6%
Demotion	14.1%	14.7%	15.2%	17.0%	13.9%	13.7%
Suspension of favorable person status	48.4%	47.8%	49.3%	51.4%	48.1%	47.7%
Bar to reenlistment	28.2%	26.8%	28.2%	28.6%	28.4%	27.0%
Reenlistment	36.6%	36.4%	36.4%	35.4%	36.1%	34.8%

SOURCES: Authors' update for the RST (see Orvis et al., 2018) using RA Analyst and TAPDB data and waiver workflow data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

The cohort is expected to be older: 33 percent are older than 21 instead of 28.8 percent. These results arise because, historically, serious traffic offense waivered recruits were more likely to be Tier 1, older, and higher aptitude than non-traffic offense waivered recruits. Because the characteristics of the entry cohort change, and these characteristics (along with waivers) are correlated with outcomes, the projected change in outcomes reflects the individual effects of waivers together with the effects of the changes in the other characteristics.

Moral Conduct Waivers

In the case of moral conduct waivers, projected outcomes change the most (in an adverse direction) for drug/alcohol waivers. When these waivers are increased from a baseline of 1 percent of accessions to 20 percent, the projected first-term attrition rate increases from a baseline of 34.3 percent to 36.4 percent, implying that the accession cohort would provide fewer years of service per accession. At the baseline, the percentage of recruits who separate for misconduct related to drug abuse is 3.6 percent. If drug/alcohol waivers were increased to 20 percent of accessions, this figure is projected to increase to 5.5 percent. Separation for court martial–related reasons is projected to increase from 2.9 percent to 3.7 percent, and demotions are projected to increase from a baseline of 14.1 percent of accessions to 17.0 percent. Increasing the share of recruits with the other categories of moral conduct waivers—serious traffic waivers and non-traffic offense waivers—is generally projected to produce qualitatively similar, but smaller in magnitude, results for these outcomes.[5]

Changes in these outcomes could have substantive effects on cost. For example, assuming annual Army accessions were 80,000, the increase in attrition associated with increasing drug/alcohol waivers to 20 percent of accessions would imply that accessions would need to increase by 4,898: $((36.4/34.3)–1) \times 80,000$. Although estimates of recruiting and training costs differ (and vary with the external environment, as shown by Knapp et al., 2019), assuming a cost per trained recruit of, say, $60,000 would imply an annual cost increase to the Army of about $293.9 million. This figure does not account for the possibility that recruits requiring a drug/alcohol waiver are easier to recruit, which would help mitigate this increase in cost.

Weighed against these costs would be the potential cost savings from recruiting applicants who require a moral conduct waiver. Such applicants might be less costly to recruit, especially if more applicants want to join the Army than the Army currently permits, so recruiters require less time to find such applicants, and the Army requires fewer resources to attract them. Thus, the trade-off is between the potential costs of attrition and misconduct to the Army of a more lenient moral conduct waiver policy and the potential cost savings of generating a supply of recruits who meet a less-stringent moral conduct waiver policy.

That said, the results show extreme cases of increasing waivers, and the absolute magnitude of the effects are small even in these cases. For example, even in the extreme case of increasing drug/alcohol waivers to 20 percent of accessions, the share of recruits projected to be separated for drug-related misconduct would still be 5.5 percent, or just more than one in 20 recruits. The main finding, then, for moral conduct waivers is that increasing their share substantially is expected to increase the share of accessions with adverse outcomes, but the overwhelming majority of the entry cohort would still be projected to avoid these adverse outcomes.

Weight and Medical Waivers

In the case of health-related waivers (weight and medical), the main finding is that increasing the share of recruits with medical waivers to 20 percent of accessions is projected to increase

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[5]   It is useful to note that increasing moral conduct waivers does not always produce more-adverse outcomes in Table 3.2. For example, the first-term attrition rate is projected to fall to 34.0 percent from the baseline of 34.3 percent for serious traffic waivers. Although the regression analysis discussed above indicated no statistically significant relationship between serious traffic waivers and attrition, increasing the share of those with these waivers also increases the share of recruits who are older than age 21, and age is negatively associated with first-term attrition, as shown in Table 3.2.

the attrition rate of the entry cohort and the share of recruits who separate for health-related reasons by relatively large amounts. In contrast, increasing the share of recruits with weight waivers to 20 percent of accessions is projected to produce smaller changes in outcomes in both absolute and relative terms. For medical waivers, the attrition rate is projected to increase from 34.3 percent to 37.2 percent, while separations for health-related reasons are projected to increase from 9.9 percent of accessions in the baseline to 13.5 percent.

Again, whether these increases would be acceptable to the Army depends on the costs of these adverse outcomes. In addition to the cost of replacing recruits who attrite, health-related costs and compensation for disability retirements are also a consideration. Recruits who separate for health-related reasons could require medical care prior to separation and might qualify for health care after separation, depending on their eligibility for disability retirement. If they qualify for disability compensation, they could also receive either a lump sum payment from DoD or a lifetime annuity. Consequently, even a small increase in the share of soldiers with adverse health-related outcomes could be costly to the Army, DoD, and the Department of Veterans Affairs. Weighed against these costs are the costs of generating a supply of recruits who are sufficiently healthy to meet the Army's health-related standards.

Assessment of the Army's Marijuana Waiver Policy

Societal Context

Trends in State Policies

Marijuana policy in the United States has changed dramatically over the past two decades.[1] In 1996, California became the first state to enact a medical marijuana law; in November 2012, voters in Colorado and Washington became the first to approve recreational marijuana laws. Since those two watershed moments, more states have adopted legislation in both dimensions. As of December 2018, marijuana is legal for medicinal use in 33 states and Washington, D.C., despite retaining its status as a strictly prohibited Schedule I substance at the federal level. Ten states and the District of Columbia have also legalized its use for recreational purposes (National Conference of State Legislatures, undated). Figure 4.1 displays this distribution across the United States.

This movement toward more-liberal marijuana policies mirrors growing public support for legalization. In 2018, more than 60 percent of U.S. adults said that the use of marijuana should be legalized, a considerable increase from 32 percent in 2006 (Hartig and Geiger, 2018).

Trends in Civilian Perceptions and Use

Alongside these significant changes in policy, there have also been substantial shifts in civilian perceptions about marijuana use and behaviors (Hasin, 2018), including in states without recreational legalization (Hartig and Geiger, 2018). In Appendix D, we explore these changes in detail. To summarize the literature, there have been significant declines in perceived risks associated with marijuana use and perceived social disapproval of marijuana use, among all groups. Figure 4.2 provides a sense of the magnitude of these changes, showing the percentage of youth who believe that smoking marijuana regularly carries "great risk." Declines in perceived risk are evident, both as individuals age (e.g., the percentage of 8th-graders with this belief is higher than the percentage of 10th-graders, which is higher than the percentage of 12th-graders) and over time since the early 1990s.

These trends have been mirrored by rising marijuana use (including daily or near-daily use) among adults but *not* among adolescents, for whom use has remained relatively stable (Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, 2018; Azofeifa et al., 2016). Nevertheless, the use of marijuana remains relatively common among adolescents and young adults: In 2017, approximately 20 percent

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[1]   Appendix D provides more information on trends in state policies, including depenalization or decriminalization more generally.

Figure 4.1
Status of State Marijuana Policies, December 2018

Figure 4.2
Percentage of Individuals Reporting Belief That Smoking Marijuana Regularly Carries Great Risk, 1980–2017

NOTE: Data on 8th-, 10th-, and 12th-graders taken from Johnston et al., 2018. Data on those ages 19 to 22 taken from Schulenberg et al., 2017.

of youths ages 18 to 25 reported using marijuana in the past 30 days (Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, 2018). A substantially higher percentage reported ever having used marijuana. Figure 4.3 displays these data in more detail.

Although some studies suggest that expansions in the medical marijuana market might increase the extent of use of marijuana by adolescents, it is unclear whether this occurs through increased experimental use or more-regular use. These expansions do appear to increase the *potency* of available marijuana products and the methods of consumption available for both youths and adults (Vandrey et al., 2015; Carlini, Garrett, and Harwick, 2017). Given the recency of legislative changes, there is far less evidence for how recreational marijuana legalization affects patterns of marijuana consumption. The evidence that is available suggests that recreational marijuana laws have little impact on the extent of marijuana use among adolescents but might increase use among college students.

Effects of Marijuana Use on Health Risks, Behavior, Academic Outcomes, and Job Performance

A substantial literature, reviewed in detail in Appendix D, shows that adolescent marijuana use is associated with several health and social factors, such as mental health problems, criminal justice involvement, poor academic performance, and higher job loss. However, many of these studies suggest that risk factors for these health and behavioral outcomes *preceded* marijuana use and thus could reflect the characteristics of the youth population who began to use marijuana at an early age under a regime of prohibition. There is also very little empirical evidence that there are long-term effects of marijuana use. For cognitive outcomes, there is evidence that some effects dissipate after a period of abstinence as brief as three days (Scott et al., 2018).

Figure 4.3
Marijuana Use in Lifetime, Past Year, and Past Month, by Age

NOTE: Data from the 2017 National Survey on Drug Use and Health (Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, 2018).

There are also examples in the literature on academic outcomes and job performance in which individuals who stop using marijuana saw performance return to pre-marijuana-initiation levels (Pardini, White, et al., 2015); in other cases, it is not clear whether adverse outcomes are purely associated with prior marijuana use or are the result of continued (but not observable) use.

In addition, most of the evidence base regarding the relationship between risk factors, marijuana use, and subsequent outcomes draws on evidence prior to the movement toward recreational marijuana legalization. Given the evolution of marijuana potency, products, and delivery methods that has occurred within legalized retail markets for marijuana, combined with the changing social norms and legal context of marijuana use, the relationships estimated in prior work might not perfectly translate to today's context. Furthermore, in areas such as criminal justice involvement, marijuana legalization could serve to fundamentally change the relationship between marijuana use and the outcome of interest.

Implications for the Army

There are multiple implications of these trends and findings for the Army. First is the trend toward more-permissive marijuana legislation. Absent a change in Army recruitment strategy or a geographic shift in individuals interested in joining the Army, increased legalization increases the probability that Army accessions will come from states where marijuana is legal in some form. Figures 4.4 and 4.5 demonstrate that this has been the case, showing the number of states with marijuana legalized for medicinal and recreational use, respectively, and the percentage of RA contracts from these states, over the FY 2001 to FY 2018 period.[2]

As Figure 4.4 shows, about 57 percent of FY 2018 contracts came from states where marijuana is legalized for medicinal use, up from about 15 percent in FY 2001. As Figure 4.5 shows, legalization for recreational purposes is more recent, with the first two states (Colorado and Washington) doing so in FY 2013. By FY 2018, however, almost 19 percent of Army contracts came from states where marijuana is legalized for recreational use. The Army has acknowledged that these trends could lead to an increase in waivers for past marijuana use (Myers, 2018b).

Second, the dramatic declines in perceived risks associated with marijuana use might appear worrisome, particularly given the increase in potency that has taken place as marijuana legislation has become more permissive. On the other hand, despite these declines, the use of marijuana has remained relatively stable among adolescents, a population from which the preponderance of Army accessions comes. Nevertheless, the data show that almost 40 percent of 18-year-olds have used marijuana in their lifetime, and almost 20 percent of 18-year-olds have used marijuana in the past month. Furthermore, the data show an increase in marijuana use, including daily use, among adults. A nontrivial number of Army accessions comes from this older population.

Third, the literature is very clear that adolescent marijuana use is associated with several negative health and societal outcomes. The literature, however, is less clear on whether marijuana use *causes* these negative outcomes or whether individuals have other, unmeasurable (to researchers) characteristics that cause them to use marijuana and display these outcomes.

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[2] All states that have passed recreational marijuana legislation already had medical marijuana legislation in place. Therefore, the data in Figure 4.5 are a subset of the data in Figure 4.4.

Figure 4.4
Number of States with Marijuana Legalized for Medicinal Use and Percentage of Regular Army Contracts from These States, FY 2001 to FY 2018

Figure 4.5
Number of States with Marijuana Legalized for Recreational Use and Percentage of Regular Army Contracts from These States, FY 2001 to FY 2018

Of greater interest, however, is the extent to which negative outcomes persist once individuals stop using marijuana. Applicants to the Army are counseled that it "does not tolerate the use of marijuana" while in service (AR 601–210, 2016, p. 70). If negative outcomes no longer manifest, it is possible that accessions with a history of marijuana use will perform at the same level as other accessions. Unfortunately, the literature is less clear on these matters.

Finally, increases in legalization could change the extent to which the Army even *knows* about an applicant's previous marijuana use. Given that the risk of arrest for marijuana-related crimes significantly declines after legalization (Firth et al., 2019; Reed, 2018; Plunk, Peglow, et al., 2019), it is likely that the Army will, over time, observe fewer enlistment applicants with a documented history of marijuana in states with more-permissive laws. This could create a perception of inequity, in which individuals from a state where marijuana is illegal might have convictions and individuals from a state where it is legal might not, even if the underlying rates of use were the same in both states.

The Army's Marijuana Waiver Policy, Accession Characteristics, and Outcomes

AR 601–210, most recently updated on August 31, 2016, allows individuals to request a waiver for the following marijuana-related behaviors:

- positive test for marijuana at the time of physical examination
- misdemeanor conviction for possession of marijuana or drug paraphernalia, provided they test negative for marijuana during their physical examination
- misdemeanor conviction for driving while under the influence of marijuana or while impaired.

It is worth noting that, over time, the Army has adjusted its marijuana waiver policy for individuals. These changes are documented in periodic updates to AR 601–210 but are more frequently made through memoranda issued by the Department of the Army. At times, the Army has "suspended" these waivers, meaning that they have not granted any waivers for individuals with a history of marijuana. Other changes over time have included

- the length of time an individual must wait after testing positive for marijuana before being allowed to retest (e.g., six months, 90 days, 45 days)
- the number of prior incidents that resulted in a conviction that could be considered for a waiver (e.g., one, two)
- the level at which a waiver application is considered (e.g., Commanding General, U.S. Army Recruiting Command; Recruiting Battalion Commander)
- whether an applicant previously served.

Currently, the Director of Military Personnel Management in the Office of the Deputy Chief of Staff, G-1, reviews waiver requests for marijuana-related behaviors, and the applicant "must display sufficient mitigating circumstances that clearly justify approving the waiver" (Army Directive 2018-12, 2018, p. 2). Individuals who initially test positive for marijuana are required to wait 90 days, at which point they are allowed to retest, and individuals who retest

negative can request a waiver. Finally, individuals with a single misdemeanor conviction for possession of marijuana or marijuana-related paraphernalia can request a waiver, provided they test negative for marijuana during their physical examination.[3]

Army Accessions with a Documented History of Marijuana

The personnel data that we have access to do not allow us to precisely identify whether an accession receives a waiver because of a positive test for marijuana or a misdemeanor conviction associated with marijuana. For example, we can determine that an individual received a waiver because of a drug/alcohol test result but cannot determine whether it was because of alcohol or drugs or, if the latter, whether the drug was marijuana. Similarly, we can identify that an individual received a waiver for a non-traffic offense but not the specific offense for which the waiver was granted.

However, as discussed in detail in Chapter Two, as an enlistment applicant makes their way through the process, HRC collects detailed information about the applicant that could require an enlistment waiver. Using these waiver workflow data, we are able to identify, for each RA accession, whether an individual's record has any reference to marijuana. These references can include codes for possession or positive tests that would disqualify someone for enlistment (in the absence of a waiver) or the relevant codes for misconduct or major misconduct in AR 601–210.[4] We refer to these individuals as accessions with a documented history of marijuana.

It is worth emphasizing what these data do, and do not, appear to represent. Although the majority of these accessions have an enlistment waiver consistent with a documented history of marijuana, some do not. Over the FY 2001 to FY 2018 period, 58 percent of accessions with a documented history of marijuana also have a non-traffic offense waiver (consistent with a misdemeanor conviction for possession of marijuana); another 25 percent have a waiver for a positive drug/alcohol test. However, about 8.5 percent of these individuals enlist without any waiver at all.[5] We do not have information that would allow us to determine why, and under what circumstances, these individuals have a documented history of marijuana that does not lead to an enlistment waiver. Furthermore, we cannot determine whether there are accessions who receive waivers for marijuana but do not have a documented history of marijuana in the HRC data.

With these caveats in mind, Table 4.1 shows the percentage of RA accessions in each year from FY 2001 to FY 2018 who have a documented history of marijuana, as recorded in the data provided to us by HRC. Two things stand out from these data. First, the number of accessions with any documented involvement with marijuana is low, measuring 0.4 percent over this period. Second, however, there are some fiscal years with relatively high percentages. As Table 4.1 shows, FY 2009, FY 2017, and FY 2018 had a disproportionately high number of accessions with a history of marijuana, ranging from 1.8 percent to 2.4 percent. FY 2016 was also above average, at 0.8 percent, and the increase from FY 2016 to FY 2017 is consistent

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[3] Prior-service personnel must wait until 24 months after separation.

[4] The data codebook also lists a code for "self-admitted" involvement with marijuana, but no Army accessions have this code in their record.

[5] In the FY 2001 to FY 2012 data we use in the regression and RST analysis, 72.9 percent of those with a documented history of marijuana had a nontraffic offense waiver, while 7.9 percent had a drug/alcohol waiver.

Table 4.1
Percentage of Regular Army Accessions
with a Documented History of Marijuana,
FY 2001 to FY 2018

Fiscal Year	Percentage
2001	<0.1%
2002	<0.1%
2003	<0.1%
2004	<0.1%
2005	<0.1%
2006	<0.1%
2007	0.1%
2008	0.2%
2009	2.4%
2010	0.3%
2011	0.1%
2012	0.1%
2013	<0.1%
2014	<0.1%
2015	0.1%
2016	0.8%
2017	1.8%
2018	2.1%

SOURCES: Authors' tabulations of
RA Analyst data merged with waiver
workflow data.

with news reports describing the increase in waivers for marijuana use.[6] It is not clear whether the relatively higher numbers from FY 2016 to FY 2018 represent a structural shift or whether future FYs will return to historical levels.[7]

Estimated Relationships Between Documented History of Marijuana and Outcomes

Table 4.2 shows regression results (specifically, the estimated RRR − 1 values) that relate outcomes to having a documented history of marijuana, as indicated by a marijuana disqualification code in the waiver workflow data. Because the majority of recruits who have a documented history of marijuana were also granted a non-traffic offense waiver in our data, we also show the estimated effects for recruits who have both a documented history of marijuana

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[6]   See Baldor, 2017.

[7]   As the pattern from FY 2008 to FY 2010 shows, substantial increases in the percent of accessions with a documented history of marijuana (e.g., in FY 2009) are not necessarily permanent (as the return in FY 2010 to FY 2008 levels shows).

Table 4.2
Estimated Relative Risk Ratios for Documented History of Marijuana, FY 2001 to FY 2012 Accession Cohorts

Outcome (Baseline Rate)	1. Marijuana History	2. Marijuana History and Non-Traffic Offense Waiver	3. Marijuana History, Non-Traffic Offense Waiver, and Misconduct Offense
Attrition			
DEP attrition (11.3%)	35.2%		
Failure to complete first term, given accession (34.3%)			
Reason for separation, given failure to complete first term			
Health-related separation (33.5%)	−24.3%	−47.0%	−48.2%
Performance-related separation (18.0%)		−40.8%	−59.0%
Misconduct-related separation but not drugs (16.0%)		32.7%	
Misconduct-related separation, drugs (9.6%)	64.4%	79.2%	293.9%
Court martial–related separation (7.9%)			
Negative personnel flag			
Demotion (14.1%)	19.7%	81.2%	129.2%
Suspension of favorable person status (48.4%)		16.1%	17.3%
Bar to reenlistment, conditional on completion of first term (31.7%)			
PULHES in service, given completion of 36 months			
Significant physical limitation (1.8%)	44.9%	50.4%	
Significant psychiatric limitation (0.6%)			
Transition to officer			
Warrant (3.0%)	−55.2%	−77.6%	−83.9%
Commissioned (1.1%)			
Reenlistment, given completion of first term and no bar to reenlistment (59.6%)			
Promoted to E5 during 4-year term, given completion of first term (36.7%)			

NOTE: Table shows (RRR − 1). Results are shown only in cases for which the RRR − 1 is greater than 10 percent and is statistically significant at the 5-percent level. See full regression results in Appendix B.

and a non-traffic offense waiver. Finally, we show results for recruits who also have a misconduct offense code (listed in Chapter Two) associated with marijuana. Thus, Table 4.2 includes three columns because some recruits could have a documented history of marijuana but do not require a non-traffic offense waiver (Column 1), whereas others do require a non-traffic offense waiver (Column 2). Finally, some recruits had a misconduct offense code for marijuana, so these recruits required a waiver and had a documented history (Column 3). Note that very few recruits receive the complete set of misconduct offense codes associated with marijuana (only 125 in the FY 2001 to FY 2012 cohorts).

The main result is that we find no statistically significant (with an effect larger than 10 percent) relationship between a documented history of marijuana and outcomes in many cases; however, in the cases where we do estimate a substantive and statistically significant effect, the estimates generally show that these recruits are more likely to have adverse outcomes.

On the positive side, those with a documented history of marijuana and a non-traffic offense waiver who separate during the first term are less likely to do so because of health-related reasons (by 47.0 percent) or for performance-related reasons (by 40.8 percent). On the negative side, recruits with a documented history of marijuana and a non-traffic offense waiver who separate during the first term are 32.7 percent more likely to separate because of misconduct (not drug abuse) and 79.2 percent more likely to do so for drug abuse. In terms of predicted rates (see Table 7.2), 9.6 percent of those who separate do so because of misconduct related to drug abuse. This figure is estimated to rise to 17.2 percent for recruits with a non-traffic offense waiver and a documented history of marijuana. These recruits are also more likely to receive a negative personnel flag in the form of a demotion (by 81.2 percent) or a suspension of favorable person status (by 16.1 percent). They are also more likely to receive a PULHES during the first three years of service indicating a significant physical limitation. In short, nearly all of the statistically significant effects show adverse effects (except for health-related separations).

Comparing across the columns in Table 4.2, we find that the adverse effects that we estimate are greater if the recruit also requires a non-traffic offense waiver and if they also received a misconduct offense code. For example, those with a documented history of marijuana but who did not receive a non-traffic offense waiver are estimated to be 64.4 percent more likely to separate because of drug abuse (Column 1). If the recruit also received a waiver, the figure rises to 79.2 percent (Column 2). If the recruit also received a misconduct offense code, the figure is even higher, at 293.9 percent. Insofar as drug abuse separations reflect a type of recidivism for recruits with a documented history of marijuana, these results imply that this recidivism is less acute for recruits whose documented backgrounds did not rise to the level of requiring a waiver and a misconduct offense code.

Prospective Cohort Outcomes from Increasing Accessions with a Documented History of Marijuana

Next, we show simulations of the prospective recruit characteristics and outcomes when we increase the share of recruits with a documented history of marijuana during the waiver workflow screening process, similar to the analysis in Chapter Three. As explained in Chapter Three, the regression analysis shows the estimated outcomes at the individual recruit level, holding other observed characteristics constant, whereas the RST analysis shows results for an entry cohort while allowing other characteristics that are correlated with waivers to vary. Table 4.3 illustrates the RST results. Historically, among the FY 2001 to FY 2012 accession

Table 4.3
Documented History of Marijuana: Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

	Baseline	Share of Accessions with Documented History of Marijuana = 20.0%
Selected recruit characteristics		
Ages 22 and older	28.8%	31.2%
Tier 2	13.6%	14.1%
AFQT category I–IIIA	65.6%	66.5%
Documented history of marijuana	0.20%	20.0%
Selected outcomes		
First-term attrition, given accession	34.3%	34.0%
Separation for:		
Health-related separation	9.9%	9.4%
Performance-related separation	4.9%	4.6%
Misconduct-related separation (not drugs)	6.3%	7.0%
Misconduct-related separation, drugs	3.6%	5.3%
Court martial–related separation	2.9%	2.8%
Demotion	14.1%	16.1%
Suspension of favorable person status	48.4%	49.7%
Bar to reenlistment	28.2%	30.6%
Reenlistment	36.6%	35.8%

SOURCES: Authors' update for the RST (see Orvis et al., 2018) using RA Analyst and TAPDB data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

cohorts, 0.2 percent have a documented history of marijuana. To illustrate the prospective effect on the characteristics and outcomes of the cohort if the share of recruits with a documented history of marijuana was increased, we simulated the effects of increasing the percentage from 0.2 percent to 20 percent. Again, this is clearly an extreme example, but it highlights how the mix of accession characteristics and selected outcomes would be expected to change, given the historical data.[8]

The RST predicts that a cohort that has a higher share of recruits with a documented history of marijuana would have a higher share of older recruits, Tier 2 recruits, and recruits in AFQT categories I–IIIA. The projected outcomes of increasing the share of recruits with a documented history of marijuana for the entry cohort are consistent with the regression results. The share of recruits who are projected to separate for drug-related misconduct reasons would increase (from a baseline of 3.6 percent to 5.3 percent), as would the percentage of recruits who are projected to be demoted (from 14.1 percent to 16.1 percent). We also find that the percentage of recruits who would reenlist is projected to fall (from 36.6 percent to 35.8 percent).

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[8]   The choice of 20 percent was arbitrary, and other figures could have been used to illustrate extreme cases.

Interestingly, although the regression analysis indicated no large and statistically significant difference in the likelihood of being barred from reenlistment for recruits with a documented history of marijuana, the RST analysis projects an increase in the share of accessions who would be barred, from 28.2 percent to 30.6 percent. The difference in this result from the two analyses is attributable to the correlation between a documented history of marijuana and other characteristics that are related to being barred to reenlistment that are being held constant in the regression analysis but not in the RST.

As discussed earlier in this chapter, marijuana legalization and marijuana use among the adult population has been increasing. The RST results indicate that separations for drug-related misconduct are expected to increase if a much larger share of recruits have a documented history of marijuana. Such misconduct hurts military readiness. On the other hand, recruiting costs could be lower when the Army allows more applicants with a documented history of marijuana. This could occur if recruits with a documented history of marijuana are *demand constrained*, meaning that more applicants want to join the Army than are currently permitted. If so, less recruiter time would be required to find qualified applicants, and fewer resources would be required to expand the market sufficiently to induce a supply of qualified applicants. Any lower recruiting costs would need to be balanced against the adverse readiness consequences of having more soldiers engaging in drug-related misconduct.

Estimated Effects of Legalization on Recruit Characteristics and Outcomes

Given the societal trends regarding the legalization of marijuana, it is worth considering whether soldiers from states where marijuana has been legalized perform differently, relative to before legalization and relative to soldiers from other states. This analysis would provide insights into the extent to which legalization has affected soldier outcomes to date and would provide a sense of how outcomes might change in the future as more states legalize marijuana's use. We conclude, however, that there is no strong empirical evidence that changes in marijuana legislation have resulted in substantive changes in soldier outcomes.

To arrive at this conclusion, we used a statistical technique called the *difference-in-differences* method. This allows us to measure outcomes for soldiers from states where marijuana has been legalized relative to (1) outcomes from these states prior to legalization (the first difference) and (2) outcomes from states where marijuana has not been legalized (the second difference). For each of the outcomes conditional on accession from Table 2.2,[9] we estimate regressions that take the following form:

$$outcome_{st} = \alpha_1 \times afterM_{st} + \beta FY_t + \gamma_s + \varepsilon_{st},$$

where

- $outcome_{st}$ is the percentage of soldiers from state s and FY t who experience the outcome
- $afterM_{st}$ is an indicator for marijuana being legal in state s and FY t, set to 1 in the FY the policy becomes effective and for all subsequent FYs and set to 0 otherwise (including states where marijuana has not been legalized)
- FY_t are indicator variables for FY, meant to capture any fluctuations over time in the outcome measures

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[9] In other words, because we are focused on soldier performance, we do not include DEP attrition in these analyses.

- γ_s are state fixed effects, meant to capture any general differences in outcomes across states.

Given the different trends documented in Figure 4.4 and Figure 4.5, we estimate regressions separately for both the legalization of marijuana for medical use and the legalization of marijuana for recreational use. The only difference between these two sets of regressions is that, with a subset of states that legalized marijuana for medical use also having chosen to do so for recreational use, $afterM_{st}$ is set equal to 1 for fewer states in the recreational marijuana regressions.

Regression results for both the legalization of medical (Table B.8) and recreational (Table B.9) marijuana are presented in Appendix B. Inspection of these results reveals that, when the estimated associations are statistically significant, legalization of medical marijuana is associated with *improvements* in outcomes. Specifically, we estimate that, when medical marijuana is legalized, soldiers from these states are less likely to

- fail to complete their first term
- be demoted
- separate for entry-level performance
- separate for failing a medical or physical standard.

For recreational marijuana, we find that, after legalization, soldiers from these states are less likely to have a suspension of favorable person status or to separate for unsatisfactory performance. Again, these are improvements in outcomes. However, we also estimate that soldiers from these states are less likely to transition to warrant officer. Note that none of the statistically significant relationships we observe for legalization of medical marijuana continue to be statistically significant when focusing on the legalization of recreational marijuana. However, as Figure 4.5 makes clear, there are many fewer states, and many fewer years since legalization, in this second set of analyses.

Sensitivity Analyses

We also conducted a series of sensitivity analyses to address common concerns associated with difference-in-differences methods. First, we estimated these regressions for a subset of states: those that have *ever* legalized marijuana. This analysis reflects a concern that states that ever legalize marijuana are different in some fundamental but unobservable (to the researcher) way that would bias the results. Second, we considered the possibility that outcomes might adjust over time, either before the legislation is implemented (i.e., an *anticipatory* effect) or after the legislation is implemented (i.e., a *delayed* effect, in which the effect either dissipates or takes time to manifest).[10] Third, we estimated regressions that combine both of these sensitivities (i.e., focusing on both the subset of states that ever legalize marijuana and measuring the extent to which there are anticipatory or delayed effects). Finally, we controlled for state-level differences in demographic characteristics (e.g., gender, age, race/ethnicity, marital status, AFQT category I–IIIA, Tier 1, prior service).

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[10] We estimate any potential effects up to five years before and after legalization.

For both medical and recreational marijuana, the statistically significant associations that we initially observe *do not persist* through these sensitivity analyses.[11] Interestingly, it is when we control for state-level differences in demographic characteristics that the observed associations for marijuana legislation change most dramatically, even though the associations between demographic characteristics and outcomes are not statistically significant. Given the sensitivity of the estimates to specification, we conclude that there is no strong evidence that changes in marijuana legislation have resulted in substantive changes in soldier outcomes.

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[11]   For brevity, we do not present the regression results of these sensitivity analyses but describe them here.

Assessment of the Army's Behavioral Health Waiver Policies

Societal Context

Attention-Deficit/Hyperactivity Disorder

ADHD is diagnosed when individuals exhibit any combination of symptoms that include inattention, hyperactivity, and impulsivity. Children must exhibit six or more symptoms of inattentiveness and six or more symptoms of hyperactivity and impulsivity; the minimum is five or more symptoms for adults (American Psychiatric Association, 2013). In addition, an individual must exhibit (1) several inattentive or hyperactive-impulsive symptoms before age 12;[1] (2) several symptoms in multiple settings; (3) evidence that symptoms interfere with, or reduce the quality of, social, school, or work functioning; and (4) evidence that the symptoms are not explained by another disorder (American Psychiatric Association, 2013). Diagnosis of children with ADHD occurs well before they are teens: The median age of diagnosis in 2011 was six, and the median age of diagnosis for severe, moderate, and mild ADHD was four, six, and seven, respectively (Visser et al., 2014).

In this section, we briefly review the evidence on ADHD trends, with a fuller discussion provided in Appendix E. The key findings are that ADHD prevalence has been increasing over time (with rates higher for boys than for girls), though the overall rates are still relatively low. Estimates of persistence into adulthood vary considerably, but even the lowest rates suggest that one in five cases persist into adulthood. Lower academic achievement and worse labor market outcomes were more likely among those with ADHD than among their peers without ADHD, and those with ADHD had a higher risk of suicide and were more likely to have substance abuse disorders or to be incarcerated.

Trends in ADHD Prevalence and Persistence

Prevalence generally refers to the percentage of a given population that has ever been diagnosed with ADHD. Figure 5.1 shows trends in ADHD prevalence among U.S. children ages 4 to 17, drawing from research from four recent studies. Prevalence has almost doubled from 1998 to 2016, rising from 6.1 percent to 10.2 percent (Xu et al., 2018). Prevalence is rising for both boys and girls but is much higher for boys than for girls (Figures 5.2 and 5.3). In 2016, the rate was 14 percent for boys and 6 percent for girls, according to Xu et al., 2018.

Studies have also documented that ADHD can be misdiagnosed, citing the fact that many states establish different cutoff dates for admission to kindergarten. Children with similar characteristics who were born just a few days before or after the cutoff should have similar

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[1] The maximum diagnostic age was seven in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1994) and was five in the third edition (American Psychiatric Association, 1980).

Figure 5.1
Percentage of Children Ever Diagnosed with ADHD

Figure 5.2
Percentage of Boys Ever Diagnosed with ADHD

Figure 5.3
Percentage of Girls Ever Diagnosed with ADHD

risks of ADHD, since they are essentially the same age (born just a few days apart). Yet research consistently finds that ADHD diagnoses in the United States are related to the cutoff (Elder, 2010; Evans, Morrill, and Parente, 2010). For example, Evans, Morrill, and Parente, 2010, p. 658, finds that "children born just after the cutoff date are 2.1 percentage points less likely to be diagnosed with ADHD and 1.6 percent less likely to be treated with a stimulant, numbers that are roughly 25 percent smaller than their sample means." It appears that children who are less mature (born before the cutoff) are being overdiagnosed; alternatively, those who are more mature (born after the cutoff) are being underdiagnosed. The general finding in this literature is that "a diagnosis of ADHD is not solely based upon underlying biological conditions" (Evans, Morrill, and Parente, 2010, p. 671).

ADHD is a chronic condition for some individuals. Several studies have documented this persistence, with estimates of childhood cases lasting into adulthood ranging from 21.9 percent (Agnew-Blais et al., 2016) to 86.5 percent (van Lieshout et al., 2016). The wide range of estimates could reflect differences in ADHD severity across the studies, as well as data problems involved with tracking children with this condition over a long period.

Effects of ADHD on Educational and Labor Market Outcomes and Social Outcomes

Given that ADHD can be a chronic condition, it is not surprising that it can be associated with outcomes of older children and adults. With regard to educational outcomes, those with ADHD are less likely to graduate from high school or from college. For example, one study estimated that those with ADHD were 3.7 times more likely to drop out of high school and 6.5 times more likely to have no postsecondary education (Erskine et al., 2016). Another study found that men who had ADHD as children were significantly more likely to be financially dependent on their parents and, when financially independent, experienced lower rates of col-

lege graduation and lower socioeconomic status compared with the socioeconomic status of their parents or guardians (Biederman, Petty, Woodword, et al., 2012).

Research also indicates a higher likelihood of poor labor market outcomes. Those with ADHD were far more likely to be dismissed from employment or to be unemployed (Erskine et al., 2016). Another study found that those with ADHD were likely to perform at a satisfactory level, but their non-ADHD counterparts were performing significantly better (Klein et al., 2012).

Research also finds that individuals diagnosed with childhood ADHD were more likely to have interactions with law enforcement and the judicial system, have a higher risk of suicide, and experience substance abuse disorders. For example, individuals with ADHD were 1.7 to 3.6 times more likely to be arrested, depending on the type of crime, and two times more likely to be convicted (Klein et al., 2012; Erskine et al., 2016; Mohr-Jensen and Steinhausen, 2016). Individuals with ADHD were estimated to be 1.6 to 4.3 times more likely to be incarcerated (Hechtman et al., 2016; Erskine et al., 2016) and were 3.6 to 5.9 times as likely to attempt and complete suicide (Ljung et al., 2016).

Depression and Anxiety

Major depressive disorder is diagnosed when an individual experiences five or more of the following symptoms during the same two-week period (American Psychiatric Association, 2013):

- depressed mood most of the day, nearly every day
- markedly diminished interest in pleasure in all, or almost all, activities most of the day, nearly every day
- significant weight loss when not dieting or weight gain, or a decrease/increase in appetite
- slowing down of thought and a reduction of physical movement
- fatigue/loss of energy all day, nearly every day
- feelings of worthlessness or excessive/inappropriate guilt nearly every day
- diminished ability to think/concentrate, or indecisiveness, nearly every day
- recurrent thoughts of death/suicidal ideation.

Anxiety disorders are characterized by excessive fear and anxiety. Anxiety disorders include generalized anxiety disorder, panic disorder, specific phobia, agoraphobia, social anxiety disorder, obsessive-compulsive disorder, and separation anxiety disorder. Generalized anxiety disorder is characterized by excessive anxiety or worrying, difficulty concentrating, irritability, and somatic symptoms (such as muscle tension, sleep issues, and fatigue).

In this section, we briefly review the evidence on trends in diagnosis and medication use and recurrence of depression and anxiety and include a summary of the literature that examines labor market outcomes. A more complete discussion is provided in Appendix E.

Trends in Prevalence and Medication Use

Prevalence generally refers to the percentage of a given population that has ever been diagnosed. However, in the literature, some estimates use respondents' answers to survey questions, while others rely on parent-reported diagnoses from a doctor or health care professional. Figure 5.4 shows trends in depression prevalence among U.S. youth, summarizing estimates from three recent studies. When using respondents' answers to survey questions, Mojtabai, Olfson, and Han, 2016, for example, finds a statistically significant increase in 12-month

Figure 5.4
Estimates of Depression Prevalence Among U.S. Youth

prevalence of major depressive episodes in adolescents (ages 12 to 17), from 8.7 percent in 2005 to 11.3 percent by 2014, following a period of relative stability between 2005 and 2011. The researchers also find an increase, from 8.8 percent to 9.6 percent over the same period, for young adults (ages 18 to 25). In contrast, when using parent-reported diagnoses, Bitsko et al., 2018, does not find any evidence of increasing rates of lifetime or point prevalence for depression among children ages 6 to 17.

Figure 5.5 shows trends in depression prevalence by gender (Mojtabai et al., 2016). As these data show, girls experienced a large increase in the prevalence of depression and self-reported depressive symptoms starting in 2012. Furthermore, it is clear that girls experience depression at a higher rate than boys do.

Studies typically do not focus on trends in anxiety disorder diagnoses in the general population. However, Bitsko et al., 2018, finds that both lifetime and point prevalence of children ages 6 to 17 with an anxiety diagnosis increased between 2007 and 2011. Over this period, estimates of lifetime prevalence increased from 5.5 percent to 6.4 percent, and estimates of point prevalence increased from 3.5 percent to 4.1 percent.

Many studies in the literature tend to discuss medication use under the umbrella of psychotropic medications, which include antidepressants, anxiolytics (used to treat anxiety), sedatives, and medications for ADHD. An exception is Bachmann, Aagaard, et al., 2016, which estimates that the prevalence of antidepressant medication use increased by 26.1 percent (from 1.26 percent to 1.58 percent) between 2006 and 2012 for children under the age of 19. Olfson, Druss, and Marcus, 2015, finds that the use of psychotropic medications increased between 1996–1998 and 2010–2012, from 9.2 percent to 13.3 percent.

Figure 5.5
Depression Prevalence Among U.S. Youth, by Gender

SOURCE: Mojtabai et al., 2016.

Effects of Depression and Anxiety on Labor Market Outcomes

Both depression and anxiety can have significant implications for an individual's employment prospects and overall productivity. For example, Birnbaum et al., 2010, finds that individuals with depression were 1.6 times as likely to be unemployed compared with nondepressed respondents. Both Chatterji, Alegria, and Takeuchi, 2011, and Banerjee, Chatterji, and Lahiri, 2017, find that individuals with a psychiatric disorder (including, but not limited to, depression and anxiety disorders) were less likely to be in the labor force and, conditional on being in the labor force, were less likely to be employed.

There are also estimates in the literature on the impact of depression and other mental disorders on workplace productivity and absenteeism, which can vary by severity of condition. For example, Birnbaum et al., 2010, finds that depression can have significant effects on self-reported measures of work performance, with moderate-to-severely depressed respondents indicating they felt 4–5 percent less productive than did mild and nondepressed respondents. Furthermore, severely depressed workers are more likely to miss at least one day of work compared with depressed and nondepressed respondents (Birnbaum et al., 2010; Peng, Meyerhoefer, and Zuvekas, 2016; Banerjee, Chatterji, and Lahiri, 2017). Despite these observed relationships with productivity, the evidence is mixed as to whether there is an empirical relationship between psychiatric disorders and work hours or earnings.

Implications for the Army

For ADHD, depression, and anxiety, the rising trends in prevalence among children, together with evidence of poorer educational, labor market, and societal outcomes, are worrisome from the standpoint of recruitment into the Army of those with these disorders. That said, none

of the studies we reviewed considered a situation that is comparable to the Army's situation: specifically, the effect on outcomes of adults with a history of ADHD, depression, or anxiety but who no longer have the diagnosis or who are taking medications for these conditions and who meet other enlistment standards. The literature provides little guidance on whether Army policy with respect to these disorders is effective. Furthermore, as with much of the literature on marijuana use and outcomes discussed in the previous chapter, the literature on these disorders mostly shows associations between the disorders and outcomes and does not provide evidence that the disorders actually *caused* the worse outcomes. Next, we review the Army's ADHD and mental health waiver policies and provide analysis on Army outcomes of accessions of individuals with a documented history of these disorders.

Army's ADHD and Mental Health Waiver Policies, Accession Characteristics, and Outcomes

Medical standards for learning, psychiatric, and behavioral disorders at enlistment into the Army are defined in AR 40–501, last updated June 27, 2019. Any applicant not meeting these standards must obtain a waiver by submitting documentation, including evidence that the disqualifying condition has been successfully treated and "no longer exists" (AR 601–210, 2016, p. 33).

The Army's ADHD standard as of June 2019 states that an applicant does not meet the medical enlistment standard if they

1. required a recommended or prescribed education or work program after their 14th birthday
2. have a history of comorbid mental disorders
3. were prescribed medication within the past 24 months
4. have documentation of adverse educational or work performance (DoDI 6130.03, 2018).

The Army must adhere to at least the DoDI but can implement stricter standards. As we discuss in Appendix E, the Army's ADHD standard has changed over time and has become more stringent.

Since June 2019, the Army also disqualifies individuals with a history of depression if they

1. required outpatient care for more than 12 cumulative months
2. experienced symptoms or treatment within the past 36 months
3. required any inpatient treatment
4. experienced any recurrence
5. experienced any suicidality (DoDI 6130.03, 2018).

Standards for depression have also changed over time and, as with ADHD, have become more stringent (see Appendix E).

Prior to 2008, anxiety disorders were subject to the same standards as depression and other mood and dissociative disorders. However, from 2008 to June 2019, anxiety disorders were referenced independent of depression and other mood disorders, and a specific subset of anxiety disorders were identified as not meeting enlistment standards (e.g., panic disorder with

and without agoraphobia, social and simple phobia, obsessive-compulsive disorder, and post-traumatic stress disorder [PTSD]) without qualifying conditions (e.g., not requiring treatment in the past year). Under DoDI 6130.03, anxiety disorders are again held to the same standards as depression, as of June 2019.

Army Accessions with a Documented History of ADHD, Depression, and Anxiety

As discussed in Chapter Two and in the previous chapter with regard to marijuana, the Army's waiver workflow data do not allow us to precisely measure medical histories. We can identify whether an applicant who ultimately enlisted has an ICD-9 code indicating specific conditions. However, we cannot ascertain the severity of these conditions. Furthermore, applicants might hide their history of ADHD, depression, or anxiety. The data allow us to observe whether a recruit received a medical waiver but not the specific condition for which they received the waiver. Although most of these accessions have a waiver consistent with a history of ADHD, depression, or anxiety (i.e., they received a medical waiver), not all of them do. For example, among the FY 2001 to FY 2012 accession cohorts, 88.4 percent of those with a documented history of ADHD had a medical waiver, while 58.1 percent of those with a documented history of anxiety or depression received a medical waiver. We have no information to determine what happened, such as whether the information on these conditions was erroneous and did not require a medical waiver after all. It is possible that prescreening indicated a history of anxiety or depression but did not require a waiver because the individual did not require medication or outpatient care and did not have a history within a required period (such as 12 months). Such individuals would have a documented history of anxiety or depression indicated in the waiver workflow data but would not require a waiver. It is likely that we simultaneously overstate (because individuals with a documented history receive no waiver) and understate (because individuals with conditions might hide their past history) the number of accessions who have an ADHD, depression, or anxiety waiver.

   With these caveats in mind, we compute the percentage of accessions in each fiscal year who have a documented history of one of these conditions. We combine depression and anxiety, even though they are distinct groups of diagnoses, because there are relatively few of each in our data, making analyses difficult of each individually. We find that relatively few accessions have a documented history of ADHD, depression, or anxiety. Although the percentages are quite small (less than 1 percent in all cases in Table 5.1), they vary over time. They increased over time for ADHD; for depression and anxiety, they increased through FY 2009 and decreased thereafter.

Estimated Relationships Between Documented History of ADHD and Depression/Anxiety and Outcomes

Table 5.2 summarizes the estimated RRRs from our regression analysis for each outcome, focusing on a documented history of ADHD and depression/anxiety conditions. The full regression results are shown in Appendix B. The table shows results for those who enlist with a documented history of these conditions but without a medical waiver and for those with a medical waiver. As mentioned, the majority of recruits with a documented history of these conditions received a medical waiver. As before, the RRR shows the percentage change in the likelihood of an outcome for a recruit with the indicated characteristic relative to that of a recruit without that characteristic but who is similar in all other measured respects. Also, as before, a blank in the table means that either the estimated coefficient was not statistically dif-

Table 5.1
Percentage of Regular Army Accessions with a
Documented History of ADHD or Depression/Anxiety

FY	Percentage with History of ADHD	Percentage with History of Depression or Anxiety
2001	<0.1%	0.1%
2002	<0.1%	<0.1%
2003	<0.1%	0.1%
2004	0.2%	0.2%
2005	0.1%	0.2%
2006	0.1%	0.2%
2007	0.1%	0.4%
2008	0.1%	0.5%
2009	0.1%	0.5%
2010	0.1%	0.3%
2011	0.2%	0.3%
2012	0.4%	0.3%
2013	0.6%	0.3%
2014	0.6%	0.3%
2015	0.8%	0.2%
2016	0.6%	0.1%
2017	0.6%	0.1%
2018	0.4%	0.3%

SOURCES: Authors' tabulations of RA Analyst data merged with
waiver workflow data.

ferent from zero at the 5-percent level and/or the estimated RRR was not greater than plus or minus 10 percent. Table 7.2 in Chapter Seven summarizes the results by showing the predicted rates of outcomes for recruits with a documented history of these conditions who also received a medical waiver.

Consider first the results for those with a documented history of ADHD in the waiver workflow data. The main findings are that these recruits are more likely to separate because of performance-related issues (by 36.7 percent without a waiver and by 35.6 percent with a medical waiver) and to have a significant psychiatric limitation indicated during the first three years of service (by 3,095.8 percent for those with a medical waiver) than are recruits without a documented history of ADHD. Relative to the baseline of 0.6 percent of recruits who receive a significant psychiatric limitation in the first three years of service, we estimate the rate to be 20.7 percent for those with a documented history of ADHD and a medical waiver (see Table 7.2). These recruits are also more likely to be barred from reenlistment, and they are less likely to be promoted to E5 during a four-year enlistment term.

Table 5.2
Estimated Relative Risk Ratios for Documented History of ADHD or Depression/Anxiety Conditions, FY 2001 to FY 2012 Accession Cohorts

Outcome (Baseline Rate)	ADHD		Depression/Anxiety Conditions	
	No medical waiver	With medical waiver	No medical waiver	With medical waiver
Attrition				
DEP attrition (11.3%)	−46.6%	−43.7%	−49.4%	−46.5%
Failure to complete first term, given accession (34.3%)			29.9%	33.8%
Reason for separation, given failure to complete first term				
Health-related separation (33.5%)		17.6%	68.9%	87.8%
Performance-related separation (18.0%)	36.7%	35.6%	−20.5%	−21.3%
Misconduct-related separation, but not drugs (16.0%)			−49.7%	−56.1%
Misconduct-related separation, drugs (9.6%)				
Court martial-related separation (7.9%)		−42.7%	−60.6%	−68.9%
Negative personnel flag				
Demotion (14.1%)				
Suspension of favorable person status (48.4%)				
Bar to reenlistment, conditional on completion of first term (31.7%)	17.5%	26.0%		
PULHES in service, given completion of 36 months				
Significant physical limitation (1.8%)	−75.2%	192.1%	−76.7%	175.6%
Significant psychiatric limitation (0.6%)	714.9%	3,095.8%	442.3%	2,148.8%
Transition to officer				
Warrant (3.0%)				−32.9%
Commissioned (1.1%)				
Reenlistment, given completion of first term and no bar to reenlistment (59.6%)				
Promoted to E5 during 4-year term, given completion of first term (36.7%)	−51.3%	−53.9%	−21.7%	−25.3%

NOTE: Table shows (RRR − 1). Results are shown only in cases for which the RRR − 1 is greater than 10 percent and is statistically significant at the 5-percent level.

Like those with a documented history of ADHD, those with a documented history of depression/anxiety conditions are also considered to have behavioral health issues. The results in Table 5.2 indicate that the outcomes for this group are similar to outcomes for those with a documented history of ADHD along many dimensions. Among recruits who fail to complete their first term, those with a documented history of depression/anxiety conditions are more likely to separate for health-related reasons, by as much as 87.8 percent for those who also

received a medical waiver. In terms of predicted levels, 33.5 percent of recruits who separate do so because of health-related reasons. This figure is estimated to increase to 63.0 percent for those with a documented history of depression/anxiety and who have a waiver (see Table 7.2). Furthermore, like those with a documented history of ADHD, those with a documented history of depression/anxiety are more likely to receive a PULHES indicating a significant psychiatric limitation during the first three years of service (by 2,148.8 percent) compared with those without a documented history of these conditions. In terms of predicted levels, 0.8 percent of recruits have a status indicating a significant psychiatric limitation, but the figure is predicted to increase to 14.6 percent for those with a history of depression/anxiety.

Unlike those with a documented history of ADHD, those with a documented history of depression/anxiety are more likely to fail to complete their first term. Among those who separate early, we also find that these recruits are less likely to separate for performance-related reasons, by 21.3 percent for those who also received a medical waiver. They are also less likely to transition to warrant officer status. Also unlike those with a documented history of ADHD, we find no evidence of large and statistically significant relationships between a documented history of depression/anxiety and negative personnel flags, such as demotion, suspension of favorable person status, or bar to reenlistment. That said, these recruits are less likely to be promoted to E5 during a four-year enlistment term, similar to those with a documented history of ADHD.

Finally, we find no large and statistically significant differences for several other outcomes for those with a documented history of ADHD or a documented history of depression/anxiety. We find that, holding other characteristics constant, those with a documented history of any of these conditions (and with a medical waiver) have no large and statistically different outcomes in terms of reenlistment, separation for misconduct related to drug abuse, or transition to commissioned officer. Also, for those with a documented history of ADHD, we find no large and statistically significant differences in outcomes with respect to first-term attrition and transition to warrant officer status, unlike the results for those with a documented history of depression/anxiety. Finally, we find that those with a documented history of these conditions are less likely to separate because of court martial–related reasons.

These results suggest that recruits with a documented history of behavioral health conditions are more likely to have subsequent health issues during their first term. This is especially the case with respect to psychiatric limitations. Furthermore, those with a documented history of ADHD are more likely to have performance-related issues, as evidenced by the higher likelihood of separation for performance-related reasons and the higher likelihood of being barred from reenlistment. On the other hand, we find no evidence of a higher rate of misconduct for those with a documented history of these behavioral health conditions.

Prospective Cohort Outcomes from Increasing Accessions with a Documented History of Behavioral Health Conditions

We next show simulations of the prospective recruit characteristics and outcomes when we increase the share of recruits with a documented history of ADHD and of depression/anxiety conditions during the waiver workflow screening process. As before, the base case shows the historical characteristics and outcomes for the FY 2001 to FY 2012 entry cohorts. In the base case, the share of accessions with a documented history of ADHD or depression/anxiety is 0.1 percent and 0.2 percent, respectively. As before, to highlight the changes in cohort charac-

teristics and outcomes, we consider extreme cases in which we increase the share by 20 percent for each type of condition. Table 5.3 shows the results.

Dramatically increasing the share of accessions with a documented history of ADHD to 20 percent is projected to change the entry characteristics of the cohort from the base case in that it is more likely to be younger (a drop in the share of older recruits from 28.8 percent to 26.6 percent), Tier 2 (an increase from 13.6 percent to 14.1 percent), and high aptitude (from 65.6 percent to 66.4 percent). On the other hand, increasing the share of accessions with a documented history of depression or anxiety is projected to increase the share of recruits who are older (to 29.4 percent) and who are Tier 2 (to 14.3 percent).

The most notable change in projected outcomes associated with increasing the share of recruits with a documented history of ADHD is an increase in the share of accessions who separate because of health-related issues (an increase from 9.9 percent to 10.6 percent) or because of performance-related issues (an increase from 4.9 percent to 5.3 percent). This result is consistent with the regression findings shown in Table 5.2 in which we found that those with a

Table 5.3
Documented History of ADHD and Depression/Anxiety: Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

	Baseline	Share of Accessions with Documented History of ADHD = 20.0%	Share of Accessions with Documented History of Depression or Anxiety = 20.0%
Selected recruit characteristics			
Ages 22 and older	28.8%	26.6%	29.4%
Tier 2	13.6%	14.1%	14.3%
AFQT category I–IIIA	65.6%	66.4%	65.7%
Documented history of ADHD	0.1%	20.0%	0.4%
Documented history of depression/anxiety	0.2%	0.4%	20.0%
Selected outcomes			
First-term attrition, given accession	34.3%	34.1%	37.2%
Separation for:			
Health-related separation	9.9%	10.6%	13.5%
Performance-related separation	4.9%	5.3%	5.0%
Misconduct-related separation (not drugs)	6.3%	6.5%	5.9%
Misconduct-related separation, drugs	3.6%	3.6%	3.4%
Court martial–related separation	2.9%	2.7%	2.6%
Demotion	14.1%	14.3%	13.7%
Suspension of favorable person status	48.4%	48.8%	47.7%
Bar to reenlistment	28.2%	29.1%	27.0%
Reenlistment	36.6%	35.9%	34.8%

SOURCES: Authors' update for the RST (see Orvis et al., 2018) using RA Analyst and TAPDB data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

documented history of ADHD (and a medical waiver) were more likely to separate for health reasons or performance-related reasons. We also find that the percentage of accessions barred from reenlistment is expected to increase, from 28.2 percent to 29.1 percent, a result we do not find in the regression analysis (in which we hold observed characteristics constant).

The projected changes in health-related separations are even larger when the share of recruits with a documented history of depression/anxiety is increased to 20 percent. These separations are expected to increase from a baseline of 9.9 percent to 13.5 percent. We find that the projected attrition rate increases as well, from 34.3 percent to 37.2 percent, while the percentage of accessions projected to reenlist would fall from 36.6 percent to 34.8 percent.

These potential changes would have cost implications for the Army. Assuming the Army required 80,000 accessions to sustain force levels in the base case, the higher attrition rate would imply that the Army would need to increase accessions by 6,764, or $((37.2/34.3) - 1) \times 80,000$. Assuming a cost per trained recruit of $60,000, Army costs would increase by $409 million: a sizable increase, though under an extreme scenario. The lower reenlistment rate would further increase this cost. Furthermore, the percentage of recruits who attrite because of a health-related reason would increase substantially. We do not estimate health care costs, so we are unable to estimate whether and how health care costs could change if more recruits are separating for physical conditions or failing medical standards. Offsetting these costs are the recruiting costs avoided by the Army. Recruiting costs could be lower when the Army permits more applicants with a documented history of ADHD or depression or anxiety conditions because recruiters might spend less time finding qualified applicants. If so, the Army could reduce recruiting costs when a larger share of such applicants is permitted to enlist.

Mitigating a Higher Likelihood of Adverse Outcomes

Our results indicate a higher likelihood of adverse outcomes in some cases for waivered recruits and recruits with a documented history of marijuana or a documented history of ADHD or depression/anxiety. We find a higher likelihood of adverse outcomes despite the additional screening that these recruits receive from the Army as result of the waiver process. This does not mean that all outcomes are adverse or that screening is ineffective. For example, we find that waivered recruits have no difference in attrition rates or reenlistment rates compared with similar recruits without waivers. However, the adverse outcomes we do find indicate that additional screening is appropriate and that perhaps more could be done.

To provide guidance to the Army for what additional screening might be effective, we considered rules of thumb that the Army could use according to the analysis of the historical data presented earlier. For example, a useful rule of thumb could be that, in addition to the usual screening an applicant requesting a waiver undergoes, the Army should consider only granting such waivers to Tier 1 recruits or those in AFQT categories I–IIIA. When developing the rules of thumb, we deliberately avoided complicated rules in accordance with the Army's request for easy implementation. We also avoided a consideration of gender, marital status, race, or ethnicity as additional screening criteria because doing so would be inconsistent with Army values.

We focused on three characteristics: Tier 1 status, AFQT categories I–IIIA, and older recruit status (ages 22 and older).[1] We chose these characteristics because the results in Table 3.1 indicate that recruits with these characteristics are less likely to have various adverse outcomes in many cases (i.e., they tend to be offsetting characteristics), though the extent to which these characteristics are offsetting depends on the outcome. To investigate how successful these characteristics are in offsetting adverse relationships between waivers and outcomes, we used the regression results in Appendix B and the RST results in Appendix C. The regression results allow us to consider the effect of these characteristics at the individual recruit level and to consider the outcomes of similar recruits who differ only in terms of waiver status and the offsetting characteristic. The RST analysis allows us to consider the effect of these characteristics at the aggregate level of the entry cohort.

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[1] We also considered prior-service status as another offsetting characteristic in Table 3.1. However, the Army limits the number of prior-service accessions, so prior-service status might not be the most promising mitigating characteristic. For that reason, we do not consider prior-service status in this chapter.

Regression Results

We used the regression results in Appendix B to compute the RRRs of the joint effect of having a given type of waiver or a waiver workflow history and each of the potentially off-setting characteristics. Tables 6.1 through 6.4 show the results. Table 6.1 focuses on moral conduct waivers, and Table 6.2 focuses on weight and medical waivers. For results related to a waiver workflow history, Table 6.3 focuses on a documented history of marijuana, and Table 6.4 focuses on a documented history of ADHD or depression/anxiety. We tested for the statistical significance of the joint effects by using a chi-squared test, and the tables show the results for cases in which the joint effects are statistically significant from zero at the 5-percent level and the RRR − 1 values are at least 10 percent. (For ease of comparison, the table also replicates the relevant results from Tables 3.1, 4.2, and 5.2, labeled "not joint" in Tables 6.1–6.4.) We note that we only show outcomes for which we estimated an adverse relationship in the previous chapters. For example, in Chapter Three, we showed that those with a drug/alcohol waiver are more likely to fail to complete their first term, so Table 6.1 shows the effects of this outcome for those with a drug/alcohol waiver but shows not applicable (N/A) for those with either a serious traffic waiver or a non-traffic offense waiver. Also, we found no evidence of an adverse relationship between these three categories of moral conduct waivers and DEP attrition (for example); we do not show results in this case.

Waivers

As discussed in Chapter Three, we found that recruits with one of the categories of moral conduct waivers are more likely to have adverse outcomes than are similar recruits without a moral conduct waiver. In particular, these recruits are more likely to separate because of misconduct and are more likely to have a negative personnel flag. Table 6.1 shows the results for the estimated relationship between having a moral conduct waiver and Army outcomes when recruits also have one of the three potential mitigating characteristics.

We find that all three characteristics—Tier 1, AFQT category I–IIIA, and older—fully or partially offset the likelihood that a recruit with a moral conduct waiver later receives a negative personnel flag, such as demotion, suspension of favorable status, or bar to reenlistment. For example, recruits with a non-traffic offense waiver are 54 percent more likely to be demoted during the first term; however, recruits with this waiver who are also a Tier 1 recruit are no more likely to be demoted than nonwaivered recruits. In this case, being a Tier 1 recruit is a fully offsetting characteristic. We find a similar result for those with a serious traffic waiver. Being an AFQT category I–IIIA recruit also fully offsets the higher likelihood of suspension of favorable person status and partially offsets the higher likelihood of demotion for those with a moral conduct waiver. We find that being an older recruit more than offsets the higher likelihood of a negative personnel flag for recruits with a moral conduct waiver. For example, older recruits who receive a drug/alcohol waiver are 82 percent less likely to be demoted, 51.4 percent less likely to have their favorable person status suspended, and 31.3 percent less likely to be barred from reenlistment.

We find that being an older recruit also more than offsets the negative relationship between having a moral conduct waiver and separating for misconduct (other than drug abuse). For example, recruits with a drug/alcohol waiver are 32.4 percent more likely to separate for misconduct than similar recruits without this waiver but are 85.8 percent less likely to separate for this reason if they are older than age 21. Being an older recruit mitigates, but does not nec-

Table 6.1
Estimated Relative Risk Ratios for Joint Effects of Serious Traffic, Non-Traffic, and Drug/Alcohol Waivers, Selected Outcomes

Outcome (Baseline Rate)	Serious Traffic Waiver				Non-Traffic Offense Waiver				Drug/Alcohol Waiver			
	Not Joint	Not Tier 2	AFQT Category I–IIIA	Age 22+	Not Joint	Not Tier 2	AFQT Category I–IIIA	Age 22+	Not Joint	Not Tier 2	AFQT Category I–IIIA	Age 22+
Attrition												
Failure to complete first term, given accession (34.3%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	29.3%		22.5%	−32.9%
Reason for separation, given attrition												
Misconduct-related separation but not drugs (16.0%)	52.8%	29.9%	38.4%	−82.9%	35.8%	14.7%	22.5%	−85.3%	32.4%	11.9%	19.5%	−85.8%
Misconduct-related separation, drugs (9.6%)	94.9%	95.8%	111.5%		79.2%	79.9%	94.7%		171.2%	172.1%	191.9%	53.2%
Court martial–related separation (7.9%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	21.0%	−19.5%	20.1%	−30.2%
Negative personnel flag												
Demotion (14.1%)	60.3%		41.7%	−86.4%	54.0%		36.5%	−87.0%	98.0%	40.4%	76.5%	−82.0%
Suspension of favorable person status (48.4%)	12.7%			−63.6%	13.3%			−63.3%	30.8%	13.1%	22.4%	−51.4%
Bar to reenlistment, conditional on completion of first term (31.7%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18.3%		10.3%	−31.3%
PULHES in service, given 36 months												
Significant psychiatric limitation (0.6%)	N/A		N/A	N/A	30.7%			95.2%	76.5%		56.9%	163.1%
Transition to officer												
Warrant officer (3.0%)	−38.0%	107.6%	198.7%	−72.5%	−49.7%	69.6%	145.4%	−77.7%	−71.5%		42.7%	−87.4%

NOTE: Results are shown only in cases for which the RRR − 1 is greater than 10 percent, is statistically significant at the 5-percent level, and for which the estimated relationship in the "not joint" case shows an adverse relationship between outcomes. "N/A" is shown if none of these conditions hold. See full regression results in Appendix B.

essarily fully mitigate, the negative relationship between moral conduct waivers and separation for drug abuse. For example, recruits with a drug/alcohol waiver are 171.2 percent more likely to separate for misconduct related to drug abuse but are 53.2 percent more likely if they are also older recruits. Being an older recruit also more than offsets the higher likelihood of first-term attrition among those with a drug/alcohol waiver and more than offsets the higher likelihood of separation for a court martial–related reason.

AFQT category I–IIIA and Tier 1 education credentials also help offset the higher likelihood of separation for misconduct among recruits with a moral conduct waiver. However, these traits are only partially offsetting. For example, a recruit with a non-traffic offense waiver has a predicted 35.8 percent higher likelihood of misconduct-related reasons for separation (not drugs), but the predicted effect falls to 14.7 percent for a Tier 1 recruit and to 22.5 percent for an AFQT category I–IIIA recruit.

As discussed in Chapter Three, older recruits are more likely to have health-related issues while in the Army. For example, as shown in Table 3.1, older recruits who separate during the first term are more likely to do so for health-related reasons. Table 6.1 shows that older recruits with a moral conduct waiver are more likely to have a significant psychiatric limitation during the first 36 months. Thus, a potential trade-off of using age to help mitigate the higher likelihood of adverse outcomes associated with a moral conduct waiver is that these older recruits are more prone to health issues during their first term.

The interactions of the three characteristics (especially age) with medical and weight waivers are shown in Table 6.2, focusing on the outcomes for which waivered recruits were more likely to have adverse outcomes in Table 3.1. We also find evidence that those with a weight waiver are more likely to have a negative personnel flag and are less likely to be promoted to E5 than are similar recruits who were not granted a weight waiver. In Table 6.2, we find that none of the three characteristics—AFQT category I–IIIA, Tier 1 status, or older ages—mitigate the negative relationship between weight or medical waiver and subsequent health outcomes. In fact, these characteristics, especially age, actually exacerbate the negative relationships shown in Table 3.2.

For example, recruits with a medical waiver are 18.3 percent more likely to separate because of a health-related reason. That likelihood increases to 32.5 percent if the recruit has Tier 1 credentials, to 23.1 percent if the recruit is in AFQT categories I-IIIA, and to 132.7 percent if the recruit is also older than age 21. Similarly, recruits with either a weight waiver or a medical waiver are more likely to have a significant PULHES physical limitation than are recruits without either of these waivers, but if these recruits are also in AFQT categories I-IIIA or are older, the likelihood of a significant PULHES physical limitation is even greater. The implication of these results is that subsequent adverse health conditions for those with weight or medical waivers at entry are not mitigated with the education credentials, aptitude, or age of the recruit at the individual level.

On the other hand, these characteristics have some mitigating effects on the estimated adverse performance-related outcomes of recruits with a weight or medical waiver. For example, recruits with a weight waiver are 34.4 percent more likely to have their favorable status suspended. The estimated effect falls to 16.9 percent if the recruit has Tier 1 credentials and to 26.1 percent if the recruit is higher aptitude.

Table 6.2
Estimated Relative Risk Ratios for Joint Effects of Weight and Medical (Other Health) Waivers, Selected Outcomes

Outcome (Baseline Rate)	Weight Waiver				Medical Waiver			
	Not Joint	Not Tier 2	AFQT Category I–IIIA	Age 22+	Not Joint	Not Tier 2	AFQT Category I–IIIA	Age 22+
Reason for separation, given attrition								
Health-related separation (33.5%)	17.2%	31.3%	21.9%	131.9%	18.3%	32.5%	23.1%	132.7%
Negative personnel flag								
Suspension of favorable person status (48.4%)	34.4%	16.9%	26.1%	–48.6%	N/A	N/A	N/A	N/A
Bar to reenlistment, conditional on completion of first term (31.7%)	65.2%	52.0%	74.2%		N/A	N/A	N/A	N/A
PULHES in service, given 36 months								
Significant physical limitation (1.8%)	145.7%	144.5%	1,916.0%	359.4%	925.1%	921.6%	922.1%	1,598.7%
Significant psychiatric capacity limitation (0.6%)	N/A	N/A	N/A	N/A	357.4%	252.0%	307.4%	575.7%
Transition to officer								
Warrant officer (3.0%)	–56.0%	49.3%	116.6%	–80.5%	N/A	N/A	N/A	N/A
Commissioned officer (1.1%)	–40.3%			–93.3%	N/A	N/A	N/A	N/A
Promoted to E5 during 4-year term, given completion of first term (36.7%)	–37.9%	–12.9%	-16.6%	–41.9%	N/A	N/A	N/A	N/A

NOTE: Table shows (RRR – 1). Results are shown only in cases for which the RRR – 1 is greater than 10 percent, is statistically significant at the 5-percent level, and for which the estimated relationship in the "not joint" case shows an adverse relationship between outcomes. "N/A" is shown if none of these conditions hold. See full regression results in Appendix B.

Marijuana

In Table 6.3, we consider whether being a Tier 1, an AFQT category I–IIIA, or an older recruit helps offset the estimated negative relationships between outcomes and having a documented history of marijuana (shown in Table 4.2). Given that the majority of those with a documented history of marijuana also have a non-traffic offense waiver, the results in Table 6.3 assume that all recruits also have this waiver.

As we showed in Chapter Four, recruits with a documented history of marijuana are 32.7 percent more likely to separate because of misconduct (not drug abuse) and 79.2 percent more likely to do so for drug abuse. We also found that these recruits were 81.2 percent more likely to be demoted. As shown in Table 6.3, we find that being older recruits fully or more than fully mitigates these adverse relationships between these outcomes and a documented history of marijuana. For example, older recruits with a documented history of marijuana (as well as a non-traffic offense waiver) are 85.7 percent *less* likely to separate for misconduct (not drugs), and we find no large or statistically significant relationship between a documented his-

Table 6.3
Estimated Relative Risk Ratios for Joint Effects of a Documented History of Marijuana with a Non-Traffic Offense Waiver, Selected Outcomes

Outcome (Baseline Rate)	Not Joint	Not Tier 2	AFQT Category I–IIIA	Age 22+
Reason for separation, given attrition				
Misconduct-related separation but not drugs (16.0%)	32.7%	N/A	19.7%	−85.7%
Misconduct-related separation, drugs (9.6%)	79.2%	180.5%	200.6%	N/A
Negative personnel flag				
Demotion (14.2%)	81.2%	27.3%	61.0%	−84.0%

NOTE: Table shows (RRR − 1). Results are shown only in cases for which the RRR − 1 is greater than 10 percent, is statistically significant at the 5-percent level, and for which the estimated relationship in the "not joint" case shows an adverse relationship between outcomes. "N/A" is shown if none of these conditions hold. See full regression results in Appendix B.

tory of marijuana and separation because of drug abuse for older recruits. Furthermore, older recruits with a documented history of marijuana are 84.0 percent less likely to be demoted.

Being a Tier 1 or a higher-aptitude recruit also has mitigating influences on the adverse relationship between a documented history of marijuana and demotion, as well as between a documented history of marijuana and misconduct (not drugs). For example, those who are Tier 1 have a 27.3 percent higher likelihood of demotion, a smaller albeit positive effect when compared with the 81.2 percent higher likelihood of demotion among recruits with a documented history of marijuana. But education credentials or aptitude do not have a mitigating effect on separation for drug abuse. In fact, Tier 1 and higher-aptitude recruits are even more likely to separate for drug abuse if they have a documented history of marijuana: 180.5 percent in the case of Tier 1 recruits and 200.6 percent in the case of AFQT category I–IIIA recruits.

Behavioral Health

In Chapter Five, we showed that Army recruits with a documented history of behavioral health conditions are more likely to have subsequent health issues during their first term, especially psychiatric limitations, and those with a documented history of depression/anxiety were more likely to fail to complete their first term and less likely to transition to warrant officer status. Table 6.4 shows whether the three characteristics help mitigate these adverse relationships. (For the purposes of the computations in the table, we assume recruits also receive a medical waiver.) We find that, in general, these characteristics do not tend to lessen these health-related estimated adverse relationships but do lessen the adverse estimated relationships pertaining to attrition and transition to warrant officer status.

For example, recruits with a documented history of ADHD or depression/anxiety are more likely to separate for health-related reasons, by 17.6 percent and 87.8 percent, respectively. These estimates increase if the recruits are Tier 1, higher aptitude, or older. In the case of older recruits, the estimated effects are 132.2 percent and 169.0 percent, respectively. Similarly, these recruits are more likely to have a PULHES indicating a significant psychiatric limitation during the first three years of service, by 3,095.8 percent for those with a documented history of ADHD and by 2,148.8 percent for those with a documented history of depression/anxiety.

Table 6.4
Estimated Relative Risk Ratios for Joint Effects of a Documented History of ADHD or Mental Health Condition with Medical Waiver, Selected Outcomes

Outcome (Baseline Rate)	ADHD History with Medical Waiver				Depression/Anxiety History with Medical Waiver			
	Not Joint	Not Tier 2	AFQT Category I–IIIA	Age 22+	Not Joint	Not Tier 2	AFQT Category I–IIIA	Age 22+
Failure to complete first term, given accession (34.3%)					33.8%	N/A	27.0%	−29.6%
Reason for separation, given attrition								
Health-related separation (33.5%)	17.6%	31.7%	22.3%	132.2%	87.8%	101.0%	92.4%	169.0%
Performance-related separation (18.0%)	35.6%	48.2%	31.7%	122.3%	N/A	N/A	N/A	N/A
Negative personnel flag								
Bar to reenlistment, conditional on completion of first term (31.7%)	26.0%	13.6%	17.8%	−25.6%	N/A	N/A	N/A	N/A
PULHES in service, given completion of 36 months								
Significant physical limitation (1.8%)	192.1%	190.7%	190.9%	442.0%	175.6%	174.4%	174.5%	413.0%
Significant psychiatric capacity limitation (0.6%)	3,095.8%	2,467.5%	2,804.7%	4,242.0%	2,148.8%	1,679.6%	1,929.7%	3,042.6%
Transition to officer								
Warrant (3.0%)					−32.3%	123.0%	221.3%	−70.2%
Promoted to E5 during 4-year term, given completion of first term (36.7%)	−51.3%	−33.3%	−36.4%	−57.1%	−25.3%	N/A	N/A	−29.9%

NOTE: Table shows (RRR − 1). Results are shown only in cases for which the RRR − 1 is greater than 10 percent, is statistically significant at the 5-percent level, and for which the estimated relationship in the "not joint" case shows an adverse relationship between outcomes. "N/A" is shown if none of these conditions hold. See full regression results in Appendix B.

These estimated effects are even larger for recruits who are Tier 1, higher aptitude, or older. For example, an older recruit with a documented history of ADHD is 4,242.0 percent more likely to have a PULHES indicating a significant psychiatric limitation during the first three years of service.

These results are consistent with those found in Table 6.2 for weight and medical waivers in that educational credential, aptitude, and age are not generally effective at mitigating the negative relationship between health at entry—in this case, a documented history of behavioral health issues—and subsequent health outcomes in the Army.

In Chapter Five, we also found that those with a documented history of ADHD are more likely to have performance-related issues, such as a higher likelihood of separation for performance-related reasons and a higher likelihood of being barred from reenlistment. We find educational credential, aptitude, and age have mixed success at mitigating effects in these cases. These characteristics do, however, have a mitigating influence in the case of being barred

from reenlistment. For instance, older recruits with a documented history of ADHD are estimated to be less likely to be barred from reenlistment. But being older actually worsens the relationship between having a documented history of ADHD and separating for performance-related reasons. Specifically, those with a documented history of ADHD have a 35.6 percent higher likelihood of separating for performance-related reasons. This estimate rises to 122.3 percent if the recruit is older than age 21. It also rises if the recruit is Tier 1.

Finally, we find that education, aptitude, and age help offset the positive estimated relationship between a documented history of depression/anxiety and attrition and the negative estimated relationship between a documented history of these conditions and transition to warrant officer. For example, being a higher-aptitude recruit reduces the positive estimated relationship with attrition, from 33.8 percent to 27.0 percent, while being an older recruit reverses the relationship from positive to negative, equal to −29.6 percent. Being a Tier 1 or higher-aptitude recruit also switches the sign of the estimated relationship between a documented history of these conditions and transition to warrant officer, from −32.3 percent to 123 percent and 221.3 percent, respectively.

Recruit Selection Tool Results

At the aggregate level, among an entry cohort, the ability of these characteristics to offset the higher likelihood of adverse outcomes could differ from the individual level because of correlations between other characteristics that are related to outcomes. To illustrate the offsetting effects of the three characteristics at the cohort level, we use the RST and show how increasing the share of Tier 1 recruits can help offset the adverse effects of increasing waivers. Appendix C shows results when the share of AFQT category I–IIIA recruits is increased to 75 percent and the results when the share of older recruiters is increased to 50 percent.

Table 6.5 shows the RST results when we simulate an increase in the share of recruits with waivers and Tier 1 education. The first column shows the RST base case, indicating the historical characteristics of the FY 2001 to FY 2012 accession cohorts. The next column shows RST simulations if the Army set a target of increasing serious traffic waivers to 20 percent alone and then in conjunction with a target of reducing the targeted share of Tier 2 recruits to 5 percent. Note that this does not mean that the recruits with a traffic waiver are only Tier 1 recruits; rather, across the entire cohort, the share of serious traffic offense waivers is 20 percent and the share of Tier 1 recruits is 95 percent. The remaining columns in the table show results for the other waiver categories. Table 6.6 shows the RST results when we simulate increasing the share of recruits with a documented history of marijuana, ADHD, or depression/anxiety in conjunction with increasing the share of Tier 1 recruits.

Waivers

We find that the education credentials act as a mitigating factor, consistent with the regression results presented earlier. In the case of moral conduct waivers, we found in Chapter Three that increasing the share of recruits with each category of moral conduct waiver increased the share of accessions who separated for misconduct and who have a negative personnel flag, such as demotion. When the share of recruits with a Tier 1 credential is also increased, these changes are more muted. For example, when the share of recruits with a non-traffic offense waiver is increased to 20 percent, we found in Chapter Three that the share of recruits with a

Mitigating Waivers with Increased Tier 1 Recruits, Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

	Baseline	Serious Traffic Waivers		Non-Traffic Offense Waivers		Drug/Alcohol Waivers		Weight Waivers		Medical Waivers	
		20.0%	20.0% with 95% Tier 1 Recruits	20.0%	20.0% with 95% Tier 1 Recruits	20.0%	20.0% with 95% Tier 1 Recruits	20.0%	20.0% with 95% Tier 1 Recruits	20.0%	20.0% with 95% Tier 1 Recruits
Selected recruit characteristics											
Ages 22 and older	28.8%	33.0%	34.5%	30.3%	30.5%	26.6%	28.8%	27.5%	27.7%	29.0%	29.3%
Tier 2	13.6%	12.5%	5.0%	15.1%	5.0%	15.4%	5.0%	14.2%	5.0%	13.3%	5.0%
AFQT category I–IIIA	65.6%	67.9%	68.1%	65.9%	65.6%	65.9%	65.5%	64.7%	64.5%	65.9%	65.6%
Serious traffic waiver	0.3%	20.0%	20.0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Non-traffic offense waiver	5.9%	4.8%	4.4%	20.0%	20.0%	4.8%	4.1%	4.7%	4.4%	5.0%	4.7%
Drug/alcohol waiver	1.0%	0.8%	0.6%	0.8%	0.8%	20.0%	20.0%	0.8%	0.7%	0.8%	0.8%
Weight waiver	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	20.0%	20.0%	0.4%	0.4%
Medical waiver	6.4%	5.1%	5.2%	5.4%	5.6%	5.1%	5.3%	5.1%	5.2%	20.0%	20.0%
Medical waiver											
First term attrition, given accession	34.3%	34.0%	33.3%	34.8%	33.4%	36.4%	35.3%	35.1%	34.1%	34.5%	33.7%
Separation for:											
Health-related separation	9.9%	9.5%	9.2%	9.7%	9.4%	9.6%	9.3%	11.3%	11.0%	10.3%	10.0%
Performance-related separation	4.9%	4.6%	4.5%	4.7%	4.6%	4.7%	4.7%	5.0%	5.0%	4.9%	4.9%
Misconduct-related separation (not drugs)	6.3%	6.3%	5.9%	6.8%	6.3%	7.4%	6.9%	6.1%	5.7%	6.2%	5.8%

Table 6.5

Table 6.5—Continued

	Serious Traffic Waivers		Non-Traffic Offense Waivers		Drug/Alcohol Waivers		Weight Waivers		Medical Waivers	
	Baseline	20.0%	20.0% with 95% Tier 1 Recruits	20.0%	20.0% with 95% Tier 1 Recruits	20.0%	20.0% with 95% Tier 1 Recruits	20.0%	20.0% with 95% Tier 1 Recruits	20.0%	20.0% with 95% Tier 1 Recruits
Misconduct-related separation, drugs	3.6%	3.8%	3.6%	4.2%	3.9%	5.5%	5.2%	3.4%	3.2%	3.5%	3.3%
Court martial–related separation	2.9%	3.0%	2.7%	3.1%	2.7%	3.7%	3.2%	2.8%	2.5%	2.8%	2.4%
Demotion	14.1%	14.7%	14.3%	15.2%	14.5%	17.0%	16.3%	14.2%	13.6%	13.9%	13.3%
Suspension of favorable person status	48.4%	47.8%	47.0%	49.3%	48.2%	51.4%	50.3%	51.9%	51.1%	48.1%	47.2%
Bar to reenlistment	28.2%	26.8%	26.9%	28.2%	28.4%	28.6%	28.9%	30.0%	30.2%	28.4%	28.6%
Reenlistment	36.6%	36.4%	36.6%	36.4%	36.6%	35.4%	35.7%	35.1%	35.4%	36.1%	36.3%

SOURCE: Authors' update for RST (see Orvis et al., 2018) using RA Analyst and TAPDB data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

Table 6.6

Mitigating Documented History of Marijuana, ADHD, and Depression/Anxiety with Increased Tier 1 Recruits, Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

		Marijuana		ADHD		Depression/Anxiety	
	Baseline	**20.0%**	**20.0% with 95% Tier 1 Recruits**	**20.0%**	**20.0% with 95% Tier 1 Recruits**	**20.0%**	**20.0% with 95% Tier 1 Recruits**
Selected recruit characteristics							
Ages 22 and older	28.8%	31.2%	31.1%	26.6%	26.9%	29.4%	29.7%
Tier 2	13.6%	14.1%	5.0%	14.1%	5.0%	14.3%	5.0%
AFQT category I–IIIA	65.6%	66.5%	65.7%	66.4%	66.0%	65.7%	65.4%
Documented history of marijuana	0.2%	20.0%	20.0%	0.2%	0.2%	0.2%	0.2%
Documented history of ADHD	0.1%	0.1%	0.1%	20.0%	20.0%	0.4%	0.4%
Documented history of depression/anxiety	0.2%	0.1%	0.1%	0.4%	0.4%	20.0%	20.0%
Selected outcomes							
First term attrition, given accession	34.3%	34.0%	33.1%	34.1%	33.2%	37.2%	36.1%
Separation for:							
Health-related separation	9.9%	9.4%	9.2%	10.6%	10.4%	13.5%	12.9%
Performance-related separation	4.9%	4.6%	4.6%	5.3%	5.3%	5.0%	5.0%
Misconduct-related separation (not drugs)	6.3%	7.0%	6.6%	6.5%	6.1%	5.9%	5.6%
Misconduct-related separation, drugs	3.6%	5.3%	5.0%	3.6%	3.3%	3.4%	3.2%
Court martial–related separation	2.9%	2.8%	2.4%	2.7%	2.3%	2.6%	2.3%
Demotion	14.1%	16.1%	15.4%	14.3%	13.6%	13.7%	13.1%
Suspension of favorable person status	48.4%	49.7%	48.8%	48.8%	47.9%	47.7%	46.8%
Bar to reenlistment	28.2%	30.6%	30.7%	29.1%	29.5%	27.0%	27.3%
Reenlistment	36.6%	35.8%	35.9%	35.9%	36.1%	34.8%	35.2%

SOURCES: Authors' update for RST (see Orvis et al., 2018) using RA Analyst and TAPDB data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

misconduct separation (not drugs) increased from 6.3 percent to 6.8 percent. Table 6.5 shows that simultaneously increasing the share of Tier 1 recruits to 95 percent reduces this percentage back to 6.3 percent. Increasing the share of Tier 1 recruits also mitigates the increase in the share of recruits who are demoted: Instead of an increase in share from 14.1 percent to 15.2 percent, we find the share is 14.5 percent.

In some cases, increasing the share of waivers improves outcomes, as shown in Chapter Three, and the improvement in outcomes is even greater when more recruits are Tier 1. For example, the cohort attrition rate is 34.3 percent in the base case and improves to 34.0 percent when the share of recruits with a serious traffic waiver increases to 20 percent (Table 6.5). When the share of recruits who are Tier 1 also increases, the attrition rate further falls to 33.3 percent.

In the case of weight and medical waivers, we found in Chapter Three that increasing the share of these waivers increased the share of accessions who would separate for health-related reasons. Table 6.5 shows that increasing educational credentials has a partially mitigating effect on this outcome. Specifically, the percentage of accessions separating for a health reason is 9.9 percent in the baseline but is 10.3 percent when the share of medical waivers is increased to 20 percent. If the percentage of Tier 1 recruits is also increased, Table 6.5 shows that the percentage of recruits separating for health-related reasons is 10 percent. Interestingly, the mitigating effect of educational credential for medical waivers in the RST analysis contrasts with the regression analysis results shown in Table 6.2. With the regression analysis, we found that being a Tier 1 recruit *increased* the likelihood that a recruit with a medical waiver would separate for health-related reasons. The difference in results is reconcilable by recognizing that the RST results do not compare separation rates for health-related reasons among similar recruits, as the regression analysis does. An implication is that the mitigating effects of educational credential in this case do not operate at the individual recruit level; that is, enlisting recruits with a medical waiver who are also Tier 1 is not predicted to have a mitigating effect. Instead, the mitigating effects of educational credentials occur at the entry cohort level; that is, enlisting an entry pool with a higher share of Tier 1 credentials when the pool also includes a higher share of medical waivers is predicted to have an offsetting effect at the aggregate level.

Documented History of Marijuana, ADHD, or Depression/Anxiety

As shown in Chapter Four, the RST predicts that separations for misconduct increase among the entry cohort when the share of recruits with a documented history of marijuana increases dramatically. The results in Table 6.6 indicate that enlisting a higher share of Tier 1 recruits partially offsets this effect. For example, separations for drug abuse are 6.3 percent of the entry cohort in the base case but are 7.0 percent when more recruits have a documented history of marijuana. But if the share of Tier 1 recruits is also increased, the percentage falls to 6.6 percent. We find that, at the entry cohort level, Tier 1 status also helps mitigate the higher rate of negative personnel actions among the cohort when the documented history of marijuana increases. Specifically, the percentage of recruits demoted is 14.1 percent in the baseline, increasing to 16.1 percent when the share of recruits with a documented history of marijuana increases to 20 percent. When the educational credentials of the cohort are improved as well, the percentage of recruits demoted falls to 15.4 percent.

A similar result is found for those with a documented history of ADHD and of depression/anxiety (Table 6.6). The increase in the separation rate for health-related reasons is not as great when more Tier 1 recruits are enlisted as well. In the case of recruits with a documented

history of depression/anxiety, separations for health-related reasons increase from 9.9 percent to 12.9 percent (rather than 13.5 percent). Table 6.6 also shows that the higher attrition rate of an entry cohort with a higher share of recruits with a documented history of depression/anxiety is reduced from 37.2 percent to 36.1 percent (compared with 34.3 percent in the baseline) when more Tier 1 recruits are enlisted.

It is important to remember that these results are illustrative in the sense that we consider extreme cases in which the percentage of waivers or the percentage of recruits with a documented history of marijuana, ADHD, or depression/anxiety is increased dramatically to 20 percent. Under more-realistic scenarios, the effects shown in Table 6.5 and Table 6.6 would be smaller. Conceptually, one could build an optimization routine that finds the best set of recruit characteristics that would fully (or close to fully) offset the negative outcomes of increasing the share of any given waiver category. However, doing so might not be practical from the standpoint of implementing recruiting policy. Applying a complex set of criteria for screening a cohort of recruits could be complex and costly to implement by the recruiting enterprise, especially if the optimal set of criteria differed across waiver categories.

Implications and Recommendations for the Army

Army recruits who receive waivers are those who require additional screening, meaning they are evaluated on a "whole person" basis, because they do not meet one or more enlistment standards. The purpose of the additional screening is to ensure that waivers are granted to applicants who are likely to be able to perform their military duties successfully. If applicants who require waivers are less likely to be successful, and if the additional screening they require is fully effective, one would expect that applicants who receive waivers and enlist would perform as well as those who did not require a waiver. Furthermore, we would expect changes in the share of recruits with waivers within an enlistment cohort to have little (if any) impact on the performance of the cohort in aggregate. Our analyses addressed the question of whether this is the case for waivered recruits and for those who had a documented history of marijuana, ADHD, and depression/anxiety. In this chapter, we draw the key implications and recommendations for the Army from these analyses.

Implications

The performance of an accession cohort would change relatively little if waivers were substantially increased. The RST analysis in the previous chapters showed that, at the entry cohort level, the share of the cohort with adverse outcomes (such as higher attrition; negative personnel flags; or separation for misconduct, performance, drugs, or health-related reasons) increased to some extent. For example, increasing the share of non-traffic offense waivers to 20 percent of all accessions increased the prospective attrition rate from 34.3 percent to 34.8 percent. Whether these adverse outcomes are acceptable will depend on the costs to the Army of attrition, lower performance, or more adverse-health outcomes. It will also depend on the savings in recruiting costs if costs are lower when a higher share of recruits receive waivers.

That said, it is important to recognize that the increase in the percentage of adverse outcomes tends to be small in magnitude, often a change in less than a percentage point. Furthermore, the scenarios we considered are extreme cases in which the share of accessions with a given waiver were increased by 100-fold (e.g., from 0.2 percent of accessions to 20 percent). This result provides good news for the Army: specifically, that increasing the share of waivers in a cohort of recruits, even by a substantial amount, has relatively modest effects on the cohort's subsequent Army performance. This is good news because observers frequently comment that waivers contribute to the hollowing out of the Army force that will lead to substandard performance (see, for example, Laich, Askonas, and Barndollar, 2018). However, the his-

torical evidence does not support that observation. We illustrate this in Table 7.1, which shows RST results for two scenarios:

- **Waiver scenario.** Non-traffic offense waivers are increased by 20 percent.[1]
- **Hollow force scenario.** The percentage of Tier 2 recruits is set to 48 percent, and the percentage of AFQT category I–IIIA recruits is set to 22 percent, which is comparable to the Army's situation (during the actual hollow force years) in 1980.

We note that both scenarios are beyond recent historical experience. Although the second scenario represents the 1980 situation, we do not use data back to 1980 to estimate the subsequent performance of that cohort. The results in Table 7.1 are illustrative, but they show that increasing non-traffic offense waivers dramatically is not equivalent to a hollow force scenario. In fact, outcomes are far worse in the hollow force scenario. For example, under the waiver scenario, the first-term attrition rate is expected to be half a percentage point higher: 34.8 percent versus 34.3 percent baseline. Under the hollow force scenario, we estimate that the first-term attrition rate would increase by more than three percentage points to 37.8 percent. Demotions are projected to increase by a percentage point to 15.2 percent under the waiver scenario but by nearly four percentage points to 18 percent under the hollow force scenario.

Thus, increasing waivers is not expected to be the same as reducing quality to the levels associated with the hollow force years in the late 1970s and early 1980s. There are two reasons for the smaller change. First, even with a dramatic increase in waivers, most Army recruits still do not receive waivers, and aggregate performance largely reflects the performance of these recruits. Second, the Army has sustained the quality of the force along different dimensions. As shown in Table 7.1, the accession cohort with more waivers still is composed of just less than 85 percent Tier 1 recruits, and nearly 70 percent of recruits are in AFQT categories I–IIIA. Furthermore, a higher share of recruits is older, relative to the hollow force scenario. These other dimensions of quality are offsetting and serve to mute or fully offset the adverse outcomes associated with waivers.

More generally, our projections of the aggregate effects of increasing substantially the share of accessions with waivers or with a documented history of marijuana or behavioral health conditions are relatively small for the accession cohort as a whole, and the effects in some cases are improvements, not reductions, in performance. For example, as shown in Table 7.1, increasing the share of recruits with a non-traffic offense waiver to 20 percent is projected to result in an increase in the share of recruits who separate for drug abuse, from 3.6 percent to 4.2 percent, and an increase in the share of recruits who separate for other misconduct, from 6.3 percent to 6.8 percent. The effect on these outcomes of increasing the share of non-traffic offense waivers is partially mitigated by the increase in the share of recruits in the cohort who are Tier 1, in AFQT categories I–IIIA, or older. All three characteristics are correlated with having a non-traffic offense waiver, possibly as a result of Army policy to recruit individuals with offsetting characteristics or because of the underlying traits of waivered recruits. In either case, these characteristics are negatively related to separation for misconduct. The implication is that, according to historical relationships in the data that we use, we would project relatively little change in aggregate outcomes when waivers are increased.

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[1] The non-traffic offense case is illustrative. Other cases could be used with similar qualitative results. Interested readers can insert comparisons using the RST results from previous chapters and in Appendix C.

Table 7.1

Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Waiver Scenario and Hollow Force Scenario

	Baseline	Waiver Scenario (Non-Traffic Offense Increased to 20%)	Hollow Force Scenario (Tier 2 = 48%; AFQT Category I–IIIA = 22%)
Selected recruit characteristics			
Non-traffic offense waiver	5.9%	20.0%	7.0%
Ages 22+	28.8%	30.3%	26.7%
Tier 2	13.6%	15.1%	48.0%
AFQT Category I–IIIA	65.6%	65.9%	22.9%
Selected outcomes			
First term attrition, given accession	34.3%	34.8%	37.8%
Separation for:			
Health-related separation	9.9%	9.7%	10.7%
Performance-related separation	4.9%	4.7%	4.9%
Misconduct-related separation (not drugs)	6.3%	6.8%	9.1%
Misconduct-related separation, drugs	3.6%	4.2%	4.9%
Court martial–related separation	2.9%	3.1%	4.6%
Demotion	14.1%	15.2%	18.0%
Suspension of favorable person status	48.4%	49.3%	54.2%
Bar to reenlistment	28.2%	28.2%	27.8%
Reenlistment	36.6%	36.4%	38.1%

SOURCES: Authors' update for RST (see Orvis et al., 2018) using RA Analyst, TAPDB, and waiver workflow data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

Waivered recruits and recruits with a documented history of marijuana, ADHD, or depression/anxiety are likely to perform as well as or better than similar recruits on many dimensions. The regression analysis allowed us to consider the relationship between waivers and outcomes for recruits who are similar along other observable dimensions. Thus, the analysis provides insight into the underlying riskiness of recruits with waivers or a documented history of marijuana, ADHD, or anxiety/depression. By way of summary of our analysis of the relationship between waivers or a documented history of marijuana, ADHD, or depression/anxiety, Table 7.2 shows baseline and predicted outcomes for each waiver category (serious traffic, non-traffic offense, drug/alcohol, weight, and medical) for the case in which recruits have a non-traffic offense waiver and a documented history of marijuana and for the case in which recruits have a medical waiver and a documented history of either ADHD or depression/anxiety. The results are color coded. Blue indicates that the likelihood of an outcome is statistically the same for similar waivered and nonwaivered recruits or within 10 percent of one another, green indicates that waivered recruits are statistically less likely to have an adverse outcome (i.e., outcomes are more likely to improve) by at least 10 percent, and red

Table 7.2
Predicted Outcomes by Waiver Category or Documented History of Marijuana, ADHD, or Depression/Anxiety, FY 2001 to FY 2012 Accession Cohorts

	All	Serious Traffic Waiver	Non-Traffic Offense Waiver	Drug/Alcohol Waiver	Weight Waiver	Other Health Waiver	Marijuana History and Non-Traffic Offense Waiver	ADHD History with Medical Waiver	Depression/Anxiety History with Medical Waiver
DEP attrition	11.3%	8.4%	8.5%	6.7%	4.5%	11.9%	11.6%	6.4%	6.0%
Failure to complete first term	34.3%	31.8%	35.5%	44.4%	35.3%	35.5%	32.0%	33.2%	45.9%
Health-related separation	33.5%	23.4%	24.3%	19.1%	39.3%	39.7%	17.8%	39.4%	63.0%
Performance-related separation	18.0%	11.2%	12.6%	10.5%	20.0%	17.8%	10.6%	24.4%	14.1%
Misconduct-related separation (not drugs)	16.0%	26.6%	24.8%	30.2%	12.1%	14.3%	21.3%	12.5%	7.0%
Misconduct-related separation, drugs	9.6%	18.7%	17.2%	26.0%	6.3%	8.8%	17.2%	8.1%	6.3%
Court martial–related separation	7.9%	9.8%	8.6%	9.6%	6.6%	6.3%	8.5%	4.5%	2.5%
Demotion	14.1%	22.7%	21.8%	28.0%	14.1%	13.7%	27.9%	14.5%	12.7%
Suspension	48.4%	54.5%	54.8%	63.3%	65.0%	47.6%	56.2%	50.3%	45.4%
Bar to reenlistment	31.7%	32.1%	32.9%	37.5%	52.3%	34.2%	32.7%	39.9%	31.8%
Significant physical limitation	1.8%	1.4%	1.9%	1.7%	4.5%	18.6%	2.7%	5.3%	5.0%
Significant psychiatric limitation	0.6%	0.5%	0.8%	1.1%	0.8%	3.0%	0.9%	20.7%	14.6%
Transition to warrant officer	3.0%	1.8%	1.5%	0.8%	1.3%	2.8%	1.1%	1.9%	2.0%
Transition to commissioned	1.1%	1.4%	1.1%	1.0%	0.7%	1.1%	1.2%	0.7%	1.0%
Reenlistment	59.6%	58.1%	60.0%	58.7%	55.5%	60.1%	61.6%	61.4%	56.3%
Promoted to E5	36.7%	43.9%	38.8%	33.1%	22.8%	35.1%	41.7%	14.8%	27.4%

NOTE: Green indicates that waivered recruits have a lower likelihood, that is both statistically significant and larger than 10 percent, of an adverse outcome than similar, nonwaivered recruits. Blue indicates that the difference is not statistically significant and/or larger than 10 percent. Red indicates that waivered recruits have a higher likelihood, that is both statistically significant and larger than 10 percent, of an adverse outcome.

indicates that waivered recruits are statistically more likely to have an adverse outcome (outcomes are likely to be worse) by at least 10 percent.

A quick glance shows several cells are blue or green, indicating that recruits with waivers in each category are no worse in terms of the likelihood of an adverse outcome and, in some cases, are better. For example, waivered recruits are less likely to attrite during DEP or during the first term and are as likely to reenlist or transition to a commissioned officer compared with similar recruits without waivers in each category. The exception is recruits with drug/alcohol waivers, who we find have a higher likelihood of first-term attrition. We find similar results for recruits with a documented history of marijuana, ADHD, or depression/anxiety. Among those who attrite during the first term, recruits with a moral conduct waiver and those with a documented history of marijuana are less likely to attrite because of health reasons, whereas those with a weight or medical waiver are as likely or less likely to attrite because of performance-related reasons or misconduct. Those with a documented history of depression/anxiety are also less likely to separate for these reasons.

In short, the analysis shows that recruits with waivers or with a documented history of marijuana or behavioral health conditions do not necessarily have a higher likelihood than similar recruits of adverse outcomes across all dimensions; in some cases, they might even be more likely to perform better. These results imply that the waivered recruits and recruits with a documented history of marijuana, ADHD, or depression/anxiety are not uniformly riskier for all dimensions.

For other dimensions, waivered recruits and recruits with a documented history of marijuana, ADHD, or depression/anxiety are more likely to perform worse. That said, we find that waivered recruits are more likely to have adverse outcomes for some dimensions, relative to similar recruits without waivers or a documented history of marijuana or behavioral health conditions.

The red cells indicate evidence that waivered recruits have a higher (and substantively so) likelihood of poorer performance for other dimensions relative to similar recruits without a given type of waiver. Similarly, the red cells indicate that recruits with a documented history of marijuana, ADHD, or depression/anxiety are more likely to have an adverse outcome than are similar recruits without each of these documented histories. In particular, we find evidence that recruits who receive a drug/alcohol waiver or a waiver for a serious traffic offense or non-traffic offense and those with a documented history of marijuana exhibit recidivism, meaning that these recruits are more likely to separate during their first term because of drug abuse. We also find that these recruits are more likely to separate for a misconduct-related reason (not drugs) and to have a higher likelihood of receiving a negative personnel flag, including demotion and suspension of favorable person status. Recruits with a documented history of depression/anxiety in addition to a health waiver are more likely to fail to complete their first term or to transition to warrant officer status.

Recruits with a weight or health-related waiver show a higher likelihood of subsequent health conditions, as well as a higher likelihood of negative personnel flags in the case of weight waivers. For example, those with a weight waiver or other health waiver are more likely to separate for a health-related condition than are similar recruits without each of these waivers. Those with a weight waiver are more likely to receive a medical profile during their first 36 months indicating a significant physical limitation, and those who receive a medical waiver (other than weight) are more likely to receive a medical profile during their first 36 months

indicating a significant psychiatric limitation. Recruits with a weight waiver also have a higher likelihood of suspension of favorable person status and of being barred from reenlistment.

Recruits with a documented history of ADHD or depression/anxiety conditions also have a higher likelihood of separating because of health-related reasons. They are also more likely to receive a medical profile during their first 36 months indicating a significant physical or psychiatric limitation. Those with a documented history of ADHD are also more likely to separate for performance-related reasons and to be barred from reenlistment than are those without a documented history of ADHD. We also find that those with a documented history of ADHD are less likely to be promoted to E5 during a four-year enlistment term. These results are consistent with findings in the literature showing that ADHD is associated with poorer labor market and societal outcomes.

The Army could likely do more to offset the higher likelihood of adverse outcomes among waivered recruits and recruits with a documented history of marijuana, ADHD, or depression/anxiety. We find that there are recruit traits that likely can help mitigate the higher likelihood of adverse outcomes. Because of the Army's interest in easily implemented rules of thumb, we focused on whether recruits were higher aptitude in terms of having AFQT scores in categories I–IIIA, having Tier 1 education status, or being older (ages 22 or older). In general, we find that these three traits often fully or partially mitigate the higher likelihood of adverse effects related to performance and misconduct. For example, those with a non-traffic offense waiver are 35.8 percent more likely to separate for misconduct not related to drugs. If these waivered recruits are also 22 or older, then we find these recruits are 85.3 percent *less likely* to be separated for misconduct. Similarly, those with a documented history of marijuana are 32.7 percent more likely to separate for misconduct related to drug abuse. If the recruit is a Tier 1 recruit, the likelihood is not statistically different from zero; if the recruit is older, the likelihood *decreases* by 85.8 percent. Being older, a Tier 1 recruit, or higher aptitude also helps mitigate the higher likelihood of demotion among recruits with a documented history of marijuana. Whether sufficient numbers of individuals with these characteristics are willing to join the Army will depend on whether the Army is sufficiently attractive relative to other opportunities these individuals could pursue, the raw number of individuals in the population with these characteristics and their tastes for military service, and Army policy to attract such recruits. The key result here is that the Army could at least partially mitigate the likelihood of adverse outcomes by increasing the share of waivered recruits with these characteristics.

However, we find that these three characteristics are less successful at mitigating adverse health-related outcomes, at least at the individual recruit level. For example, recruits with a medical waiver are 18.3 percent more likely to separate because of a health-related reason than are similar recruits without a medical waiver. That likelihood actually increases to 32.5 percent if the recruit has Tier 1 educational credentials, to 23.1 percent if the recruit is in AFQT categories I–IIIA, and to 132.7 percent if the recruit is age 22 or older. Similarly, these traits do not tend to lessen the estimated adverse relationship between a documented history of ADHD or depression/anxiety and subsequent health-related outcomes.

That said, at the entry cohort level, these characteristics (especially Tier 1 status and age) partially or fully mitigate adverse health outcomes associated with a higher share of medical or weight waivers in the entry cohort. In other words, increasing the share of recruits in the entry cohort who are either Tier 1, AFQT category I–IIIA, or older when the share of recruits with either a medical or weight waiver also increases can offset the higher likelihood of adverse health outcomes among the cohort associated with more medical or weight waivers. We find

a similar result at the entry cohort level regarding the effect of these characteristics when the entry cohort has a higher share of recruits with a history of ADHD or depression/anxiety. That is, we find that the Army could fully or partially offset the higher likelihood of adverse health outcomes among the entry cohort when the share of recruits with a history of ADHD or depression/anxiety increases by simultaneously increasing the share of the entry cohort with these characteristics. Importantly, at the entry cohort level, it is not necessary that the recruits with a medical or weight waiver or with a history of ADHD or depression/anxiety also have these characteristics. What is needed is for other recruits in the cohort to have them.

Tabulations of the entry characteristics of recruits with and without a waiver or with and without a documented history of marijuana or behavioral health conditions indicate that the Army has historically granted waivers to recruits with these characteristics to some extent, but not always. Figure 7.1 shows the percentage of recruits ages 22 and older, by waiver, and Figures 7.2 and 7.3 show the percentage of recruits who are Tier 1 or in AFQT categories I–IIIA, respectively, by waiver status. Figures 7.4 through 7.6 show similar graphics by whether a recruit has a documented history of marijuana, ADHD, or depression/anxiety.

The tabulations in Figures 7.1 through 7.3 show that recruits with a waiver are more likely to be ages 22 or older and are more likely to be in AFQT categories I–IIIA, with the exception of recruits with a weight waiver. However, waivered recruits are less likely, not more likely, to be Tier 1, with the exception of serious traffic and health waivers. The Army could do more to mitigate the adverse performance outcomes of waivers by increasing the share of recruits who are Tier 1. Similarly, the tabulations in Figures 7.4 through 7.6 show that those with a documented history of marijuana, ADHD, or depression/anxiety conditions are more likely to be in AFQT categories I–IIIA. In the case of marijuana and depression/anxiety, they are also more likely to be older. However, recruits with a documented history of marijuana, ADHD, or depression/anxiety are less likely, not more likely, to be Tier 1. These results indicate that if the Army can cost-effectively attract sufficient numbers of individuals in the population with these

Figure 7.1
Percentage of Accessions Ages 22 or Older, by Waiver Category, FY 2001 to FY 2012

Figure 7.2
Percentage of Tier 1 Accessions, by Waiver Category, FY 2001 to FY 2012

Figure 7.3
Percentage of AFQT Category I–IIIA Accessions, by Waiver Category, FY 2001 to FY 2012

Figure 7.4
Percentage of Accessions Ages 22 or Older, by Documented History of Marijuana, ADHD, or Depression/Anxiety, FY 2001 to FY 2012

Figure 7.5
Percentage of Tier 1 Accessions, by Documented History of Marijuana, ADHD, or Depression/Anxiety, FY 2001 to FY 2012

Figure 7.6
Percentage of AFQT Category I–IIIA Accessions, by Documented History of Marijuana, ADHD, or Depression/Anxiety, FY 2001 to FY 2012

characteristics, it could do more to mitigate the adverse relationship between a documented history of marijuana, ADHD, or depression/anxiety and outcomes by increasing the share of recruits with Tier 1 status.

Our analysis indicates that the legalization of marijuana has not resulted in worse recruit outcomes. Given the societal trends toward the legalization of marijuana across states and localities, we considered whether Army recruits who enlisted in states where marijuana has been legalized performed differently than those from other states. Our regression analysis considered medical versus recreational marijuana legalization separately. Although we find some indications that legalization could be associated with an improvement in outcomes, these results are not robust. Notably, however, we do not find evidence that outcomes have worsened. The key conclusion, then, is that there is no strong evidence that changes in marijuana legalization have substantially changed recruit outcomes.

Recommendations

In lights of these findings and implications, we offer the following recommendations to the Army to strengthen its waiver policies.

Recast the message about what a waiver means. The term *waiver* is not well understood by policymakers and the press and is often confused to mean that the Army is lowering standards and enlisting unqualified soldiers. The Army should create, disseminate, and use a clear definition that highlights that all waivered recruits are qualified and eligible to enlist, even if they do not meet every enlistment standard, and that the enlistment standards allow for waivers. The messaging should highlight that increasing waivers has historically had little impact on the overall performance of an enlistment cohort and that, at the individual level, waivered recruits do not always perform worse and sometimes perform better than similar nonwaivered recruits.

To mitigate the higher likelihood of adverse performance-related outcomes, require that waivered recruits and those with a documented history of marijuana or behavioral health issues are either Tier 1, AFQT category I–IIIA, or older (age 22 or older). Waivered recruits typically are in AFQT categories I–IIIA or are older, but our research finds that being a Tier 1 recruit also often mitigates, at least partially, the adverse performance outcomes associated with waivers and with having a documented history of marijuana or behavioral health issues.

To mitigate the share of adverse health-related outcomes among an accession cohort when the share of accessions in the cohort with either a weight or medical waiver or who have a documented history of behavioral health issues increases, require that cohort to also have a higher share of Tier 1, AFQT category I–IIIA, or older (age 22 or older) recruits. We find that these characteristics are less successful at the individual level in mitigating the higher likelihood that a given recruit with either a weight or medical waiver or with a documented history of ADHD or depression/anxiety has a subsequent adverse health outcome. However, these characteristics can be mitigating at the overall cohort level. This recommendation, as well as the previous one, presumes that the Army can cost-effectively attract sufficient numbers of individuals in the population with these offsetting characteristics.

Distinguish between recruits with only a documented history of marijuana and those who also have misconduct offenses. The adverse effects of having a documented history of marijuana can be less acute if recruits do not also have misconduct offenses. For example, separation for drug abuse is less likely for recruits with only a documented history of marijuana without any misconduct offenses, and (unlike those who also have misconduct offenses) they are no more likely to have a suspension of favorable person status than any other recruit. Furthermore, we find no evidence of substantially worse performance among a cohort of recruits who have a greater share with a documented history of marijuana or evidence of worse performance in states where legalization of marijuana has occurred. The implication is that the Army should continue to carefully screen recruits with a documented history of marijuana but should be less concerned with these recruits if they have no misconduct offenses.

Conclusions

Our main finding is that the Army's waiver policy has been successful overall insofar as increasing the share of waivered recruits has small effects on an enlistment cohort, and the performance of waivered recruits is often no worse and sometimes is better than the performance of similar, nonwaivered recruits. The Army's waiver policy can be strengthened, however, by being more proactive in granting waivers to recruits who have mitigating characteristics, such as age, aptitude, and education, and by distinguishing between recruits with a documented history of marijuana who have misconduct offenses and those whose documented history does not rise to that level. Finally, the Army needs to be more proactive in how it messages the issue of waivers with the press, Congress, and other leaders. Specifically, the Army must more effectively communicate that waivered recruits are qualified and eligible to enlist and that enlistment standards permit waivers as part of the eligibility process.

U.S. Army Waiver Codes

Waivers are tracked by different codes. The codes are tracked by the Office of the Secretary of Defense in DoDI 1304.32, 2017. These codes change over time, and the codes relevant to our analysis of Army data were provided by the Army and are presented in Table A.1. A consolidation of these codes is shown in Table 1.2.

Table A.1
Army Waiver Codes

Code	Explanation
AYA	Age maximum exceeded for enlistment purposes waiver granted by the highest authority level.
AYB	Age maximum exceeded for enlistment purposes waiver granted by the Recruiting Command Headquarters level.
AYC	Age maximum exceeded for enlistment purposes waiver granted by the U.S. Marine Corps Command level.
AYD	Age maximum exceeded for enlistment purposes waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
AYE	Age maximum exceeded for enlistment purposes waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Air Force Squadron level, or U.S. Marine Corps Recruiting Station.
AYF	Age maximum exceeded for enlistment purposes waiver granted by the U.S. Coast Guard Recruiting Center.
BAA	Dependency of a military spouse waiver granted by the highest authority level.
BAB	Dependency of a military spouse waiver granted by the Recruiting Command Headquarters level.
BAC	Dependency of a military spouse waiver granted by the U.S. Marine Corps Regional Command level.
BAD	Dependency of a military spouse waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
BAE	Dependency of a military spouse waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Air Force Squadron level, or U.S. Marine Corps Recruiting Station.
BAF	Dependency of a military spouse waiver granted by the U.S. Coast Guard Recruiting Center.
BBA	Dependency due to number of dependents waiver granted by the highest authority level.
BBB	Dependency due to number of dependents waiver granted by the Recruiting Command Headquarters level.
BBC	Dependency due to number of dependents waiver granted by the U.S. Marine Corps Regional Command level.
BBD	Dependency due to number of dependents waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
BBE	Dependency due to number of dependents waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Air Force Squadron level, or U.S. Marine Corps Recruiting Station.
BBF	Dependency due to number of dependents waiver granted by the U.S. Coast Guard Recruiting Center.
CYA	Mental qualification – meets ASVAB testing requirements (AFQT and sub test) waiver granted by the highest authority level.
CYB	Mental qualification – meets ASVAB testing requirements (AFQT and sub test) waiver granted by the Recruiting Command Headquarters level.
CYC	Mental qualification – meets ASVAB testing requirements (AFQT and sub test) waiver granted by the U.S. Marine Corps Regional Command level.
CYD	Mental qualification – meets ASVAB testing requirements (AFQT and sub test) waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
CYE	Mental qualification – meets ASVAB testing requirements (AFQT and sub test) waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
CYF	Mental qualification – meets ASVAB testing requirements (AFQT and sub test) waiver granted by the U.S. Coast Guard Recruiting Center.

Table A.1—Continued

Code	Explanation
DAA	Law violations of adjudicated minor traffic offense(s) waiver granted by the highest authority level.
DAB	Law violations of adjudicated minor traffic offense(s) waiver granted by the Recruiting Command Headquarters level.
DAC	Law violations of adjudicated minor traffic offense(s) waiver granted by the U.S. Marine Corps Regional Command level.
DAD	Law violations of adjudicated minor traffic offense(s) waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
DAE	Law violations of adjudicated minor traffic offense(s) waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
DAF	Law violations of adjudicated minor traffic offense(s) waiver granted by the U.S. Coast Guard Recruiting Center.
DBA	Law violations of adjudicated serious traffic offense(s) waiver granted by the highest authority level.
DBB	Law violations of adjudicated serious traffic offense(s) waiver granted by the Recruiting Command Headquarters level.
DBC	Law violations of adjudicated serious traffic offense(s) waiver granted by the U.S. Marine Corps Regional Command level.
DBD	Law violations of adjudicated serious traffic offense(s) waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
DBE	Law violations of adjudicated serious traffic offense(s) waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
DBF	Law violations of adjudicated serious traffic offense(s) waiver granted by the U.S. Coast Guard Recruiting Center.
DCA	Law violations of adjudicated minor non-traffic offense(s) waiver granted by the highest authority level.
DCB	Law violations of adjudicated minor non-traffic offense(s) waiver granted by the Recruiting Command Headquarters level.
DCC	Law violations of adjudicated minor non-traffic offense(s) waiver granted by the U.S. Marine Corps Regional Command level.
DCD	Law violations of adjudicated minor non-traffic offense(s) waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
DCE	Law violations of adjudicated minor non-traffic offense(s) waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
DCF	Law violations of adjudicated minor non-traffic offense(s) waiver granted by the U.S. Coast Guard Recruiting Center.
DDA	Law violations of adjudicated serious non-traffic offense(s) waiver granted by the highest authority level.
DDB	Law violations of adjudicated serious non-traffic offense(s) waiver granted by the Recruiting Command Headquarters level.
DDC	Law violations of adjudicated serious non-traffic offense(s) waiver granted by the U.S. Marine Corps Regional Command level.
DDD	Law violations of adjudicated serious non-traffic offense(s) waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
DDE	Law violations of adjudicated serious non-traffic offense(s) waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.

Table A.1—Continued

Code	Explanation
DDF	Law violations of adjudicated serious non-traffic offense(s) waiver granted by the U.S. Coast Guard Recruiting Center.
DEA	Law violations of adjudicated felony offense(s) as an adult waiver granted by the highest authority level.
DEB	Law violations of adjudicated felony offense(s) as an adult waiver granted by the Recruiting Command Headquarters level.
DEC	Law violations of adjudicated felony offense(s) as an adult waiver granted by the U.S. Marine Corps Regional Command level.
DED	Law violations of adjudicated felony offense(s) as an adult waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
DEE	Law violations of adjudicated felony offense(s) as an adult waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
DEF	Law violations of adjudicated felony offense(s) as an adult waiver granted by the U.S. Coast Guard Recruiting Center.
DFA	Law violations of adjudicated felony offense(s) as a juvenile waiver granted by the highest authority level.
DFB	Law violations of adjudicated felony offense(s) as a juvenile waiver granted by the Recruiting Command Headquarters level.
DFC	Law violations of adjudicated felony offense(s) as a juvenile waiver granted by the U.S. Marine Corps Regional Command level.
DFD	Law violations of adjudicated felony offense(s) as a juvenile waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
DFE	Law violations of adjudicated felony offense(s) as a juvenile waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
DFF	Law violations of adjudicated felony offense(s) as a juvenile waiver granted by the U.S. Coast Guard Recruiting Center.
EEA	Previous military separation, does not apply to delayed entry program separation, re-enlistment eligibility reason waiver granted by the highest authority level.
EAB	Previous military separation, does not apply to delayed entry program separation, re-enlistment eligibility reason waiver granted by the Recruiting Command Headquarters level.
EAC	Previous military separation, does not apply to delayed entry program separation, re-enlistment eligibility reason waiver granted by the U.S. Marine Corps Regional Command level.
EAD	Previous military separation, does not apply to delayed entry program separation, re-enlistment eligibility reason waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
EAE	Previous military separation, does not apply to delayed entry program separation, re-enlistment eligibility reason waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
EAF	Previous military separation, does not apply to delayed entry program separation, re-enlistment eligibility reason waiver granted by the U.S. Coast Guard Recruiting Center.
EBA	Previous military separation, does not apply to delayed entry program separation, pay grade waiver granted by the highest authority level.
EBB	Previous military separation, does not apply to delayed entry program separation, pay grade waiver granted by the Recruiting Command Headquarters level.

Table A.1—Continued

Code	Explanation
EBC	Previous military separation, does not apply to delayed entry program separation, pay grade waiver granted by the U.S. Marine Corps Regional Command level.
EBD	Previous military separation, does not apply to delayed entry program separation, pay grade waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
EBE	Previous military separation, does not apply to delayed entry program separation, pay grade waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
EBF	Previous military separation, does not apply to delayed entry program separation, pay grade waiver granted by the U.S. Coast Guard Recruiting Center.
ECA	Previous military separation, does not apply to delayed entry program separation, lost time waiver granted by the highest authority level.
ECB	Previous military separation, does not apply to delayed entry program separation, lost time waiver granted by the Recruiting Command Headquarters level.
ECC	Previous military separation, does not apply to delayed entry program separation, lost time waiver granted by the U.S. Marine Corps Regional Command level.
ECD	Previous military separation, does not apply to delayed entry program separation, lost time waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
ECE	Previous military separation, does not apply to delayed entry program separation, lost time waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
ECF	Previous military separation, does not apply to delayed entry program separation, lost time waiver granted by the U.S. Coast Guard Recruiting Center.
EDA	Previous military separation, does not apply to delayed entry program separation, condition that existed prior to service waiver granted by the highest authority level.
EDB	Previous military separation, does not apply to delayed entry program separation, condition that existed prior to service waiver granted by the Recruiting Command Headquarters level.
EDC	Previous military separation, does not apply to delayed entry program separation, condition that existed prior to service waiver granted by the U.S. Marine Corps Regional Command level.
EDD	Previous military separation, does not apply to delayed entry program separation, condition that existed prior to service waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
EDE	Previous military separation, does not apply to delayed entry program separation, condition that existed prior to service waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
EDF	Previous military separation, does not apply to delayed entry program separation, condition that existed prior to service waiver granted by the U.S. Coast Guard Recruiting Center.
EEA	Previous military separation, does not apply to delayed entry program separation, skill requirement waiver granted by the highest authority level.
EEB	Previous military separation, does not apply to delayed entry program separation, skill requirement waiver granted by the Recruiting Command Headquarters level.
EEC	Previous military separation, does not apply to delayed entry program separation, skill requirement waiver granted by the U.S. Marine Corps Regional Command level.
EED	Previous military separation, does not apply to delayed entry program separation, skill requirement waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.

Table A.1—Continued

Code	Explanation
EEE	Previous military separation, does not apply to delayed entry program separation, skill requirement waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
EEF	Previous military separation, does not apply to delayed entry program separation, skill requirement waiver granted by the U.S. Coast Guard Recruiting Center.
FAA	Drug involvement not considered a law violation with alcohol abuse waiver granted by the highest authority level.
FAB	Drug involvement not considered a law violation with alcohol abuse waiver granted by the Recruiting Command Headquarters level.
FAC	Drug involvement not considered a law violation with alcohol abuse waiver granted by the U.S. Marine Corps Regional Command level.
FAD	Drug involvement not considered a law violation with alcohol abuse waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
FAE	Drug involvement not considered a law violation with alcohol abuse waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
FAF	Drug involvement not considered a law violation with alcohol abuse waiver granted by the U.S. Coast Guard Recruiting Center.
FBA	Drug involvement not considered a law violation with marijuana usage waiver granted by the highest authority level.
FBB	Drug involvement not considered a law violation with marijuana usage waiver granted by the Recruiting Command Headquarters level.
FBC	Drug involvement not considered a law violation with marijuana usage waiver granted by the U.S. Marine Corps Regional Command level.
FBD	Drug involvement not considered a law violation with marijuana usage waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
FBE	Drug involvement not considered a law violation with marijuana usage waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
FBF	Drug involvement not considered a law violation with marijuana usage waiver granted by the U.S. Coast Guard Recruiting Center.
FCA	Drug involvement not considered a law violation with other drug usage waiver granted by the highest authority level.
FCB	Drug involvement not considered a law violation with other drug usage waiver granted by the Recruiting Command Headquarters level.
FCC	Drug involvement not considered a law violation with other drug usage waiver granted by the U.S. Marine Corps Regional Command level.
FCD	Drug involvement not considered a law violation with other drug usage waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
FCE	Drug involvement not considered a law violation with other drug usage waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
FCF	Drug involvement not considered a law violation with other drug usage waiver granted by the U.S. Coast Guard Recruiting Center.
FDA	Drug involvement not considered a law violation with drug and alcohol test positive waiver granted by the highest authority level.

Table A.1—Continued

Code	Explanation
FDB	Drug involvement not considered a law violation with drug and alcohol test positive waiver granted by the Recruiting Command Headquarters level.
FDC	Drug involvement not considered a law violation with drug and alcohol test positive waiver granted by the U.S. Marine Corps Regional Command level.
FDD	Drug involvement not considered a law violation with drug and alcohol test positive waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
FDE	Drug involvement not considered a law violation with drug and alcohol test positive waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
FDF	Drug involvement not considered a law violation with drug and alcohol test positive waiver granted by the U.S. Coast Guard Recruiting Center.
HAA	Medical disqualification height waiver by the highest authority level.
HAB	Medical disqualification height waiver granted by the Recruiting Command Headquarters level.
HAC	Medical disqualification height waiver granted by the U.S. Marine Corps Regional Command level.
HAD	Medical disqualification height waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
HAE	Medical disqualification height waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
HAF	Medical disqualification height waiver granted by the U.S. Coast Guard Recruiting Center.
HBA	Medical disqualification weight waiver granted by the highest authority level.
HBB	Medical disqualification weight waiver granted by the Recruiting Command Headquarters level.
HBC	Medical disqualification weight waiver granted by the U.S. Marine Corps Regional Command level.
HBD	Medical disqualification weight waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
HBE	Medical disqualification weight waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
HBF	Medical disqualification weight waiver granted by the U.S. Coast Guard Recruiting Center.
HCA	Medical disqualification Disease Classification (ICD-9) waiver granted by the highest authority level.
HCB	Medical disqualification Disease Classification (ICD-9) waiver granted by the Recruiting Command Headquarters level.
HCC	Medical disqualification Disease Classification (ICD-9) waiver granted by the U.S. Marine Corps Regional Command level.
HCD	Medical disqualification Disease Classification (ICD-9) waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
HCE	Medical disqualification Disease Classification (ICD-9) waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
HCF	Medical disqualification Disease Classification (ICD-9) waiver granted by the U.S. Coast Guard Recruiting Center.
JYA	Sole surviving family member waiver granted by the highest authority level.
JYB	Sole surviving family member waiver granted by the Recruiting Command Headquarters level.
JYC	Sole surviving family member waiver granted by the U.S. Marine Corps Regional Command level.

Table A.1—Continued

Code	Explanation
JYD	Sole surviving family member waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
JYE	Sole surviving family member waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
JYF	Sole surviving family member waiver granted by the U.S. Coast Guard Recruiting Center.
KYA	Minimum education requirement waiver granted by the highest authority level.
KYB	Minimum education requirement waiver granted by the Recruiting Command Headquarters level.
KYC	Minimum education requirement waiver granted by the U.S. Marine Corps Regional Command level.
KYD	Minimum education requirement waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
KYE	Minimum education requirement waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
KYF	Minimum education requirement waiver granted by the U.S. Coast Guard Recruiting Center.
LYA	Aliens who have traveled or resided in a nation whose interests are inimical to those of the United States (also applies to aliens whose spouse, parent, brother, sister, or children currently reside in such a nation) waiver granted by the highest authority level.
LYB	Aliens who have traveled or resided in a nation whose interests are inimical to those of the United States (also applies to aliens whose spouse, parent, brother, sister, or children currently reside in such a nation) waiver granted by the Recruiting Command Headquarters level.
LYC	Aliens who have traveled or resided in a nation whose interests are inimical to those of the United States (also applies to aliens whose spouse, parent, brother, sister, or children currently reside in such a nation) waiver granted by the U.S. Marine Corps Regional Command level.
LYD	Aliens who have traveled or resided in a nation whose interests are inimical to those of the United States (also applies to aliens whose spouse, parent, brother, sister, or children currently reside in such a nation) waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
LYE	Aliens who have traveled or resided in a nation whose interests are inimical to those of the United States (also applies to aliens whose spouse, parent, brother, sister, or children currently reside in such a nation) waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
LYF	Aliens who have traveled or resided in a nation whose interests are inimical to those of the United States (also applies to aliens whose spouse, parent, brother, sister, or children currently reside in such a nation) waiver granted by the U.S. Coast Guard Recruiting Center.
MYA	Refusal or failure to complete a loyalty certificate (includes derogatory information entered on a loyalty certificate) waiver granted by the highest authority level.
MYB	Refusal or failure to complete a loyalty certificate (includes derogatory information entered on a loyalty certificate) waiver granted by the Recruiting Command Headquarters level.
MYC	Refusal or failure to complete a loyalty certificate (includes derogatory information entered on a loyalty certificate) waiver granted by the U.S. Marine Corps Regional Command level.
MYD	Refusal or failure to complete a loyalty certificate (includes derogatory information entered on a loyalty certificate) waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
MYE	Refusal or failure to complete a loyalty certificate (includes derogatory information entered on a loyalty certificate) waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.

Table A.1—Continued

Code	Explanation
MYF	Refusal or failure to complete a loyalty certificate (includes derogatory information entered on a loyalty certificate) waiver granted by the U.S. Coast Guard Recruiting Center.
NYA	Conscientious objector waiver granted by the highest authority level.
NYB	Conscientious objector waiver granted by the Recruiting Command Headquarters level.
NYC	Conscientious objector waiver granted by the U.S. Marine Corps Regional Command level.
NYD	Conscientious objector waiver granted by the U.S. Army Brigade, U.S. Marine Corps District, U.S. Navy Area, or U.S. Air Force Group level.
NYE	Conscientious objector waiver granted by the U.S. Army Battalion, U.S. Navy District, U.S. Marine Corps Recruiting Station, or U.S. Air Force Squadron level.
NYF	Conscientious objector waiver granted by the U.S. Coast Guard Recruiting Center.
PYA	Army Service Administrative Waiver – Service unique waiver policy granted at the highest authority level.
PYB	Army Service Administrative Waiver – Service unique waiver policy granted at the Recruiting Headquarters level.
PYD	Army Service Administrative Waiver – Service unique waiver policy granted at the Army Brigade level.
PYE	Army Service Administrative Waiver – Service unique waiver policy granted at the Army Battalion level.
QYA	Air Force Service Administrative Waiver – Service unique waiver policy granted by the highest authority level.
QYB	Air Force Service Administrative Waiver – Service unique waiver policy granted by the Recruiting Headquarters level.
QYD	Air Force Service Administrative Waiver – Service unique waiver policy granted by the U.S. Air Force Group level.
QYE	Air Force Service Administrative Waiver – Service unique waiver policy granted by the U.S. Air Force Squadron level.
RYA	Navy Service Administrative Waiver – Service unique waiver policy granted at the highest authority level.
RYB	Navy Service Administrative Waiver – Service unique waiver policy granted at the Recruiting Headquarters level.
RYD	Navy Service Administrative Waiver – Service unique waiver policy granted at the Navy Area level.
RYE	Navy Service Administrative Waiver – Service unique waiver policy granted at the Navy district level.
SYA	U.S. Coast Guard Service Administrative Waiver – Service unique waiver policy granted at the Recruiting Center level.
XYA	Marine Corps Service Administrative Waiver – Service unique waiver policy granted at the highest authority level.
XYB	Marine Corps Service Administrative Waiver – Service unique waiver policy granted at the Recruiting Headquarters level.
XYC	Marine Corps Service Administrative Waiver – Service unique waiver policy granted at the Regional Command (U.S. Marine Corps only) level.
XYD	Marine Corps Service Administrative Waiver – Service unique waiver policy granted at the U.S. Marine Corps District level.

Table A.1—Continued

Code	Explanation
XYE	Marine Corps Service Administrative Waiver – Service unique waiver policy granted at the U.S. Marine Corps Recruiting Station level.
XXB	Marine Corps Service Administrative Waiver – U.S. Marine Corps Medical Rehabilitation Program (MREP) granted at the Recruiting Headquarters level.
XXE	Marine Corps Service Administrative Waiver – U.S. Marine Corps Medical Rehabilitation Program (MREP) granted at the U.S. Marine Corps Recruiting Station level.
XXF	Marine Corps Service Administrative Waiver – U.S. Marine Corps Medical Rehabilitation Program (MREP) granted at the U.S. Coast Guard Recruiting Center.
YYY	No condition currently exists requiring a waiver; however, there may be administrative conditions that exist.

NOTE: ASVAB = Armed Services Vocational Aptitude Battery.

Descriptive Statistics and Regression Results

Tables B.1 and B.2 show descriptive statistics, by waiver status, using the FY 2001 to FY 2012 data. Table B.3 shows the regression results for DEP loss. Table B.4 shows results for outcomes conditional on accession: specifically, first-term loss, suspension of favorable person status, demotion, and transition to warrant officer and to commission officer. Table B.5 shows regression results conditional on failure to complete the first term, and Table B.6 shows regression results conditional on completing 36 months of service or conditional on completing the first term. Table B.7 corresponds to Table 7.2 and shows the number of personnel estimated to have each outcome per 1,000 accessions for each waiver type and waiver workflow history type. Tables B.8 and B.9 show regression results regarding the legalization of marijuana.

Table B.1
Means for FY 2001 to FY 2012 Accession Cohorts, Overall and by Waiver Category

Variable	Metric	Overall	Any	Any = 1	DB = 0	DB = 1	NTO = 0	NTO = 1	DAT = 0	DAT = 1	Weight = 0	Weight = 1	Med. = 0	Med. = 1
Female	Mean	0.167	0.142	0.171	0.167	0.062	0.173	0.076	0.168	0.090	0.167	0.269	0.167	0.163
	SD	0.373	0.350	0.377	0.373	0.242	0.378	0.266	0.374	0.287	0.373	0.444	0.373	0.370
Age at contract = 21 or younger	Mean	0.568	0.455	0.588	0.569	0.283	0.578	0.408	0.568	0.538	0.568	0.625	0.569	0.544
	SD	0.495	0.498	0.492	0.495	0.451	0.494	0.491	0.495	0.499	0.495	0.484	0.495	0.498
Age at contract = 22–24	Mean	0.124	0.154	0.118	0.124	0.218	0.120	0.180	0.123	0.162	0.124	0.128	0.123	0.134
	SD	0.329	0.361	0.323	0.329	0.413	0.325	0.384	0.329	0.368	0.329	0.334	0.329	0.341
Age at contract = 25–30	Mean	0.115	0.150	0.109	0.115	0.217	0.113	0.162	0.116	0.099	0.116	0.078	0.115	0.117
	SD	0.320	0.357	0.312	0.319	0.412	0.316	0.369	0.320	0.299	0.320	0.268	0.319	0.322
Age at contract = 31–35	Mean	0.032	0.043	0.030	0.032	0.062	0.032	0.036	0.032	0.016	0.032	0.011	0.032	0.030
	SD	0.176	0.202	0.171	0.176	0.241	0.176	0.186	0.177	0.126	0.177	0.105	0.177	0.170
Age at contract = 36+	Mean	0.016	0.019	0.016	0.016	0.005	0.017	0.010	0.016	0.001	0.016	0.007	0.016	0.024
	SD	0.126	0.138	0.124	0.126	0.072	0.128	0.099	0.127	0.035	0.126	0.084	0.124	0.153
Race/Ethnicity = Asian	Mean	0.032	0.028	0.033	0.032	0.017	0.033	0.020	0.032	0.012	0.032	0.024	0.032	0.038
	SD	0.177	0.166	0.178	0.177	0.131	0.179	0.139	0.177	0.108	0.177	0.152	0.175	0.191
Race/Ethnicity = Black	Mean	0.174	0.141	0.180	0.174	0.047	0.177	0.115	0.173	0.209	0.174	0.120	0.176	0.145
	SD	0.379	0.348	0.384	0.379	0.212	0.382	0.319	0.379	0.407	0.379	0.326	0.381	0.352
Race/Ethnicity = Hispanic	Mean	0.107	0.093	0.110	0.107	0.088	0.109	0.084	0.108	0.077	0.107	0.135	0.108	0.091
	SD	0.309	0.290	0.313	0.310	0.283	0.311	0.278	0.310	0.267	0.309	0.341	0.311	0.287

Variable	Metric	Overall	Any	Any = 1	DB = 0	DB = 1	NTO = 0	NTO = 1	DAT = 0	DAT = 1	Weight = 0	Weight = 1	Med. = 0	Med. = 1
Race/Ethnicity = Other	Mean	0.020	0.015	0.021	0.020	0.017	0.020	0.014	0.020	0.019	0.020	0.017	0.020	0.016
	SD	0.139	0.123	0.142	0.139	0.131	0.140	0.118	0.139	0.135	0.139	0.128	0.140	0.124
Never married, no kids	Mean	0.761	0.730	0.767	0.761	0.761	0.762	0.752	0.761	0.811	0.761	0.809	0.759	0.791
	SD	0.426	0.444	0.423	0.426	0.427	0.426	0.432	0.426	0.391	0.426	0.393	0.427	0.407
Never married, kids	Mean	0.022	0.030	0.021	0.022	0.038	0.021	0.041	0.022	0.034	0.022	0.020	0.022	0.022
	SD	0.148	0.170	0.144	0.148	0.190	0.144	0.198	0.148	0.181	0.148	0.140	0.148	0.145
Married, no kids	Mean	0.073	0.063	0.075	0.073	0.055	0.074	0.062	0.073	0.053	0.073	0.067	0.073	0.066
	SD	0.260	0.243	0.263	0.260	0.227	0.261	0.240	0.260	0.225	0.260	0.250	0.261	0.248
Married, kids	Mean	0.121	0.154	0.115	0.121	0.113	0.121	0.121	0.121	0.087	0.121	0.091	0.122	0.102
	SD	0.326	0.361	0.319	0.326	0.316	0.326	0.326	0.326	0.282	0.326	0.288	0.327	0.303
Formerly married, no kids	Mean	0.011	0.011	0.011	0.011	0.015	0.011	0.011	0.011	0.006	0.011	0.005	0.011	0.011
	SD	0.104	0.102	0.105	0.104	0.121	0.104	0.104	0.105	0.077	0.104	0.073	0.104	0.104
Formerly married, kids	Mean	0.010	0.012	0.010	0.010	0.019	0.010	0.014	0.010	0.008	0.010	0.007	0.010	0.008
	SD	0.101	0.111	0.099	0.101	0.137	0.100	0.116	0.101	0.091	0.101	0.081	0.101	0.091
Three-year enlistment	Mean	0.466	0.465	0.467	0.467	0.408	0.464	0.505	0.466	0.468	0.467	0.409	0.469	0.433
	SD	0.499	0.499	0.499	0.499	0.491	0.499	0.500	0.499	0.499	0.499	0.492	0.499	0.496
Four-year enlistment	Mean	0.346	0.365	0.343	0.346	0.442	0.345	0.363	0.346	0.406	0.346	0.378	0.346	0.358
	SD	0.476	0.481	0.475	0.476	0.497	0.475	0.481	0.476	0.491	0.476	0.485	0.476	0.479
Five-year enlistment	Mean	0.101	0.085	0.104	0.101	0.075	0.103	0.062	0.101	0.065	0.101	0.128	0.100	0.110
	SD	0.301	0.279	0.305	0.301	0.263	0.304	0.241	0.302	0.246	0.301	0.334	0.300	0.313

Table B.1—Continued

Variable	Metric	Overall	Any	Any = 1	DB = 0	DB = 1	NTO = 0	NTO = 1	DAT = 0	DAT = 1	Weight = 0	Weight = 1	Med. = 0	Med. = 1
Six-year enlistment	Mean	0.086	0.085	0.086	0.086	0.076	0.087	0.070	0.086	0.061	0.086	0.085	0.085	0.099
	SD	0.281	0.279	0.281	0.281	0.264	0.282	0.255	0.281	0.239	0.281	0.279	0.279	0.299
AFQT category I–IIIA	Mean	0.652	0.693	0.645	0.652	0.786	0.649	0.700	0.652	0.690	0.652	0.628	0.649	0.699
	SD	0.476	0.461	0.479	0.476	0.410	0.477	0.458	0.476	0.462	0.476	0.483	0.477	0.459
Not Tier 1	Mean	0.137	0.168	0.132	0.137	0.075	0.131	0.231	0.136	0.223	0.137	0.162	0.139	0.110
	SD	0.344	0.373	0.338	0.344	0.264	0.338	0.421	0.343	0.416	0.344	0.368	0.346	0.313
College degree	Mean	0.048	0.061	0.046	0.048	0.068	0.049	0.035	0.048	0.009	0.048	0.026	0.046	0.075
	SD	0.214	0.239	0.209	0.213	0.252	0.215	0.184	0.214	0.096	0.214	0.160	0.210	0.263
Some college	Mean	0.092	0.110	0.089	0.092	0.154	0.091	0.104	0.092	0.067	0.092	0.097	0.091	0.110
	SD	0.289	0.313	0.284	0.289	0.361	0.288	0.305	0.289	0.250	0.289	0.296	0.287	0.313
Prior service	Mean	0.089	0.001	0.105	0.089	0.000	0.094	0.000	0.090	0.000	0.089	0.000	0.095	0.000
	SD	0.285	0.025	0.306	0.285	0.021	0.292	0.014	0.286	0.011	0.285	0.000	0.293	0.022
During screening process: ever received ICD-9 code for ADHD	Mean	0.001	0.008	0.000	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.001	0.000	0.019
	SD	0.037	0.090	0.012	0.037	0.030	0.038	0.020	0.037	0.015	0.037	0.032	0.013	0.136
During screening process: ever received ICD-9 code for anxiety or depression	Mean	0.002	0.006	0.001	0.002	0.000	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.014
	SD	0.040	0.080	0.027	0.040	0.021	0.040	0.025	0.040	0.024	0.040	0.023	0.027	0.119
During screening process: ever disqualified for marijuana	Mean	0.002	0.014	0.000	0.002	0.000	0.001	0.029	0.002	0.019	0.002	0.002	0.002	0.003
	SD	0.049	0.117	0.018	0.049	0.000	0.026	0.169	0.047	0.136	0.049	0.042	0.048	0.052

Variable	Metric	Overall	Any	Any = 1	DB = 0	DB = 1	NTO = 0	NTO = 1	DAT = 0	DAT = 1	Weight = 0	Weight = 1	Med. = 0	Med. = 1
During screening process: ever received misconduct offense code for selected offenses	Mean	0.000	0.001	0.000	0.000	0.000	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.000
	SD	0.012	0.030	0.003	0.012	0.000	0.007	0.041	0.012	0.029	0.012	0.023	0.011	0.019
Enlistment waiver category: traffic offense	Mean	0.003	0.017	0.000			0.003	0.000	0.003	0.000	0.003	0.000	0.003	0.000
	SD	0.051	0.131	0.000			0.053	0.000	0.052	0.000	0.052	0.000	0.053	0.000
Enlistment waiver category: non-traffic offense	Mean	0.059	0.387	0.000	0.059	0.000			0.059	0.000	0.059	0.000	0.063	0.000
	SD	0.235	0.487	0.000	0.236	0.000			0.236	0.000	0.236	0.000	0.243	0.000
Enlistment waiver category: drug/alcohol	Mean	0.010	0.064	0.000	0.010	0.000	0.010	0.000			0.010	0.000	0.010	0.000
	SD	0.098	0.244	0.000	0.098	0.000	0.101	0.000			0.098	0.000	0.101	0.000
Enlistment waiver category: weight	Mean	0.005	0.030	0.000	0.005	0.000	0.005	0.000	0.005	0.000			0.005	0.000
	SD	0.067	0.170	0.000	0.067	0.000	0.069	0.000	0.068	0.000			0.070	0.000
Enlistment waiver category: medical (not weight)	Mean	0.064	0.418	0.000	0.064	0.000	0.068	0.000	0.064	0.000	0.064	0.000		
	SD	0.244	0.493	0.000	0.244	0.000	0.251	0.000	0.245	0.000	0.245	0.000		
Enlistment waiver category: other waiver	Mean	0.013	0.084	0.000	0.013	0.000	0.014	0.000	0.013	0.000	0.013	0.000	0.014	0.000
	SD	0.113	0.278	0.000	0.113	0.000	0.116	0.000	0.113	0.000	0.113	0.000	0.116	0.000

Table B.1—Continued

Variable	Metric	Overall	Any	Any = 1	DB = 0	DB = 1	NTO = 0	NTO = 1	DAT = 0	DAT = 1	Weight = 0	Weight = 1	Med. = 0	Med. = 1
No waiver	Mean	0.848			0.850	0.000	0.901	0.000	0.856	0.000	0.852	0.000	0.905	0.000
	SD	0.359			0.357	0.000	0.299	0.000	0.351	0.000	0.355	0.000	0.293	0.000
Months scheduled to be in the DEP	Mean	2.549	1.947	2.657	2.550	2.135	2.622	1.390	2.564	0.985	2.552	1.887	2.546	2.595
	SD	2.946	2.476	3.010	2.948	1.996	2.978	2.051	2.952	1.633	2.946	2.760	2.956	2.794
Transition to commissioned officer	Mean	0.011	0.011	0.011	0.011	0.016	0.011	0.011	0.011	0.009	0.011	0.007	0.011	0.012
	SD	0.105	0.103	0.106	0.105	0.126	0.106	0.102	0.106	0.095	0.106	0.081	0.105	0.110
Transition to warrant officer	Mean	0.030	0.029	0.030	0.030	0.030	0.031	0.014	0.030	0.005	0.030	0.009	0.029	0.032
	SD	0.170	0.167	0.170	0.170	0.170	0.172	0.116	0.170	0.071	0.170	0.094	0.169	0.177
Served first term	Mean	0.657	0.632	0.661	0.657	0.673	0.657	0.647	0.658	0.548	0.657	0.618	0.658	0.642
	SD	0.475	0.482	0.473	0.475	0.469	0.475	0.478	0.474	0.498	0.475	0.486	0.474	0.480
Demotion	Mean	0.141	0.168	0.137	0.141	0.170	0.137	0.214	0.140	0.296	0.141	0.146	0.142	0.126
	SD	0.348	0.374	0.343	0.348	0.376	0.344	0.410	0.347	0.457	0.348	0.353	0.349	0.332
No suspense of favorable person status	Mean	0.516	0.495	0.520	0.516	0.547	0.520	0.457	0.518	0.357	0.517	0.336	0.515	0.538
	SD	0.500	0.500	0.500	0.500	0.498	0.500	0.498	0.500	0.479	0.500	0.472	0.500	0.499
No bar to reenlistment	Mean	0.718	0.718	0.718	0.717	0.787	0.717	0.723	0.718	0.698	0.718	0.631	0.718	0.709
	SD	0.450	0.450	0.450	0.450	0.409	0.450	0.447	0.450	0.459	0.450	0.483	0.450	0.454
Reenlist	Mean	0.366	0.339	0.371	0.366	0.356	0.367	0.351	0.366	0.303	0.366	0.290	0.368	0.331
	SD	0.482	0.473	0.483	0.482	0.479	0.482	0.477	0.482	0.460	0.482	0.454	0.482	0.470

Variable	Metric	Overall	Any	Any = 1	DB = 0	DB = 1	NTO = 0	NTO = 1	DAT = 0	DAT = 1	Weight = 0	Weight = 1	Med. = 0	Med. = 1
Separation for misconduct: drug abuse	Mean	0.036	0.054	0.033	0.036	0.045	0.034	0.074	0.035	0.136	0.036	0.027	0.036	0.032
	SD	0.186	0.225	0.178	0.186	0.206	0.180	0.262	0.184	0.342	0.186	0.162	0.187	0.175
Separation for health-related reasons	Mean	0.099	0.104	0.098	0.099	0.076	0.100	0.085	0.099	0.080	0.099	0.168	0.098	0.122
	SD	0.299	0.305	0.298	0.299	0.264	0.300	0.279	0.299	0.271	0.299	0.374	0.297	0.327
Separation for performance-related reasons	Mean	0.049	0.044	0.049	0.049	0.033	0.050	0.034	0.049	0.042	0.049	0.053	0.048	0.052
	SD	0.215	0.205	0.217	0.215	0.179	0.217	0.182	0.215	0.200	0.215	0.224	0.215	0.223
Separation for misconduct, but not drugs	Mean	0.063	0.073	0.062	0.063	0.061	0.061	0.095	0.063	0.118	0.063	0.053	0.064	0.054
	SD	0.243	0.260	0.240	0.243	0.239	0.240	0.293	0.242	0.323	0.244	0.223	0.245	0.226
Separation for court martial–related reasons	Mean	0.029	0.034	0.028	0.029	0.037	0.028	0.044	0.028	0.070	0.029	0.028	0.029	0.021
	SD	0.167	0.180	0.164	0.167	0.189	0.164	0.205	0.166	0.255	0.167	0.164	0.168	0.143

SOURCES: Authors' tabulations of RA Analyst, TAPDB, and waiver workflow data.

NOTE: Any = any waiver; DB = serious traffic offense waiver; NTO = non-traffic offense waiver; DAT= drug/alcohol waiver; Med. = medical (not weight) waiver; SD = standard deviation.

Table B.2
Means for FY 2001 to FY 2012 Accession Cohorts, Overall and by Waiver Category

Variable	Metric	Overall	ADHD = 0	ADHD = 1	Marijuana = 0	Marijuana = 1	Anxiety/ Depression = 0	Anxiety/ Depression = 1
Female	Mean	0.167	0.167	0.040	0.167	0.059	0.167	0.195
	SD	0.373	0.373	0.196	0.373	0.236	0.373	0.397
Age at contract = 21 or less	Mean	0.568	0.568	0.712	0.568	0.367	0.568	0.516
	SD	0.495	0.495	0.453	0.495	0.482	0.495	0.500
Age at contract = 22–24	Mean	0.124	0.124	0.117	0.124	0.199	0.124	0.134
	SD	0.329	0.329	0.322	0.329	0.399	0.329	0.341
Age at contract = 25–30	Mean	0.115	0.116	0.058	0.115	0.172	0.115	0.134
	SD	0.320	0.320	0.234	0.319	0.378	0.320	0.341
Age at contract = 31–35	Mean	0.032	0.032	0.003	0.032	0.030	0.032	0.036
	SD	0.176	0.176	0.051	0.176	0.170	0.176	0.186
Age at contract = 36+	Mean	0.016	0.016	0.001	0.016	0.011	0.016	0.015
	SD	0.126	0.126	0.029	0.126	0.105	0.126	0.123
Race/Ethnicity = Asian	Mean	0.032	0.032	0.007	0.032	0.016	0.032	0.028
	SD	0.177	0.177	0.082	0.177	0.124	0.177	0.165
Race/Ethnicity = Black	Mean	0.174	0.174	0.046	0.174	0.164	0.174	0.083
	SD	0.379	0.379	0.210	0.379	0.371	0.379	0.276
Race/Ethnicity = Hispanic	Mean	0.107	0.107	0.035	0.107	0.082	0.107	0.089
	SD	0.309	0.310	0.184	0.310	0.274	0.309	0.285
Race/Ethnicity = Other	Mean	0.020	0.020	0.005	0.020	0.005	0.020	0.023
	SD	0.139	0.139	0.071	0.139	0.073	0.139	0.152

Table B.2—Continued

Variable	Metric	Overall	ADHD = 0	ADHD = 1	Marijuana = 0	Marijuana = 1	Anxiety/ Depression = 0	Anxiety/ Depression = 1
Never married, no kids	Mean	0.761	0.761	0.878	0.762	0.741	0.762	0.722
	SD	0.426	0.426	0.327	0.426	0.438	0.426	0.448
Never married, kids	Mean	0.022	0.022	0.010	0.022	0.041	0.022	0.019
	SD	0.148	0.148	0.101	0.148	0.199	0.148	0.137
Married, no kids	Mean	0.073	0.073	0.052	0.073	0.061	0.073	0.074
	SD	0.260	0.260	0.222	0.260	0.239	0.260	0.262
Married, kids	Mean	0.121	0.121	0.053	0.121	0.140	0.121	0.144
	SD	0.326	0.326	0.224	0.326	0.347	0.326	0.351
Formerly married, no kids	Mean	0.011	0.011	0.004	0.011	0.007	0.011	0.022
	SD	0.104	0.104	0.065	0.104	0.085	0.104	0.147
Formerly married, kids	Mean	0.010	0.010	0.003	0.010	0.010	0.010	0.018
	SD	0.101	0.101	0.051	0.101	0.098	0.101	0.134
Three-year enlistment	Mean	0.466	0.466	0.500	0.466	0.625	0.466	0.474
	SD	0.499	0.499	0.500	0.499	0.484	0.499	0.499
Four-year enlistment	Mean	0.346	0.347	0.287	0.347	0.258	0.346	0.330
	SD	0.476	0.476	0.452	0.476	0.438	0.476	0.470
Five-year enlistment	Mean	0.101	0.101	0.102	0.101	0.048	0.101	0.108
	SD	0.301	0.301	0.302	0.301	0.214	0.301	0.310
Six-year enlistment	Mean	0.086	0.086	0.112	0.086	0.068	0.086	0.089
	SD	0.281	0.281	0.315	0.281	0.252	0.281	0.285

Table B.2—Continued

Variable	Metric	Overall	ADHD = 0	ADHD = 1	Marijuana = 0	Marijuana = 1	Anxiety/ Depression = 0	Anxiety/ Depression = 1
AFQT category I–IIIA	Mean	0.652	0.652	0.712	0.652	0.717	0.652	0.677
	SD	0.476	0.476	0.453	0.476	0.450	0.476	0.468
Not Tier 1	Mean	0.137	0.137	0.155	0.137	0.158	0.137	0.165
	SD	0.344	0.344	0.362	0.344	0.365	0.344	0.371
College degree	Mean	0.048	0.048	0.028	0.048	0.036	0.048	0.048
	SD	0.214	0.214	0.165	0.214	0.185	0.214	0.215
Some college	Mean	0.092	0.092	0.073	0.092	0.096	0.092	0.098
	SD	0.289	0.289	0.261	0.289	0.295	0.289	0.298
Prior service	Mean	0.089	0.089	0.022	0.089	0.014	0.089	0.102
	SD	0.285	0.285	0.147	0.285	0.118	0.285	0.303
During screening process: ever received ICD-9 code for ADHD	Mean	0.001			0.001	0.001	0.001	0.012
	SD	0.037			0.037	0.038	0.037	0.111
During screening process: ever received ICD-9 code for anxiety, depression	Mean	0.002	0.002	0.015	0.002	0.000		
	SD	0.040	0.039	0.120	0.040	0.022		
During screening process: ever disqualified for marijuana	Mean	0.002	0.002	0.003			0.002	0.001
	SD	0.049	0.049	0.051			0.049	0.027

Variable	Metric	Overall	ADHD = 0	ADHD = 1	Marijuana = 0	Marijuana = 1	Anxiety/ Depression = 0	Anxiety/ Depression = 1
During screening process: ever received misconduct offense code for selected offenses	Mean	0.000	0.000	0.000	0.000	0.015	0.000	0.000
	SD	0.012	0.012	0.000	0.010	0.122	0.012	0.000
Enlistment waiver category: traffic offense	Mean	0.003	0.003	0.002	0.003	0.000	0.003	0.001
	SD	0.051	0.051	0.041	0.051	0.000	0.051	0.027
Enlistment waiver category: non-traffic offense	Mean	0.059	0.059	0.018	0.057	0.728	0.059	0.023
	SD	0.235	0.235	0.133	0.232	0.445	0.235	0.149
Enlistment waiver category: drug/alcohol	Mean	0.010	0.010	0.002	0.010	0.077	0.010	0.004
	SD	0.098	0.098	0.041	0.097	0.266	0.098	0.061
Enlistment waiver category: weight	Mean	0.005	0.005	0.003	0.005	0.003	0.005	0.001
	SD	0.067	0.067	0.058	0.067	0.058	0.067	0.038
Enlistment waiver category: medical (not weight)	Mean	0.064	0.062	0.883	0.064	0.072	0.063	0.579
	SD	0.244	0.242	0.321	0.244	0.258	0.243	0.494
Enlistment waiver category: other waiver	Mean	0.013	0.013	0.003	0.013	0.005	0.013	0.010
	SD	0.113	0.113	0.058	0.113	0.070	0.113	0.101
No waiver	Mean	0.848	0.849	0.089	0.850	0.115	0.849	0.383
	SD	0.359	0.358	0.284	0.357	0.319	0.358	0.486

Table B.2—Continued

Variable	Metric	Overall	ADHD = 0	ADHD = 1	Marijuana = 0	Marijuana = 1	Anxiety/ Depression = 0	Anxiety/ Depression = 1
Months scheduled to be in the DEP	Mean	2.549	2.549	2.641	2.551	1.694	2.550	1.850
	SD	2.946	2.946	2.735	2.948	1.933	2.946	2.709
Transition to commissioned officer	Mean	0.011	0.011	0.009	0.011	0.012	0.011	0.010
	SD	0.105	0.105	0.092	0.105	0.110	0.105	0.101
Transition to warrant officer	Mean	0.030	0.030	0.016	0.030	0.007	0.030	0.021
	SD	0.170	0.170	0.126	0.170	0.085	0.170	0.144
Served first term	Mean	0.657	0.657	0.668	0.657	0.672	0.657	0.512
	SD	0.475	0.475	0.471	0.475	0.470	0.475	0.500
Demotion	Mean	0.141	0.141	0.151	0.141	0.237	0.141	0.122
	SD	0.348	0.348	0.358	0.348	0.425	0.348	0.327
No suspense of favorable person status	Mean	0.516	0.516	0.493	0.517	0.451	0.516	0.551
	SD	0.500	0.500	0.500	0.500	0.498	0.500	0.498
No bar to reenlistment	Mean	0.718	0.718	0.673	0.718	0.601	0.718	0.778
	SD	0.450	0.450	0.469	0.450	0.490	0.450	0.416
Reenlist	Mean	0.366	0.366	0.330	0.366	0.324	0.366	0.275
	SD	0.482	0.482	0.470	0.482	0.468	0.482	0.447
Separation for misconduct: drug abuse	Mean	0.036	0.036	0.034	0.036	0.121	0.036	0.026
	SD	0.186	0.186	0.182	0.186	0.326	0.186	0.160

Table B.2—Continued

Variable	Metric	Overall	ADHD = 0	ADHD = 1	Marijuana = 0	Marijuana = 1	Anxiety/ Depression = 0	Anxiety/ Depression = 1
Separation for health-related reasons	Mean	0.099	0.099	0.132	0.099	0.073	0.099	0.277
	SD	0.299	0.299	0.339	0.299	0.261	0.299	0.448
Separation for performance-related reasons	Mean	0.049	0.049	0.072	0.049	0.034	0.049	0.054
	SD	0.215	0.215	0.258	0.215	0.180	0.215	0.227
Separation for misconduct, but not drugs	Mean	0.063	0.063	0.073	0.063	0.099	0.063	0.043
	SD	0.243	0.243	0.259	0.243	0.298	0.244	0.204
Separation for court martial–related reasons	Mean	0.029	0.029	0.020	0.029	0.023	0.029	0.016
	SD	0.167	0.167	0.139	0.167	0.150	0.167	0.126

SOURCES: Authors' tabulations of RA Analyst and TAPDB data.

NOTE: Means for the "Overall" column are computed using data on all accessions, not only all accessions without a waiver.

Table B.3
Regression Results for DEP Loss (Mean DEP Loss Rate = 11.3%, *N* = 952,551)

Variable	Estimated Risk Ratio	P-Value	Mean
Male	54.2%	0.000	0.818
Age at time of contract = 22–24	111.4%	0.000	0.165
Age at time of contract = 25–30	127.3%	0.000	0.126
Age at time of contract = 31–35	149.2%	0.000	0.037
Age at time of contract = 36+	109.9%	0.003	0.017
Married with children	72.8%	0.000	0.120
Married with no children	67.2%	0.000	0.070
Formerly married with children	95.4%	0.166	0.011
Formerly married with no children	102.5%	0.413	0.012
Single with children	114.9%	0.000	0.023
Asian	96.7%	0.089	0.031
African American	106.2%	0.000	0.171
Hispanic	104.1%	0.000	0.106
Other nonwhite non-Hispanic	100.0%	0.993	0.020
Some college	106.2%	0.000	0.094
Graduated college	82.6%	0.000	0.045
During screening: ever disqualified for marijuana	135.2%	0.000	0.003
During screening: ever received misconduct offense code for selected offenses	118.1%	0.428	0.000
During screening: ever received ICD-9 code for ADHD	53.4%	0.000	0.001
During screening: ever received ICD-9 code for anxiety, depression	50.6%	0.000	0.002
Enlistment waiver category: traffic offense	74.6%	0.000	0.003
Enlistment waiver category: non-traffic offense	74.9%	0.000	0.061
Enlistment waiver category: drug/alcohol	59.4%	0.000	0.010
Enlistment waiver category: weight	40.1%	0.000	0.005
Enlistment waiver category: medical (not weight)	105.3%	0.000	0.061
Enlistment waiver category: other waiver	62.2%	0.000	0.013
Months scheduled to be in the DEP	119.1%	0.000	2.539
Two-year term	170.9%	0.000	0.015
Three-year term	97.4%	0.001	0.449
Five-year term	96.8%	0.005	0.100
Six-year term	91.5%	0.000	0.084

Table B.3—Continued

Variable	Estimated Risk Ratio	P-Value	Mean
Education Tier 2	126.4%	0.000	0.142
AFQT category I–IIIA	91.4%	0.000	0.658
No health waiver but PULHES = 3	605.8%	0.000	0.046
Year of contract = 2002	93.1%	0.000	0.112
Year of contract = 2003	106.2%	0.000	0.101
Year of contract = 2004	106.6%	0.000	0.083
Year of contract = 2005	89.4%	0.000	0.083
Year of contract = 2006	85.5%	0.000	0.101
Year of contract = 2007	73.6%	0.000	0.093
Year of contract = 2008	75.0%	0.000	0.102
Year of contract = 2009	76.5%	0.000	0.110
Year of contract = 2010	70.2%	0.000	0.096
Year of contract = 2011	66.6%	0.000	0.022
Month of contract = January	109.3%	0.000	0.080
Month of contract = February	107.0%	0.000	0.076
Month of contract = March	111.5%	0.000	0.084
Month of contract = April	107.5%	0.000	0.079
Month of contract = June	92.7%	0.000	0.086
Month of contract = July	96.9%	0.051	0.087
Month of contract = August	96.1%	0.015	0.093
Month of contract = September	97.9%	0.193	0.089
Month of contract = October	106.0%	0.000	0.090
Month of contract = November	110.1%	0.000	0.079
Month of contract = December	110.4%	0.000	0.080
Prior military service	57.0%	0.000	0.091
Constant	11.8%	0.000	
Pseudo R^2	0.173		

SOURCES: Authors' calculations using RA Analyst, TAPDB, and waiver workflow data for FY 2000 to FY 2011 contracts.

Table B.4
Regression Results for Outcomes Conditional on Accession (*N* = 863,231)

Variable	Mean	Failure to Complete First Term (34.3%)		Suspension of Favorable Person Status (48.4%)		Demotion (14.1%)		Transition to Commissioned Officer (1.1%)		Transition to Warrant Officer (3.0%)	
		Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value
Male	0.833	55.2%	0.000	101.5%	0.000	137.4%	0.000	131.8%	0.000	147.9%	0.000
Age at time of contract = 22–24	0.168	89.5%	0.000	90.1%	0.000	71.0%	0.000	89.9%	0.000	151.0%	0.000
Age at time of contract = 25–30	0.127	88.7%	0.000	82.4%	0.000	59.5%	0.000	70.4%	0.000	125.7%	0.000
Age at time of contract = 31–35	0.036	88.3%	0.000	75.5%	0.000	51.8%	0.000	50.2%	0.000	73.9%	0.000
Age at time of contract = 36+	0.016	72.5%	0.000	65.7%	0.000	40.5%	0.000	36.0%	0.000	31.4%	0.000
Married with children	0.121	104.7%	0.000	96.1%	0.000	74.8%	0.000	59.5%	0.000	121.7%	0.000
Married with no children	0.073	104.4%	0.000	94.7%	0.000	76.4%	0.000	84.1%	0.000	134.4%	0.000
Formerly married with children	0.010	122.1%	0.000	104.5%	0.000	102.9%	0.348	80.5%	0.111	65.9%	0.000
Formerly married with no children	0.012	122.2%	0.000	97.6%	0.027	92.3%	0.008	94.9%	0.618	119.5%	0.000
Single with children	0.022	112.9%	0.000	104.8%	0.000	103.3%	0.059	63.7%	0.000	80.9%	0.000
Asian	0.032	67.9%	0.000	94.1%	0.000	78.9%	0.000	121.1%	0.000	98.3%	0.585
African American	0.174	86.0%	0.000	117.7%	0.000	155.2%	0.000	64.8%	0.000	100.1%	0.980
Hispanic	0.107	73.6%	0.000	106.6%	0.000	98.2%	0.060	85.5%	0.000	84.8%	0.000
Other nonwhite non-Hispanic	0.020	80.6%	0.000	115.3%	0.000	113.1%	0.000	68.0%	0.000	85.6%	0.012
Some college	0.092	98.5%	0.010	84.6%	0.000	79.2%	0.000	155.2%	0.000	329.7%	0.000

Table B.4—Continued

Variable	Mean	Failure to Complete First Term (34.3%)		Suspension of Favorable Person Status (48.4%)		Demotion (14.1%)		Transition to Commissioned Officer (1.1%)		Transition to Warrant Officer (3.0%)	
		Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value
Graduated college	0.048	145.9%	0.000	55.8%	0.000	47.3%	0.000	132.6%	0.000	1330.5%	0.000
During screening: ever disqualified for marijuana	0.002	99.1%	0.798	102.9%	0.238	119.7%	0.000	94.3%	0.776	44.8%	0.002
During screening: ever received misconduct offense code for selected offenses	0.000	90.1%	0.245	101.2%	0.855	131.9%	0.016	107.9%	0.897	72.3%	0.586
During screening: ever received ICD-9 code for ADHD	0.001	93.3%	0.101	105.4%	0.080	105.8%	0.433	65.1%	0.175	67.6%	0.105
During screening: ever received ICD-9 code for anxiety, depression	0.002	129.9%	0.000	95.4%	0.110	92.7%	0.302	92.9%	0.784	71.2%	0.085
Enlistment waiver category: traffic offense	0.003	92.8%	0.014	112.7%	0.000	160.3%	0.000	127.2%	0.147	62.0%	0.000
Enlistment waiver category: non-traffic offense	0.059	103.5%	0.000	113.3%	0.000	154.0%	0.000	95.6%	0.328	50.3%	0.000
Enlistment waiver category: drug/alcohol	0.010	129.3%	0.000	130.8%	0.000	198.0%	0.000	86.4%	0.202	28.5%	0.000
Enlistment waiver category: weight	0.005	102.8%	0.221	134.4%	0.000	99.7%	0.951	59.7%	0.008	44.0%	0.000
Enlistment waiver category: medical (not weight)	0.064	103.6%	0.000	98.5%	0.001	97.1%	0.012	99.5%	0.911	94.3%	0.032
Enlistment waiver category: other waiver	0.013	112.2%	0.000	95.9%	0.000	95.5%	0.143	85.6%	0.209	233.5%	0.000
Months scheduled to be in the DEP	2.550	98.5%	0.000	98.9%	0.000	97.7%	0.000	102.7%	0.000	103.8%	0.000

Table B.4—Continued

Variable	Mean	Failure to Complete First Term (34.3%)		Suspension of Favorable Person Status (48.4%)		Demotion (14.1%)		Transition to Commissioned Officer (1.1%)		Transition to Warrant Officer (3.0%)	
		Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value
Three-year term	0.466	84.7%	0.000	84.2%	0.000	80.5%	0.000	92.0%	0.001	261.1%	0.000
Five-year term	0.101	91.5%	0.000	97.0%	0.000	90.3%	0.000	78.2%	0.000	87.3%	0.000
Six-year term	0.086	92.8%	0.000	105.4%	0.000	96.8%	0.002	60.2%	0.000	163.4%	0.000
Education Tier 2	0.137	137.6%	0.000	118.2%	0.000	145.2%	0.000	46.3%	0.000	29.2%	0.000
AFQT category I–IIIA	0.653	93.9%	0.000	91.2%	0.000	87.3%	0.000	183.6%	0.000	461.4%	0.000
No health waiver but PULHES = 3	0.021	149.6%	0.000	88.9%	0.000	85.3%	0.000	85.7%	0.082	81.9%	0.000
Year of accession = 2002	0.086	101.2%	0.051	85.5%	0.000	91.3%	0.000	94.6%	0.208	207.6%	0.000
Year of accession = 2003	0.082	101.4%	0.037	87.1%	0.000	99.5%	0.695	99.0%	0.810	208.4%	0.000
Year of accession = 2004	0.090	100.8%	0.234	86.9%	0.000	104.9%	0.000	97.3%	0.515	179.0%	0.000
Year of accession = 2005	0.080	89.3%	0.000	94.3%	0.000	114.7%	0.000	97.3%	0.545	191.6%	0.000
Year of accession = 2006	0.091	80.9%	0.000	103.5%	0.000	120.8%	0.000	97.1%	0.526	207.2%	0.000
Year of accession = 2007	0.091	83.7%	0.000	106.5%	0.000	122.6%	0.000	94.5%	0.235	186.1%	0.000
Year of accession = 2008	0.091	87.2%	0.000	104.4%	0.000	121.5%	0.000	106.7%	0.157	160.5%	0.000
Year of accession = 2009	0.079	91.5%	0.000	101.2%	0.024	114.5%	0.000	125.5%	0.000	137.5%	0.000
Year of accession = 2010	0.085	92.2%	0.000	101.5%	0.002	110.3%	0.000	113.4%	0.002	100.1%	0.971
Year of accession = 2011	0.073	96.0%	0.000	102.3%	0.000	102.2%	0.101	104.9%	0.262	78.7%	0.000
Month of accession = January	0.113	99.0%	0.153	99.0%	0.064	100.9%	0.520	83.5%	0.000	95.1%	0.109
Month of accession = February	0.083	101.8%	0.020	98.5%	0.009	99.7%	0.787	101.8%	0.736	95.5%	0.181

Variable	Mean	Failure to Complete First Term (34.3%)		Suspension of Favorable Person Status (48.4%)		Demotion (14.1%)		Transition to Commissioned Officer (1.1%)		Transition to Warrant Officer (3.0%)	
		Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value	Estimated Risk Ratio	P-Value
Month of accession = March	0.078	102.5%	0.001	99.0%	0.090	101.5%	0.283	116.6%	0.003	98.6%	0.695
Month of accession = April	0.076	99.0%	0.203	100.9%	0.142	101.2%	0.413	101.3%	0.817	87.3%	0.000
Month of accession = June	0.099	99.0%	0.201	101.7%	0.003	106.1%	0.000	99.1%	0.859	120.9%	0.000
Month of accession = July	0.105	96.0%	0.000	101.2%	0.026	103.6%	0.007	95.8%	0.401	113.2%	0.000
Month of accession = August	0.107	97.3%	0.000	99.0%	0.063	99.5%	0.675	96.4%	0.472	94.1%	0.064
Month of accession = September	0.084	99.2%	0.304	98.4%	0.004	95.9%	0.002	128.9%	0.000	93.2%	0.037
Month of accession = October	0.091	105.0%	0.000	99.1%	0.097	97.3%	0.047	153.9%	0.000	104.7%	0.167
Month of accession = November	0.074	107.1%	0.000	99.7%	0.617	98.2%	0.207	140.5%	0.000	99.5%	0.889
Month of accession = December	0.015	96.5%	0.012	100.7%	0.507	105.2%	0.040	94.4%	0.564	99.2%	0.894
Prior military service	0.089	71.7%	0.000	102.1%	0.000	111.8%	0.000	86.1%	0.004	214.9%	0.000
Constant		127.7%	0.000	115.8%	0.000	16.7%	0.000	0.7%	0.000	0.1%	0.000
Pseudo R²		0.039		0.034		0.043		0.031		0.286	

SOURCES: Authors' calculations using RA Analyst, TAPDB, and waiver workflow data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

Table B.5
Regression Results for Outcomes Conditional on Failure to Complete First Term (*N* = 219,737)

Variable	Mean	Separation for Health-Related Reasons (33.5%)		Separation for Performance-Related Reasons (18.0%)		Separation for Misconduct, but not Drugs (16.0%)		Separation for Misconduct: Drug Abuse (9.6%)		Separation Because of Court Martial or in Lieu of Court Martial (7.9%)	
		Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value
Male	0.743	106.7%	0.000	95.5%	0.000	242.7%	0.000	309.9%	0.000	218.6%	0.000
Age at time of contract = 22–24	0.143	114.0%	0.000	100.7%	0.625	73.7%	0.000	98.3%	0.404	89.6%	0.000
Age at time of contract = 25–30	0.094	122.5%	0.000	107.5%	0.000	62.7%	0.000	89.4%	0.000	88.8%	0.000
Age at time of contract = 31–35	0.025	134.8%	0.000	121.1%	0.000	53.3%	0.000	80.5%	0.000	82.8%	0.001
Age at time of contract = 36+	0.008	147.9%	0.000	135.8%	0.000	47.4%	0.000	73.6%	0.002	87.7%	0.188
Married with children	0.106	92.2%	0.000	94.4%	0.001	77.8%	0.000	67.6%	0.000	107.8%	0.005
Married with no children	0.066	106.8%	0.000	99.8%	0.883	75.8%	0.000	71.5%	0.000	110.9%	0.001
Formerly married with children	0.010	94.5%	0.079	79.2%	0.000	90.6%	0.096	90.4%	0.184	106.1%	0.424
Formerly married with no children	0.012	101.1%	0.691	100.9%	0.836	101.6%	0.774	71.2%	0.000	93.6%	0.394
Single with children	0.026	86.6%	0.000	89.4%	0.000	96.4%	0.255	104.6%	0.253	107.0%	0.134
Asian	0.021	87.5%	0.000	126.4%	0.000	91.0%	0.020	90.0%	0.049	100.8%	0.875
African American	0.182	61.6%	0.000	96.7%	0.008	165.5%	0.000	163.1%	0.000	98.0%	0.328
Hispanic	0.089	81.6%	0.000	105.4%	0.001	111.6%	0.000	119.0%	0.000	100.2%	0.958
Other nonwhite non-Hispanic	0.019	78.6%	0.000	98.0%	0.559	132.1%	0.000	100.3%	0.967	106.8%	0.228
Some college	0.075	102.4%	0.043	103.3%	0.069	88.8%	0.000	79.7%	0.000	95.3%	0.142

Table B.5—Continued

Variable	Mean	Separation for Health-Related Reasons (33.5%)		Separation for Performance-Related Reasons (18.0%)		Separation for Misconduct, but not Drugs (16.0%)		Separation for Misconduct: Drug Abuse (9.6%)		Separation Because of Court Martial or in Lieu of Court Martial (7.9%)	
		Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value
Graduated college	0.022	97.4%	0.228	93.6%	0.045	65.4%	0.000	42.8%	0.000	62.3%	0.000
During screening: ever disqualified for marijuana	0.003	75.7%	0.000	85.0%	0.160	97.6%	0.788	164.4%	0.000	77.5%	0.191
During screening: ever received misconduct offense code for selected offenses	0.000	98.1%	0.918	71.0%	0.439	110.7%	0.663	155.9%	0.049	28.6%	0.070
During screening: ever received ICD-9 code for ADHD	0.001	99.3%	0.928	136.7%	0.004	88.5%	0.388	92.3%	0.660	72.0%	0.192
During screening: ever received ICD-9 code for anxiety, depression	0.002	168.9%	0.000	79.5%	0.039	50.3%	0.000	72.0%	0.066	39.4%	0.001
Enlistment waiver category: traffic offense	0.002	69.7%	0.000	62.3%	0.000	152.8%	0.000	194.9%	0.000	123.8%	0.108
Enlistment waiver category: non-traffic offense	0.065	72.4%	0.000	70.3%	0.000	135.8%	0.000	179.2%	0.000	107.9%	0.005
Enlistment waiver category: drug/alcohol	0.014	57.1%	0.000	58.7%	0.000	132.4%	0.000	271.2%	0.000	121.0%	0.000
Enlistment waiver category: weight	0.005	117.2%	0.000	111.4%	0.108	83.1%	0.019	65.9%	0.000	83.8%	0.107
Enlistment waiver category: medical (not weight)	0.065	118.3%	0.000	99.2%	0.649	88.3%	0.000	91.9%	0.004	80.0%	0.000
Enlistment waiver category: other waiver	0.013	92.6%	0.007	92.2%	0.064	103.6%	0.533	89.9%	0.195	107.6%	0.303
Months scheduled to be in the DEP	2.460	101.6%	0.000	101.6%	0.000	98.7%	0.000	98.2%	0.000	92.6%	0.000

Table B.5—Continued

| Variable | Mean | Separation for Health-Related Reasons (33.5%) | | Separation for Performance-Related Reasons (18.0%) | | Separation for Misconduct, but not Drugs (16.0%) | | Separation for Misconduct: Drug Abuse (9.6%) | | Separation Because of Court Martial or in Lieu of Court Martial (7.9%) | |
		Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value
Three-year term	0.427	108.5%	0.000	109.8%	0.000	86.0%	0.000	93.0%	0.000	89.4%	0.000
Five-year term	0.103	115.9%	0.000	90.2%	0.000	90.9%	0.000	80.7%	0.000	86.5%	0.000
Six-year term	0.088	101.6%	0.162	104.6%	0.009	101.8%	0.358	82.6%	0.000	117.7%	0.000
Education Tier 2	0.194	87.4%	0.000	90.6%	0.000	118.9%	0.000	99.5%	0.801	148.9%	0.000
AFQT category I–IIIA	0.626	104.4%	0.000	96.9%	0.004	89.6%	0.000	109.6%	0.000	99.4%	0.692
No health waiver but PULHES = 3	0.027	163.2%	0.000	103.2%	0.301	69.0%	0.000	41.7%	0.000	37.4%	0.000
Year of accession = 2002	0.095	111.9%	0.000	101.8%	0.309	81.9%	0.000	72.7%	0.000	98.2%	0.558
Year of accession = 2003	0.089	123.8%	0.000	85.1%	0.000	75.6%	0.000	85.0%	0.000	94.4%	0.075
Year of accession = 2004	0.099	120.0%	0.000	97.2%	0.098	70.6%	0.000	89.9%	0.000	89.9%	0.001
Year of accession = 2005	0.080	123.3%	0.000	55.7%	0.000	79.7%	0.000	110.1%	0.002	106.8%	0.034
Year of accession = 2006	0.082	105.2%	0.000	26.1%	0.000	104.7%	0.034	126.6%	0.000	156.3%	0.000
Year of accession = 2007	0.086	111.5%	0.000	36.7%	0.000	106.0%	0.006	143.3%	0.000	119.3%	0.000
Year of accession = 2008	0.091	126.5%	0.000	46.7%	0.000	111.7%	0.000	139.7%	0.000	80.3%	0.000
Year of accession = 2009	0.078	127.4%	0.000	68.3%	0.000	110.4%	0.000	132.0%	0.000	56.4%	0.000
Year of accession = 2010	0.078	112.3%	0.000	96.4%	0.050	109.6%	0.000	146.6%	0.000	32.7%	0.000
Year of accession = 2011	0.070	115.7%	0.000	91.4%	0.000	106.6%	0.005	151.8%	0.000	32.5%	0.000
Month of accession = January	0.111	98.8%	0.403	90.5%	0.000	103.1%	0.199	96.0%	0.202	116.2%	0.000
Month of accession = February	0.084	99.3%	0.616	95.5%	0.049	102.0%	0.422	98.0%	0.540	104.1%	0.283

Table B.5—Continued

Variable	Mean	Separation for Health-Related Reasons (33.5%)		Separation for Performance-Related Reasons (18.0%)		Separation for Misconduct, but not Drugs (16.0%)		Separation for Misconduct: Drug Abuse (9.6%)		Separation Because of Court Martial or in Lieu of Court Martial (7.9%)	
		Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value
Month of accession = March	0.079	98.6%	0.354	95.9%	0.068	102.3%	0.381	100.8%	0.812	109.3%	0.018
Month of accession = April	0.077	98.5%	0.328	100.6%	0.794	102.2%	0.409	94.5%	0.103	101.7%	0.650
Month of accession = June	0.097	97.7%	0.130	94.3%	0.010	107.2%	0.004	96.1%	0.234	106.6%	0.095
Month of accession = July	0.100	97.3%	0.071	93.1%	0.002	107.8%	0.002	97.0%	0.360	112.5%	0.002
Month of accession = August	0.105	98.4%	0.268	95.4%	0.032	102.0%	0.403	103.4%	0.292	109.9%	0.008
Month of accession = September	0.085	100.1%	0.980	97.8%	0.337	95.8%	0.095	111.3%	0.001	104.9%	0.200
Month of accession = October	0.094	96.0%	0.007	97.9%	0.344	100.2%	0.943	95.7%	0.181	128.9%	0.000
Month of accession = November	0.079	94.6%	0.000	104.7%	0.044	95.4%	0.070	92.2%	0.018	140.2%	0.000
Month of accession = December	0.012	102.0%	0.519	76.0%	0.000	117.1%	0.001	91.5%	0.183	121.1%	0.008
Prior military service	0.040	53.0%	0.000	33.2%	0.000	185.3%	0.000	124.0%	0.000	92.6%	0.060
Constant		46.7%	0.000	38.0%	0.000	9.9%	0.000	3.1%	0.000	5.2%	0.000
Pseudo R²		0.031		0.044		0.061		0.037		0.065	

SOURCES: Authors' calculations using RA Analyst, TAPDB, and waiver workflow data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

Table B.6
Regression Results for Outcomes Conditional on Completing 36 Months and Conditional on Completing First Term

| Variable | Conditional on Completing 36 Months | | | | | Conditional on Completing First Term | | | | | | |
| | | PULHES Physical Condition = 3 | | PULHES Psychiatric Condition = 3 | | | Barred from Reenlistment | | Reenlist, Conditional on not Being Barred from Reenlistment | | Promotion to E5[a] | |
	Mean	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Mean	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value
Male	0.866	49.9%	0.000	73.3%	0.000	0.872	96.3%	0.000	97.3%	0.000	109.2%	0.000
Age at time of contract = 22–24	0.171	106.8%	0.022	115.3%	0.002	0.171	95.1%	0.000	100.9%	0.029	110.0%	0.000
Age at time of contract = 25–30	0.129	109.9%	0.005	109.5%	0.106	0.130	89.5%	0.000	102.8%	0.000	105.1%	0.000
Age at time of contract = 31–35	0.037	120.9%	0.000	103.2%	0.727	0.037	85.7%	0.000	102.4%	0.004	98.5%	0.437
Age at time of contract = 36+	0.018	135.6%	0.000	114.9%	0.171	0.018	79.6%	0.000	100.0%	0.981	82.0%	0.000
Married with children	0.122	112.8%	0.000	119.0%	0.001	0.124	94.6%	0.000	126.0%	0.000	112.1%	0.000
Married with no children	0.072	113.3%	0.001	102.3%	0.721	0.072	95.0%	0.000	117.5%	0.000	110.6%	0.000
Formerly married with children	0.010	121.5%	0.016	100.3%	0.987	0.010	106.8%	0.002	115.3%	0.000	103.2%	0.366
Formerly married with no children	0.011	105.0%	0.550	116.5%	0.261	0.011	99.5%	0.786	106.5%	0.000	97.0%	0.363
Single with children	0.021	101.8%	0.797	112.8%	0.263	0.021	103.7%	0.008	113.6%	0.000	100.6%	0.804
Asian	0.036	78.4%	0.000	60.0%	0.000	0.036	89.7%	0.000	100.4%	0.585	91.2%	0.000
African American	0.175	109.4%	0.001	69.3%	0.000	0.175	109.1%	0.000	123.2%	0.000	88.8%	0.000
Hispanic	0.117	79.3%	0.000	64.5%	0.000	0.119	105.6%	0.000	107.2%	0.000	96.1%	0.000
Other nonwhite non-Hispanic	0.020	89.0%	0.118	48.9%	0.000	0.021	111.3%	0.000	113.4%	0.000	85.5%	0.000
Some college	0.096	96.2%	0.245	85.3%	0.007	0.095	84.3%	0.000	94.9%	0.000	131.3%	0.000
Graduated college	0.042	84.1%	0.000	62.1%	0.000	0.041	64.9%	0.000	83.5%	0.000	172.2%	0.000
During screening: ever disqualified for marijuana	0.002	144.9%	0.049	109.7%	0.718	0.002	99.2%	0.831	102.7%	0.374	103.4%	0.667

| Variable | Conditional on Completing 36 Months | | | | | Conditional on Completing First Term | | | | | | |
| | Mean | PULHES Physical Condition = 3 | | PULHES Psychiatric Condition = 3 | | Mean | Barred from Reenlistment | | Reenlist, Conditional on not Being Barred from Reenlistment | | Promotion to E5[a] | |
		Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value		Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value
During screening: ever received misconduct offense code for selected offenses	0.000	67.1%	0.501	140.8%	0.568	0.000	81.5%	0.077	98.3%	0.803	89.2%	0.550
During screening: ever received ICD-9 code for ADHD	0.001	24.3%	0.000	860.4%	0.000	0.001	187.0%	0.001	19.3%	0.546	59.3%	0.000
During screening: ever received ICD-9 code for anxiety, depression	0.001	23.3%	0.000	542.3%	0.000	0.001	92.7%	0.196	93.7%	0.104	78.3%	0.023
Enlistment waiver category: traffic offense	0.003	78.7%	0.280	82.8%	0.619	0.003	101.4%	0.730	97.4%	0.294	120.4%	0.000
Enlistment waiver category: non-traffic offense	0.058	103.8%	0.452	130.7%	0.000	0.058	104.0%	0.000	100.7%	0.216	107.0%	0.000
Enlistment waiver category: drug/alcohol	0.008	90.9%	0.460	176.5%	0.000	0.008	118.3%	0.000	98.4%	0.291	91.1%	0.006
Enlistment waiver category: weight	0.004	245.7%	0.000	120.1%	0.377	0.004	165.2%	0.000	93.1%	0.003	62.1%	0.000
Enlistment waiver category: medical (not weight)	0.063	1,025.1%	0.000	457.4%	0.000	0.062	108.0%	0.000	100.8%	0.168	95.9%	0.002
Enlistment waiver category: other waiver	0.011	120.5%	0.029	132.8%	0.034	0.011	99.0%	0.603	103.2%	0.021	100.8%	0.779
Months scheduled to be in the DEP	2.613	96.7%	0.000	97.0%	0.000	2.604	99.9%	0.377	99.7%	0.000	100.0%	0.953
Three-year term	0.455	98.5%	0.529	99.7%	0.944	0.485	88.0%	0.000	91.8%	0.000	N/A	N/A
Five-year term	0.104	91.1%	0.009	89.9%	0.083	0.101	84.1%	0.000	89.8%	0.000	N/A	N/A
Six-year term	0.090	100.7%	0.850	91.7%	0.174	0.087	82.7%	0.000	86.1%	0.000	N/A	N/A
Education Tier 2	0.117	100.5%	0.884	130.6%	0.000	0.118	111.8%	0.000	105.5%	0.000	72.7%	0.000

| | Conditional on Completing 36 Months | | | | | Conditional on Completing First Term | | | | | | |
| | PULHES Physical Condition = 3 | | PULHES Psychiatric Condition = 3 | | | Barred from Reenlistment | | Reenlist, Conditional on not Being Barred from Reenlistment | | Promotion to E5[a] | |
Variable	Mean	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Mean	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value
AFQT category I–IIIA	0.659	99.6%	0.856	88.9%	0.002	0.650	92.7%	0.000	90.7%	0.000	126.5%	0.000
No health waiver but PULHES = 3	0.018	1,141.9%	0.000	657.4%	0.000	0.018	108.3%	0.000	101.4%	0.224	100.5%	0.854
Year of accession = 2002	0.082	146.6%	0.000	113.5%	0.137	0.082	80.2%	0.000	99.1%	0.147	132.9%	0.000
Year of accession = 2003	0.078	132.9%	0.000	123.7%	0.013	0.078	63.1%	0.000	102.8%	0.000	128.5%	0.000
Year of accession = 2004	0.086	169.8%	0.000	148.7%	0.000	0.087	48.3%	0.000	106.1%	0.000	126.0%	0.000
Year of accession = 2005	0.080	105.2%	0.278	123.7%	0.010	0.081	42.0%	0.000	109.0%	0.000	115.6%	0.000
Year of accession = 2006	0.094	132.9%	0.000	135.0%	0.000	0.095	42.8%	0.000	109.5%	0.000	103.7%	0.006
Year of accession = 2007	0.093	110.5%	0.020	119.4%	0.022	0.093	63.7%	0.000	106.3%	0.000	92.0%	0.000
Year of accession = 2008	0.093	99.2%	0.859	146.8%	0.000	0.093	91.0%	0.000	100.7%	0.269	91.9%	0.000
Year of accession = 2009	0.081	102.6%	0.575	184.9%	0.000	0.080	106.0%	0.000	98.1%	0.004	97.6%	0.102
Year of accession = 2010	0.089	89.3%	0.013	224.5%	0.000	0.089	117.2%	0.000	102.9%	0.000	89.0%	0.000
Year of accession = 2011	0.076	68.2%	0.000	202.6%	0.000	0.075	122.1%	0.000	100.2%	0.751	77.1%	0.000
Month of accession = January	0.114	111.1%	0.017	109.1%	0.233	0.114	95.1%	0.000	95.0%	0.000	102.7%	0.071
Month of accession = February	0.081	105.2%	0.284	112.0%	0.146	0.081	96.1%	0.000	96.9%	0.000	100.0%	0.991
Month of accession = March	0.076	84.4%	0.001	86.5%	0.083	0.076	97.4%	0.010	98.1%	0.009	98.5%	0.342
Month of accession = April	0.075	88.4%	0.013	91.6%	0.290	0.076	99.4%	0.544	98.8%	0.097	96.6%	0.042
Month of accession = June	0.101	90.5%	0.041	94.0%	0.452	0.101	96.7%	0.001	100.3%	0.643	95.9%	0.006
Month of accession = July	0.109	94.5%	0.234	92.8%	0.357	0.109	97.0%	0.002	98.6%	0.034	94.3%	0.000

| Variable | Mean | Conditional on Completing 36 Months | | | | Mean | Conditional on Completing First Term | | | | | |
| | | PULHES Physical Condition = 3 | | PULHES Psychiatric Condition = 3 | | | Barred from Reenlistment | | Reenlist, Conditional on not Being Barred from Reenlistment | | Promotion to E5[a] | |
		Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value		Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value	Est. Risk Ratio	P-Value
Month of accession = August	0.109	96.3%	0.413	92.2%	0.307	0.109	97.7%	0.013	96.4%	0.000	98.7%	0.396
Month of accession = September	0.084	96.1%	0.406	107.9%	0.342	0.084	99.2%	0.468	96.8%	0.000	100.7%	0.654
Month of accession = October	0.088	104.6%	0.337	106.2%	0.447	0.088	96.2%	0.000	98.8%	0.078	99.9%	0.977
Month of accession = November	0.071	101.4%	0.782	106.5%	0.444	0.070	96.8%	0.002	98.8%	0.090	97.9%	0.196
Month of accession = December	0.016	127.7%	0.001	126.3%	0.046	0.016	94.9%	0.004	101.1%	0.385	99.7%	0.914
Prior military service	0.100	116.8%	0.000	126.2%	0.000	0.104	93.6%	0.000	127.5%	0.000	138.9%	0.000
Constant		1.7%	0.000	0.5%	0.000		92.5%	0.000	115.6%	0.000	41.3%	0.000
Pseudo R²		0.142		0.097			0.045		0.047		0.043	

SOURCES: Authors' calculations using RA Analyst, TAPDB, and waiver workflow data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

[a] The analysis of promotion to E5 is conditional on having a four-year term and completion of a four-year term, so variables for other term lengths are not included in this analysis.

Table B.7
Predicted Outcomes Out of 1,000 Accessions

	All	Serious Traffic Waiver	Non-Traffic Offense Waiver	Drug/Alcohol Waiver	Weight Waiver	Other Health Waiver	Marijuana History and Non-Traffic Offense Waiver	ADHD History with Medical Waiver	Depression/Anxiety History with Medical Waiver
DEP attrition	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Failure to complete first term	343	318	355	444	353	355	320	332	459
Health-related separation	115	74	86	85	139	141	57	131	224
Performance-related separation	62	36	45	47	71	63	34	81	50
Misconduct-related separation (not drugs)	55	85	88	134	43	51	68	42	25
Misconduct-related separation, drugs	33	60	61	116	22	31	55	27	23
Court martial–related separation	27	31	30	43	23	23	27	15	9
Demotion	141	227	218	280	141	137	279	145	121
Suspension	484	545	548	633	650	476	562	503	437
Bar to reenlistment	208	219	212	208	339	220	222	266	205
Significant physical limitation	13	10	13	12	31	130	19	37	35
Significant psychiatric limitation	5	4	6	8	5	21	7	145	102
Transition to warrant officer	30	18	15	8	13	28	11	19	20
Transition to commissioned	11	14	11	10	7	11	12	7	10
Reenlistment	268	269	260	204	171	255	282	247	248
Promoted to E5	79	94	83	71	49	75	90	32	60

NOTE: Green indicates that waivered recruits have a lower likelihood, that is both statistically significant and larger than 10 percent, of adverse outcome than similar, nonwaivered recruits. Blue indicates that the difference is not statistically significant and/or larger than 10 percent. Red indicates that waivered recruits have a higher likelihood, that is both statistically significant and larger than 10 percent, of an adverse outcome.

Table B.8
Difference-in-Differences Regression Results for Legalization of Medical Marijuana

Variable	Constant	After Legalization	N	R²
Failure to complete first term	0.337[a]	−0.029[b]	813	0.290
Suspension of favorable person status	0.477[a]	0.008	813	0.420
Demotion	0.107[a]	−0.015[c]	813	0.401
Transition to warrant officer	0.012[a]	−0.001	813	0.603
Transition to commissioned officer	0.013[a]	0.001	813	0.465
Separation for entry level performance	0.063[a]	−0.010[c]	813	0.374
Separation for physical condition, not a disability	0.033[a]	−0.004	813	0.326
Separation for failing medical or physical standard	0.047[a]	−0.018[b]	813	0.238
Separation for unsatisfactory performance	0.014[a]	0.000	813	0.303
Separation for misconduct: drug abuse	0.029[a]	−0.005	813	0.128
Separation for a commission of a serious offense	0.021[a]	0.003	813	0.214
PULHES physical condition = 3	0.014[a]	−0.001	813	0.279
PULHES psychiatric = 3	0.009[a]	0.001	813	0.221
Barred from reenlistment	0.470[a]	0.005	813	0.860
Reenlist	0.317[a]	0.009	813	0.488

NOTE: Regressions also include state and fiscal year fixed effects.

[a] Statistically significant at the 1-percent level.

[b] Statistically significant at the 5-percent level.

[c] Statistically significant at the 10-percent level.

Table B.9
Difference-in-Differences Regression Results for Legalization of Recreational Marijuana

Variable	Constant	After Legalization	N	R^2
Failure to complete first term	0.327[a]	0.012	813	0.283
Suspension of favorable person status	0.480[a]	−0.032[b]	813	0.421
Demotion	0.102[a]	−0.015	813	0.397
Transition to warrant officer	0.012[a]	−0.009[b]	813	0.606
Transition to commissioned officer	0.013[a]	−0.001	813	0.465
Separation for entry level performance	0.060[a]	−0.008	813	0.370
Separation for physical condition, not a disability	0.032[a]	−0.006	813	0.324
Separation for failing medical or physical standard	0.040[a]	0.053	813	0.257
Separation for unsatisfactory performance	0.015[a]	−0.005[c]	813	0.306
Separation for misconduct: drug abuse	0.027[a]	−0.014	813	0.128
Separation for a commission of a serious offense	0.022[a]	0.018	813	0.230
PULHES physical condition = 3	0.014[a]	0.009	813	0.287
PULHES psychiatric = 3	0.009[a]	0.003	813	0.222
Barred from reenlistment	0.471[a]	−0.031	813	0.860
Reenlist	0.320[a]	0.055	813	0.493

NOTE: Regressions also include state and fiscal year fixed effects.

[a] Statistically significant at the 1-percent level.

[b] Statistically significant at the 5-percent level.

[c] Statistically significant at the 10-percent level.

Recruit Selection Tool Results with Increasing the Share of Older and AFQT Category I–IIIA Recruits

Tables C.1 through C.4 present the RST results. Tables C.1 and C.2 show the simulated effects of mitigating waivers (Table C.1) and a documented history of marijuana, ADHD, and depression/anxiety (Table C.2) with older recruits. Similarly, Tables C.3 and C.4 show the simulated effects of mitigating waivers (Table C.3) and a documented history of marijuana, ADHD, and depression/anxiety (Table C.4) with higher-aptitude recruits.

Table C.1
Mitigating Waivers with Older Recruits, Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

	Baseline	Serious Traffic Waivers		Non-Traffic Offense Waivers		Drug/Alcohol Waivers		Weight Waivers		Medical Waivers	
		20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits
Selected recruit characteristics											
Ages 22 and older	28.8%	33.0%	50.0%	30.3%	50.0%	26.6%	50.0%	27.5%	50.0%	29.0%	50.0%
Tier 2	13.6%	12.5%	12.0%	15.1%	14.8%	15.4%	15.0%	14.2%	13.9%	13.3%	13.0%
AFQT category I–IIIA	65.6%	67.9%	69.1%	65.9%	67.0%	65.9%	67.0%	64.7%	66.0%	65.9%	67.1%
Serious traffic waiver	0.3%	20.0%	20.0%	0.2%	0.3%	0.2%	0.3%	0.2%	0.3%	0.2%	0.3%
Non-traffic offense waiver	5.9%	4.8%	4.9%	20.0%	20.0%	4.8%	5.3%	4.7%	5.3%	5.0%	5.5%
Drug/alcohol waiver	1.0%	0.8%	0.8%	0.8%	0.8%	20.0%	20.0%	0.8%	0.8%	0.8%	0.8%
Weight waiver	0.5%	0.4%	0.3%	0.4%	0.4%	0.4%	0.3%	20.0%	20.0%	0.4%	0.4%
Medical waiver	6.4%	5.1%	5.0%	5.4%	5.4%	5.1%	5.2%	5.1%	5.3%	20.0%	20.0%
Selected outcomes											
First term attrition, given accession	34.3%	34.0%	33.5%	34.8%	33.9%	36.4%	35.8%	35.1%	34.4%	34.5%	34.1%
Separation for:											
Health-related separation	9.9%	9.5%	9.1%	9.7%	9.3%	9.6%	9.2%	11.3%	10.8%	10.3%	9.8%
Performance-related separation	4.9%	4.6%	4.3%	4.7%	4.3%	4.7%	4.4%	5.0%	4.6%	4.9%	4.6%
Misconduct-related separation (not drugs)	6.3%	6.3%	5.8%	6.8%	6.2%	7.4%	6.6%	6.1%	5.4%	6.2%	5.5%

Table C.1—Continued

	Baseline	Serious Traffic Waivers		Non-Traffic Offense Waivers		Drug/Alcohol Waivers		Weight Waivers		Medical Waivers	
		20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits
Misconduct-related separation, drugs	3.6%	3.8%	3.6%	4.2%	3.9%	5.5%	5.2%	3.4%	3.4%	3.5%	3.2%
Court martial–related separation	2.9%	3.0%	2.9%	3.1%	2.9%	3.7%	3.4%	2.8%	2.6%	2.8%	2.5%
Demotion	14.1%	14.7%	13.8%	15.2%	14.0%	17.0%	15.8%	14.2%	12.8%	13.9%	12.6%
Suspension of favorable person status	48.4%	47.8%	46.3%	49.3%	47.4%	51.4%	49.4%	51.9%	49.7%	48.1%	45.9%
Bar to reenlistment	28.2%	26.8%	25.9%	28.2%	27.1%	28.6%	27.5%	30.0%	28.7%	28.4%	27.2%
Reenlistment	36.6%	36.4%	37.4%	36.4%	38.4%	35.4%	36.8%	35.1%	36.6%	36.1%	37.3%

SOURCES: Authors' update for RST (see Orvis et al., 2018) using RA Analyst and TAPDB data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

Table C.2

Mitigating Documented History of Marijuana, ADHD, and Depression/Anxiety with Older Recruits, Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

	Baseline	Marijuana		ADHD		Depression/Anxiety	
		20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits	20.0%	20.0% with 50% Older Recruits
Selected recruit characteristics							
Ages 22 and older	28.8%	31.2%	50.0%	26.6%	50.0%	29.4%	50.0%
Tier 2	13.6%	14.1%	14.0%	14.1%	13.2%	14.3%	13.9%
AFQT category I–IIIA	65.6%	66.5%	67.8%	66.4%	68.5%	65.7%	66.8%
Documented history of marijuana	0.2%	20.0%	20.0%	0.2%	0.3%	0.2%	0.2%
Documented history of ADHD	0.1%	0.1%	0.1%	20.0%	20.0%	0.4%	30.0%
Documented history of depression/anxiety	0.2%	0.1%	0.1%	0.4%	0.4%	20.0%	20.0%
Selected outcomes							
First term attrition, given accession	34.3%	34.0%	33.3%	34.1%	32.7%	37.2%	36.4%
Separation for:							
Health-related separation	9.9%	9.4%	9.0%	10.6%	9.8%	13.5%	12.8%
Performance-related separation	4.9%	4.6%	4.2%	5.3%	4.6%	5.0%	4.4%
Misconduct-related separation (not drugs)	6.3%	7.0%	6.5%	6.5%	5.6%	5.9%	5.3%
Misconduct-related separation, drugs	3.6%	5.3%	5.0%	3.6%	3.1%	3.4%	3.2%
Court martial–related separation	2.9%	2.8%	2.6%	2.7%	2.5%	2.6%	2.4%
Demotion	14.1%	16.1%	15.0%	14.3%	15.0%	13.7%	12.4%
Suspension of favorable person status	48.4%	49.7%	48.0%	48.8%	47.8%	47.7%	45.8%
Bar to reenlistment	28.2%	30.6%	29.7%	29.1%	29.5%	27.0%	26.0%
Reenlistment	36.6%	35.8%	37.0%	35.9%	36.4%	34.8%	36.3%

SOURCES: Authors' update for RST (see Orvis et al., 2018) using RA Analyst and TAPDB data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

Table C.3
Mitigating Waivers with Higher-Aptitude Recruits, Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

	Baseline	Serious Traffic Waivers		Non-Traffic Offense Waivers		Drug/Alcohol Waivers		Weight Waivers		Medical Waivers	
		20.0%	20.0% with 50% Cat I–IIIA	20.0%	20.0% with 75% Cat I–IIIA	20.0%	20.0% with 75% Cat I–IIIA	20.0%	20.0% with 75% Cat I–IIIA	20.0%	20.0% with 75% Cat I–IIIA
Selected recruit characteristics											
Ages 22 and older	28.8%	33.0%	33.5%	30.3%	30.8%	26.6%	29.0%	27.5%	28.0%	29.0%	29.5%
Tier 2	13.6%	12.5%	12.6%	15.1%	15.3%	15.4%	15.6%	14.2%	14.3%	13.3%	13.5%
AFQT category I–IIIA	65.6%	67.9%	75.0%	65.9%	75.0%	65.9%	75.0%	64.7%	75.0%	65.9%	75.0%
Serious traffic waiver	0.3%	20.0%	20.0%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Non-traffic offense waiver	5.9%	4.8%	4.8%	20.0%	20.0%	4.8%	4.8%	4.7%	4.8%	5.0%	5.1%
Drug/alcohol waiver	1.0%	0.8%	0.8%	0.8%	0.8%	20.0%	20.0%	0.8%	0.8%	0.8%	0.8%
Weight waiver	0.5%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	20.0%	20.0%	0.4%	0.4%
Medical waiver	6.4%	5.1%	5.1%	5.4%	5.5%	5.1%	5.2%	5.1%	5.2%	20.0%	20.0%
Medical waiver											
First term attrition, given accession	34.3%	34.0%	34.0%	34.8%	34.5%	36.4%	36.5%	35.1%	35.1%	34.5%	34.6%
Separation for:											
Health-related separation	9.9%	9.5%	9.4%	9.7%	9.7%	9.6%	9.6%	11.3%	11.2%	10.3%	10.2%
Performance-related separation	4.9%	4.6%	4.5%	4.7%	4.6%	4.7%	4.7%	5.0%	4.9%	4.9%	4.9%
Misconduct-related separation (not drugs)	6.3%	6.3%	6.1%	6.8%	6.7%	7.4%	7.2%	6.1%	5.9%	6.2%	6.0%
Misconduct-related separation, drugs	3.6%	3.8%	3.7%	4.2%	4.1%	5.5%	5.6%	3.4%	3.4%	3.5%	3.5%

Table C.3—Continued

	Baseline	Serious Traffic Waivers		Non-Traffic Offense Waivers		Drug/Alcohol Waivers		Weight Waivers		Medical Waivers	
		20.0%	**20.0% with 50% Cat I–IIIA**	**20.0%**	**20.0% with 75% Cat I–IIIA**	**20.0%**	**20.0% with 75% Cat I–IIIA**	**20.0%**	**20.0% with 75% Cat I–IIIA**	**20.0%**	**20.0% with 75% Cat I–IIIA**
Court martial–related separation	2.9%	3.0%	3.0%	3.1%	3.0%	3.7%	3.6%	2.8%	2.8%	2.8%	2.7%
Demotion	14.1%	14.7%	14.6%	15.2%	15.0%	17.0%	16.9%	14.2%	13.9%	13.9%	13.7%
Suspension of favorable person status	48.4%	47.8%	47.4%	49.3%	48.8%	51.4%	51.0%	51.9%	51.4%	48.1%	47.5%
Bar to reenlistment	28.2%	26.8%	26.5%	28.2%	27.9%	28.6%	28.3%	30.0%	29.7%	28.4%	28.0%
Reenlistment	36.6%	36.4%	36.0%	36.4%	35.9%	35.4%	34.9%	35.1%	34.6%	36.1%	35.6%

SOURCES: Authors' update for RST (see Orvis et al., 2018) using RA Analyst and TAPDB data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018.

Table C.4

Mitigating Documented History of Marijuana, ADHD, and Depression/Anxiety with Higher-Aptitude Recruits, Percentage of FY 2001 to FY 2012 Accession Cohorts with Selected Characteristics and Outcomes, RST Historical and Simulated Percentages

	Baseline	Marijuana		ADHD		Depression/Anxiety	
		20.0%	20.0% with 75% Cat I–IIIA	20.0%	20.0% with 75% Cat I–IIIA	20.0%	20.0% with 75% Cat I–IIIA
Selected recruit characteristics							
Ages 22 and older	28.8%	31.2%	31.8%	26.6%	27.0%	29.4%	29.9%
Tier 2	13.6%	14.1%	14.6%	14.1%	14.3%	14.3%	14.4%
AFQT category I–IIIA	65.6%	66.5%	75.0%	66.4%	75.0%	65.7%	75.0%
Documented history of marijuana	0.2%	20.0%	20.0%	0.2%	0.3%	0.2%	0.2%
Documented history of ADHD	0.1%	0.1%	0.1%	20.0%	20.0%	0.4%	0.4%
Documented history of depression/anxiety	0.2%	0.1%	0.1%	0.4%	0.4%	20.0%	20.0%
Selected outcomes							
First term attrition, given accession	34.3%	34.0%	34.0%	34.1%	34.1%	37.2%	37.2%
Separation for:							
Health-related separation	9.9%	9.4%	9.4%	10.6%	10.5%	13.5%	13.4%
Performance-related separation	4.9%	4.6%	4.5%	5.3%	5.3%	5.0%	4.9%
Misconduct-related separation (not drugs)	6.3%	7.0%	6.8%	6.5%	6.3%	5.9%	5.7%
Misconduct-related separation, drugs	3.6%	5.3%	5.2%	3.6%	3.5%	3.4%	3.3%
Court martial–related separation	2.9%	2.8%	2.7%	2.7%	2.7%	2.6%	2.6%
Demotion	14.1%	16.1%	15.9%	14.3%	14.2%	13.7%	13.3%
Suspension of favorable person status	48.4%	49.7%	49.3%	48.8%	48.4%	47.7%	47.3%
Bar to reenlistment	28.2%	30.6%	30.3%	29.1%	28.8%	27.0%	26.8%
Reenlistment	36.6%	35.8%	35.3%	35.9%	35.5%	34.8%	34.4%

SOURCE: Authors' update for RST (see Orvis et al., 2018) using RA Analyst and TAPDB data for FY 2001 to FY 2012 accession cohorts tracked through FY 2018

Marijuana Legalization and Use and Their Effects on Health Risks, Behavior, and Performance

In this appendix, we present a narrative review of the current state of scientific evidence for the possible implications of expanded marijuana legalization on outcomes relevant to productivity and labor market outcomes. We first provide background on the marijuana policy context in the United States, describing nationwide trends in marijuana policy, perceptions regarding marijuana use, and marijuana use behaviors. We then review the literature examining the relationship of marijuana use with outcomes that might indirectly relate to labor market performance (e.g., cognitive functioning, mental health, crime and criminal justice outcomes) and academic performance; we focus on findings from high-quality systematic reviews, supplemented with findings from individual studies as relevant. Finally, we review evidence for the direct effects of marijuana use on labor market outcomes and job performance. This evidence uses studies of the general population, although we attempt to highlight research on older adolescents and young adults when possible, given the relevance of this age group for Army policy implications.

Trends in Marijuana Policy

The establishment of state-legal retail sales markets for marijuana, operational in nine U.S. states as of December 2018, has followed from a series of changes in state policy regarding the criminal penalties associated with marijuana use and supply (Pacula and Smart, 2017; Kilmer and MacCoun, 2017). These state efforts to move away from a strictly prohibitive stance toward marijuana began with marijuana depenalization or decriminalization policies in the 1970s, followed by medical marijuana laws in the late 1990s and recreational marijuana laws first passed in 2012.

Depenalization or decriminalization policies reduce or eliminate criminal penalties for possession of small amounts of marijuana for personal use but maintain criminal prohibitions associated with supply or distribution. Oregon was the first state to decriminalize marijuana possession in 1973, reclassifying possession of up to one ounce from a criminal offense to a civil violation (Pacula, Chriqui, and King, 2003). By 1980, ten other states had passed some type of depenalization, removing jail terms for simple possession but, in some cases, retaining the offense's criminal status as a misdemeanor. The subsequent decades have seen additional states implement policies to reduce or remove criminal penalties associated with marijuana possession, as well as some state efforts to recriminalize the drug.

In 1996, California became the first state to enact a medical marijuana law, which provided explicit legal protections to adult (i.e., age 18 and older) patients and their caregivers for possession and use of marijuana for specific medical conditions; by 1999, four more states had followed suit.[1] Unlike decriminalization policies, medical marijuana laws provided some legal protections for marijuana supply. Early state policies were often purposefully vague regarding an explicit supply source for medicinal marijuana, typically allowing for home cultivation by patients and/or their caregivers but not permitting dispensaries or group cultivation cooperatives (Pertwee, 2014; Pacula, Chriqui, et al., 2002). The mid-2000s saw a shift toward medical marijuana laws with more-precise regulatory language regarding supply sources, and every state adopting a new medical marijuana law since 2010 has included state-licensed dispensaries as a legal form of supply in the initiating legislation. This evolution toward more-tightly regulated state oversight of the medical marijuana industry has occurred alongside a shift toward more "medicalized" medical marijuana policies (Williams, Olfson, et al., 2016).

In November 2012, voters in Colorado and Washington became the first to approve recreational marijuana laws, legalizing the possession and use of marijuana for adults ages 21 and older and allowing for the production and sale of marijuana for recreational use. In 2014, Alaska and Oregon passed similar ballot initiatives, while voters in Washington, D.C., instead approved a recreational marijuana law that allowed adults to legally grow up to six plants in their primary residence and transfer up to one ounce of marijuana to another adult (age 21 or older) if there is no remuneration (Government of the District of Columbia, 2016).[2] Subsequently, seven additional states (California, Illinois, Maine, Massachusetts, Michigan, Nevada, and Vermont) have passed recreational marijuana laws, with all but one (Vermont) authorizing commercial markets for retail marijuana sales.

Trends in Perceptions of Marijuana and Its Use

Nationally representative data from household (e.g., the National Survey on Drug Use and Health [NSDUH]) and school-based (e.g., the Youth Risk Behavior Survey [YRBS] and Monitoring the Future [MTF]) surveys have documented substantial shifts in marijuana use perceptions and behaviors over the past several decades (Guttmannova et al., 2019).

According to data from the NSDUH, the percentage of respondents who perceived "great risk" from smoking marijuana once per month declined by 31 percent from 2002 to 2014 (i.e., from a prevalence of 38.3 percent in 2002 to 26.5 percent in 2014); reductions in risk perceptions occurred across all age groups, with the largest relative declines seen for young adults ages 18 to 25 (i.e., from a prevalence of 23.5 percent in 2002 to 13.5 percent in 2014; Azofeifa et al., 2016). Data from the MTF surveys show similar patterns but allow for trend analyses over a longer period (see Figure D.1). Among 12th grade students, the proportion of individuals reporting that regular marijuana use carries great risk fell from 79.5 percent in 1991 to about 33 percent in 2016 (Terry-McElrath et al., 2017). Trends are similar among young adults. In 2016, 30 percent of surveyed individuals ages 19 to 22 perceived regular marijuana smoking to

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[1] Technically, minors under age 18 can qualify as medical marijuana patients, but they are subject to more-stringent requirements with respect to qualifying conditions and therefore represent an insignificant share of all registered patients (Fairman, 2016; Smart, 2016).

[2] The sale of marijuana retains its criminal status, carrying a penalty of up to six months in jail and a fine of up to $1,000.

Figure D.1
Percentage of Respondents Reporting Belief That Smoking Marijuana Regularly Carries Great Risk, 1980–2017

SOURCES: MTF survey data on 8th-, 10th-, and 12th-graders taken from Johnston et al., 2018. MTF survey data on those in modal age group 19 to 22 taken from Schulenberg et al., 2017.

carry great risk, down from 75 percent in 1991 and the lowest rate observed since 1980 (Schulenberg et al., 2017).

Marijuana use among adults has increased over the past several years, consistent with declining perceptions of risk and social disapproval. Significant increases since 2002 in the prevalence of annual marijuana use among adults ages 18 and older have been documented across multiple surveys, although the magnitude of this relative increase varies substantially across data sets (Hasin et al., 2015; Grucza et al., 2016). Among adults, the rising prevalence of marijuana use has occurred across gender, geographic region, employment status, and education levels (Azofeifa et al., 2016), although studies suggest that the increase over the past decade has been more pronounced among low-income males (Carliner, Mauro, et al., 2017).

In contrast, marijuana use among adolescents has remained relatively stable over the same period. In 2017, about 12 percent of individuals ages 12 to 17 reported using marijuana in the past year, with about half of past-year users reporting use in the past month (Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, 2018). These rates are comparable to those from one decade prior (Azofeifa et al., 2016). The average age of marijuana use initiation (about 15 years of age) has also remained markedly similar among adolescents generally, as well as among student samples specifically (Keyes, Rutherford, and Miech, 2019; Azofeifa et al., 2016). Figure D.2 presents recent, nationally representative data on marijuana use prevalence. Of note, more than one in five young adults ages 18 to 25 reported using marijuana in the past month in 2017.

Given the dramatic changes in youth *perceptions* regarding marijuana use over the past decade, the absence of similar changes in marijuana *use prevalence* among adolescents has puzzled researchers. Some have posited that the historically strong link between the perceived

Figure D.2
Prevalence of Marijuana Use in Lifetime, Past Year, and Past Month, by Age, 2017

SOURCE: Data from the 2017 NSDUH (Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, 2018).

harmfulness of marijuana and marijuana consumption among adolescents might have weakened (Sarvet, Wall, Keyes, et al., 2018). Others have suggested that the perceived harm from marijuana use remains a strong predictive factor but that significant declines in adolescent use of cigarettes and alcohol over the past decade have counteracted the expected rise in marijuana prevalence because of changing risk perceptions (Miech, Johnston, and O'Malley, 2017; Fleming et al., 2016). Furthermore, comparisons of national trends might mask heterogeneity by state or by demographics (Terry-McElrath et al., 2017; Fleming et al., 2016), and analyses based on marijuana use prevalence typically fail to capture changes in the quantity consumed or in the use of more-potent marijuana products or more-potent methods of consumption.

Although some surveys ask respondents about the number of days of use, we know less about the quantity used on a given day of use, which limits our understanding of how the prevalence of heavy or chronic marijuana use has evolved over the past few decades. In terms of frequent marijuana use (typically measured as daily or near-daily use, i.e., individuals who used marijuana on more than 20 of the past 30 days or individuals who used marijuana on 300 or more days in the past year), twice as many individuals ages 12 and older report daily or near-daily marijuana use in 2017 compared with 2007 (Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, 2018). These increases have been driven primarily by use patterns among adults, with the highest rates of daily or near-daily use observed among individuals ages 18 to 25, although there has also been an increase in frequent marijuana use among adolescents who use marijuana (Mauro et al., 2018). Changing use patterns among daily and near-daily users of marijuana are difficult to assess but important to measure: Although they account for only one-third of the number of individuals who use marijuana, they account for more than two-thirds of the number of marijuana use days and of the quantity of marijuana purchased (Davenport and Caulkins, 2016).

Several studies have highlighted that adolescents and adults are consuming a wider variety of marijuana product types using a wider variety of methods. Because information on marijuana consumption with this level of specificity is not commonly collected through standard national- or state-representative surveys,[3] most of this research draws on information from social media or internet surveys. Findings generally show that smoking combustible marijuana flower remains the most prevalent method of consumption, but some surveys show comparable rates of vaporizing marijuana products (Russell et al., 2018). Studies that use small samples of high-school and college students have shown lifetime prevalence rates for vaping marijuana of 6 percent and 29 percent, respectively (Jones et al., 2016; Morean et al., 2015). Edible and drinkable marijuana products have also grown in popularity, and there has been a substantial increase in the popularity of *dabbing* (i.e., the inhalation of vaporized high-potency THC[4] butane hash oil concentrate, typically through a specialized device; Russell et al., 2018; Meacham, Paul, and Ramo, 2018; Knapp et al., 2019), particularly among young adult males (Daniulaityte et al., 2017; Meier, 2017).

Impact of Marijuana Liberalization on Use and Potency

As noted in the previous sections, trends toward more-liberal state marijuana policies have occurred alongside declining perceptions of risk associated with marijuana and increased prevalence of marijuana use among adults. However, these concurrent trends do not necessarily indicate that marijuana legalization has driven the changing landscape of marijuana use. This section reviews the evidence from a growing body of research that has assessed how changes in state marijuana policy have directly affected marijuana use.

Most recent evidence exploits state-level changes in medical marijuana laws, although there is an earlier literature examining decriminalization policies (see MacCoun et al., 2009, for a summary of these earlier studies) and an emerging literature on the effects of recreational marijuana laws. In general, these studies have used standard two-way fixed effect or difference-in-differences approaches, comparing pre-post changes within states that enacted marijuana liberalization policies with states without changes in the laws, controlling for national trends and time-varying state characteristics that might relate to marijuana use.

Effects of Medical Marijuana Laws on Marijuana Use

Several recent reviews of the literature examine the effects of medical marijuana laws on marijuana use. They show little evidence that the passage of these laws significantly affects adolescent consumption of marijuana (Carliner, Brown, et al., 2017; Sarvet, Wall, Fink, et al., 2018). However, they typically find that medical marijuana laws are associated with increased marijuana use prevalence among adults, although the magnitude and precision of the estimated effects vary across studies depending on the time frame studied, the features of medical marijuana laws that are examined, and whether lagged policy effects are considered. Studies distinguishing between medical marijuana laws that allow for larger-scale production and distribution versus those that do not have tended to find more-consistent evidence that laxer supply provisions significantly increase marijuana use prevalence among adults and might

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[3] Exceptions include recent questions on specific methods of marijuana use incorporated into the Healthy Kids Colorado Survey and the California Healthy Kids Survey.

[4] Delta-9-tetrahydrocannabinol (THC) is the primary psychoactive constituent of marijuana, and it is responsible for much of marijuana's intoxicating pharmacology.

generate spillover effects to youth marijuana use (Wen, Hockenberry, and Cummings, 2015; Pacula, Powell, et al., 2015; Williams, Santaella-Tenorio, et al., 2017; Smart, 2016).

Effects of Recreational Marijuana Laws on Marijuana Use

Given how recently recreational marijuana laws have been implemented, only a few studies have attempted to evaluate their impact on marijuana use outcomes. These studies assess the effects of recreational legalization on marijuana use prevalence among school samples of adolescents and college students. Table D.1 summarizes findings from this literature, which generally shows mixed (e.g., both positive and negative effects) or no significant effects on adolescent marijuana use and positive effects on marijuana use among college students. These findings are generally consistent with the findings associated with medical marijuana legalization.

However, the existing evidence base is subject to several limitations. First, most of these studies estimate the impact of recreational marijuana legalization using the effective date of the law, which might capture the effects of changing social norms but will not account for the full impact of the policy once retail markets are more fully developed. Relatedly, most studies to date rely on data that covers a relatively short period following legalization. However, short-run changes in marijuana consumption might not accurately reflect longer-run effects once markets stabilize.[5] Nascent evidence is showing that greater access to legal marijuana retailers, and not legalization alone, is associated with increased marijuana use and frequency of use among adults (Everson et al., 2019). Finally, the three states examined to date by the literature all had relatively robust medical marijuana markets in place prior to nonmedical marijuana legalization, and the identification of a proper comparison group for these first movers is perhaps as important as the length of time considered for evaluating their effects. Many studies examining changes in use have no comparison group, and others provide limited evidence for whether the comparison states or schools provide an appropriate counterfactual.

Effects of Marijuana Laws on Marijuana Products and Potency

Although most of the existing evidence has focused on how liberalization relates to changes in use prevalence, there is also considerable evidence that commercialization of marijuana under medical and recreational legalization policies has significantly affected the *types* of marijuana available and the *ways* in which it is consumed. Marijuana potency, product variety, and methods of consumption have evolved as suppliers have been able to experiment and innovate under the legal protections granted by medical and, more recently, recreational marijuana laws. As a result, users in states with medical or recreational legalization consume a different product mix than users in other states consume.

Adults living in states with medical marijuana laws, particularly in those states with a higher density of dispensaries, are significantly more likely to vaporize or ingest marijuana products compared with individuals in states without such laws (Borodovsky et al., 2016). Adolescents in states with medical or recreational marijuana legalization were also more likely to report lifetime use of vaporized and edible cannabis products, with larger effects in states where the laws had been in place for longer or where there was a higher density of dispensaries (Borodovsky et al., 2016). Results from an internet survey found that marijuana concentrate use was nearly five times more likely among individuals living in states with recreational mari-

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[5] Indeed, studies have shown that recreational legalization results in short-term increases in cannabis prices and price volatility, followed by significant price declines as the market matures, higher rates of entry occur, and supply is able to catch up with demand (Hunt and Pacula, 2017; Smart et al., 2017).

Table D.1
Studies of the Association of Recreational Marijuana Legalization with Marijuana Use

Study	Legal States (Time Frame)	Study Design	Findings for Marijuana Use Outcomes
Adolescents			
Cerdá et al., 2017	Washington and Colorado (2010–2012, 2013–2015)	Pre-post with comparison groups	Recreational legalization in Washington was associated with significantly higher past-month marijuana use among 8th- and 10th-graders. Effects were insignificant for 12th-graders in Washington and for all grades in Colorado.
Harpin et al., 2018	Colorado (2013–2014)	Pre-post only	The Healthy Kids Colorado Survey showed no significant change in past-month marijuana use prevalence or frequency before versus after Colorado's legalization.
Brooks-Russell et al., 2019	Colorado (fall 2013, fall 2015)	Pre-post only	Among Colorado high school students, there was no significant effect found for past-month marijuana use. Among those reporting past-month use, frequent use and use on school property declined.
Dilley et al., 2019	Washington (2010–2012, 2014–2016)	Pre-post only	The Washington Healthy Youth Survey showed significant declines in past-month marijuana use among 8th- and 10th-graders. No significant change was observed among 12th-graders.
Graves et al., 2019	Washington (2010, 2016)	Pre-post only	Past-month marijuana use significantly declined for 8th- and 10th-graders of all working statuses, but past-month marijuana use significantly increased among 12th-graders working 11 hours per week or more.
Anderson et al., 2019	Seven states (1993–2017)	Pre-post with comparison groups	Among U.S. high school students (grades 9–12), legalization was associated with a significant decline in the odds of past-month marijuana use and of frequent use (10+ times in the past month).
College students			
Kerr et al., 2017	Oregon (2012–2016)	Pre-post with comparison groups	Rates of Oregon college students' past-month marijuana use increased (relative to students in nonlegalizing states) following recreational marijuana legislation in 2015 but only for students with recent heavy use of alcohol.
Miller, Rosenman, and Cowan, 2017	Washington (2005–2015)	Pre-post, compared with national trend	Students at a university in Washington experienced a significant increase in marijuana use after legalization; no additional increase was seen after stores opened (2014). The change is strongest among female students, black or Hispanic students, and students under age 21.
Jones, Jones, and Peil, 2018	Colorado (October 2013 to March 2015)	Pre-post only	Daily or near-daily use of marijuana in Colorado college students is much higher than the national average, but there was no significant change in daily or near-daily marijuana use before versus after legalization.
Parnes, Smith and Conner, 2018	Colorado (spring 2013 to fall 2015)	Pre-post only	Past-month marijuana use increased following recreational legalization for all Colorado students. No differences in past-month use frequency (number of times used) were found. Out-of-state students reported higher past-month marijuana use than in-state students reported.
Kerr, Bae, and Koval, 2018	Oregon (2008–2016)	Pre-post with comparison groups	Rates of Oregon college students' past-month marijuana use increased (relative to students in nonlegalizing states) following recreational marijuana legislation in 2015.

juana laws and nearly twice as likely among individuals living in states with "laxer" (i.e., less medicalized) medical marijuana policies (Daniulaityte et al., 2017). Administrative data on retail sales of marijuana have also demonstrated that concentrates are the fastest growing share of the legal retail market (Smart et al., 2017).

One potential concern cited about the increased use of marijuana concentrates is the very high potency of the products, which have been documented to have THC concentrations in excess of 70 percent (Raber, Elzinga, and Kaplan, 2015). Indeed, even the potency of illicit marijuana plants has increased substantially since the 1990s (ElSohly et al., 2016; Mehmedic et al., 2010). Evidence suggests that states that legally permit medical marijuana dispensaries experience significant increases in average THC levels (Sevigny, Pacula, and Heaton, 2014), and the THC concentration of marijuana products sold through medical and recreational marijuana dispensaries greatly exceeds that previously seen in illegal markets (Vandrey et al., 2015; Carlini, Garrett, and Harwick, 2017). This evolution in the diversity of cannabis products and routes of administration under legalized commercial marijuana regimes has important implications, given the evidence suggesting that the use of marijuana with higher levels of THC is more strongly associated with negative health impacts (as we will discuss below).

Effects of Marijuana Use on Health Risks, Behavior, Academic Outcomes, and Job Performance

Despite the substantial changes in state-level marijuana policy and evolving trends in marijuana perceptions and use, rigorous scientific research on how marijuana consumption affects health, social, and labor market outcomes remains limited, particularly in comparison with what is known about other substances that might confer risk, such as alcohol and tobacco (National Academies of Sciences, Engineering, and Medicine [NASEM], 2017). Although a growing evidence base has used experimental or epidemiological methods to better understand the risks associated with acute marijuana intoxication, we know far less about the sustained impact of marijuana use on domains related to productivity or other job performance metrics.

When applying the existing scientific literature to today's setting, it is important to note that most of the evidence base regarding the relationship between risk factors, marijuana use, and subsequent outcomes draws on evidence prior to the movement toward recreational marijuana legalization. Given the evolution of marijuana potency, products, and delivery methods that has occurred within legalized retail markets for marijuana, combined with the changing social norms and legal context of marijuana use, the relationships estimated in prior work might not perfectly translate to today's context.

Health Risk Outcomes

NASEM, 2017, provides a comprehensive review of what is known about the association of marijuana and cannabinoids with health outcomes. To summarize the evidence, the research team prioritized high-quality systematic reviews published since 2011 and all relevant high-quality primary studies published after the most recent systematic review. They categorized the weight of evidence (from strongest to weakest) using the following categories for definitions: conclusive, substantial, moderate, limited, or insufficient evidence (see Box D.1). Below, we briefly document findings from this review, supplemented with a few notable recent studies, to describe evidence for the sustained effects of marijuana use on three domains: cognition,

> **Box D.1**
> **Weight-of-Evidence Categories Used in the NASEM Report of Marijuana's Health Effects**
> - **Conclusive:** There are many supportive findings from high-quality randomized controlled trials and no credible opposing findings from studies of similar quality. Limitations to the evidence can be ruled out with reasonable confidence.
> - **Substantial:** There are several supportive findings from high-quality studies with very few or no credible opposing findings. Minor limitations to the evidence cannot be ruled out with reasonable confidence.
> - **Moderate:** There are several supportive findings from fair- to high-quality studies with very few or no credible opposing findings. Limitations to the evidence cannot be ruled out with reasonable confidence.
> - **Limited:** There are supportive findings from fair-quality studies or mixed findings with most favoring one conclusion. There could be significant uncertainty in the conclusions because of methodological limitations.
> - **Insufficient:** There are mixed findings, a single poor-quality study, or the health outcome has not been studied at all.

mental health, and social functioning. For areas in which NASEM, 2017, considers evidence for both acute and sustained effects of marijuana on these outcomes, we focus on the report's findings with respect to the effects of sustained use (i.e., effects after a period of abstinence from marijuana).

It is important to note that a variety of studies (including the NASEM, 2017, review) have evaluated not only the health risks of marijuana and cannabinoids but also their potential health benefits. For instance, NASEM, 2017, concludes that there was substantial evidence that marijuana is effective for treatment of chronic pain in adults and that oral cannabinoids are effective for treatment of chemotherapy-induced nausea and vomiting and multiple sclerosis spasticity symptoms. Although these medical benefits are important to consider, the therapeutic effects of marijuana are achieved with acute use (i.e., effects occur shortly after consumption). Because a review of the therapeutic benefits of ongoing marijuana consumption are beyond the scope of this report and the policy question of interest, we do not review these outcomes here.

Cognitive Functioning

The NASEM, 2017, research team used five high-quality systematic reviews for their findings regarding the effects of marijuana use on cognitive functioning. They concluded that there was *limited* evidence of sustained effects of marijuana use on the cognitive domains of learning, memory, and attention. Notably, within the context of the reviewed studies, sustained effects of marijuana use on cognition were measured after a period of abstinence from marijuana that ranged from several hours to months. It is also important to note that the reviewed studies used information from mostly adult samples, and studies rarely examined adolescents or young adults as a separate group.

There is also evidence that the use of marijuana with higher levels of THC is more strongly associated with acute cognitive effects, psychomotor impairments, and related injuries (Ramaekers et al., 2006; Hartman and Huestis, 2013), as well as with brain development and functioning (Volkow et al., 2016).

Some emerging evidence suggests that initiating marijuana use at an early age might be more likely to result in sustained neurocognitive effects, which could be related to the key neurodevelopmental processes that occur during adolescence. However, there is disagreement about whether these effects remain significant after cessation of marijuana use. Some studies suggest that the acute cognitive impairments resulting from youth marijuana use are no longer

meaningful after a period of abstinence as brief as three days (Scott et al., 2018), whereas other studies have shown sustained effects on memory and IQ for those whose marijuana use history involved greater frequency and quantity of use and/or earlier onset of use (Auer et al., 2016; Ganzer et al., 2016; Meier, Caspi, Ambler, et al., 2012). However, the causal connection between early marijuana use and subsequent declines in intelligence quotient (IQ) and executive functions is unclear; recent evidence has suggested that observed relationships between marijuana use in adolescents and subsequent cognitive outcomes instead reflects confounding from socioeconomic factors (e.g., household income) that are correlated with both adolescent marijuana use and subsequent cognitive outcomes (Meier, Caspi, Danese, et al., 2018; Rogeberg, 2013). Thus, there might be some patterns of marijuana consumption that result in longer-term effects on some aspects of cognitive function after cessation, but the state of science regarding this question is far from conclusive.

Mental Health

The NASEM, 2017, research team reviewed evidence for the relationship between marijuana use and the risk of developing depression, anxiety disorders, schizophrenia, and other psychoses. Table D.2 summarizes their findings, which showed the strongest link between high-frequency marijuana use and development of schizophrenia and showed more-moderate evidence suggesting an association between heavy or regular marijuana use and the development of depressive disorder or social anxiety disorder. They found limited or no evidence to support an association of marijuana use with incidence of other anxiety disorders, bipolar disorder, or PTSD.

Table D.2
Summary of Findings from a Comprehensive Review of the Relationship Between Marijuana Use and Mental Health

Disorder	NASEM, 2017, Conclusions	Evidence Base
Schizophrenia or other psychoses	Substantial evidence of a statistical association between marijuana use (particularly, frequent use of marijuana) and higher risk of developing schizophrenia or other psychoses	Five systematic reviews; three primary studies
Depressive disorder	Moderate evidence of a statistical association between marijuana use (particularly, heavy use of marijuana) and a small increased risk for development of depressive disorder	Two systematic reviews; seven primary studies
Anxiety disorder	Limited evidence of a statistical association between marijuana use and anxiety disorders, except for social anxiety disorder, which has moderate evidence for increased incidence with regular marijuana use	One systematic review; six primary studies
Bipolar disorder	Limited evidence of a statistical association between marijuana use (particularly, regular or daily use of marijuana) and likelihood of developing bipolar disorder	One primary study of college students
PTSD	No evidence to support or refute a statistical association of marijuana use with PTSD incidence	No high-quality literature

SOURCE: NASEM, 2017.
NOTES: Evidence was rated using the following designations, from strongest to weakest: conclusive, substantial, moderate, limited, and no or insufficient evidence. As discussed in the text, evidence from earlier systematic reviews published after 2011 were prioritized, along with primary or original studies published after the date of the most recent systematic review. In cases in which a systematic review was not identified, primary studies published since 1999 were considered.

It is important to note that although the stronger evidence was longitudinal (i.e., establishing that the use of marijuana preceded the development of the disorder), the existing literature remains limited in determining causality or establishing the direction of causality for the observed associations. The relationship between substance use and mental health is highly complex and has often been shown to be bidirectional (Pang et al., 2014; Hooshmand, Willoughby, and Good, 2012). It is also probable that many studies informing this evidence base were unable to adjust for a full range of potential confounders, and thus the observed relationships might reflect predisposing risk factors that contributed to use (or heavy use) of marijuana and to mental health symptoms or mental health disorder.

Finally, given that there has been a substantial increase in the potency of marijuana over the past decades, it is worth noting that some evidence that indicates that the risk of development of schizophrenia or other psychoses, as well as the risks of transient psychotic symptoms, might be substantially higher among individuals using higher-potency marijuana with greater concentrations of THC and minimal cannabidiol content (Di Forti, Marconi, et al., 2015; Di Forti, Morgan, et al., 2009; Murray et al., 2016; Loflin and Earleywine, 2014; D'Souza et al., 2004). Although evidence from multiple studies has shown a substantial increase in the THC concentration of available marijuana in the United States (Midgette et al., 2019; ElSohly et al., 2016; Sevigny, 2013; Mehmedic et al., 2010), accurate understanding of the magnitude of this increase and associated health implications is complicated for several reasons. First, historical measures of potency have generally been obtained from drug seizure data, whereas legalization now allows for the measurement of potency using administrative sales data (in states that have legalized and set up administrative systems); these sources are not directly comparable. Second, current administrative measures of THC concentrations are challenging to compare across product types (Davenport, 2019) and have issues with measurement caused by unreliable and inconsistent testing procedures (Jikomes and Zoorob, 2018). Finally, our large-scale surveillance systems for drug use, such as the NSDUH, do not ask about potency, and individuals might not know the potency of the products they consume (Davenport and Caulkins, 2016).

Social Functioning

Using one systematic review (Macleod et al., 2004) and three more-recent studies in the primary literature, the NASEM, 2017, research team concluded that there was limited evidence of a statistical association between cannabis use and impaired social functioning or engagement in developmentally appropriate social roles.

Crime and Criminal Justice Involvement

Studies have shown a relationship between marijuana use and criminal behavior, although this relationship is far weaker than it is for other illicit drugs, such as heroin or cocaine (Bennett, Holloway, and Farrington, 2008). These associations are more robust for chronic or heavy users (Brook, Lee, Brown, et al., 2011; Brook, Lee, Finch, and Brook, 2014; Flory et al., 2004; Tucker et al., 2005; Pardini, Bechtold, et al., 2015).

A few studies have attempted to better isolate the causal effect of youth marijuana use on adult criminal outcomes by controlling for a broad set of factors. One study used propensity score matching, and the authors found that heavy use of marijuana in adolescence (defined by the authors as using marijuana at least 20 times by age 16) increased the risk of engaging in drug-related or property crime, having an arrest record, and being incarcerated; marijuana use was not related to violent crime (Green et al., 2010). Another study examined how mari-

juana use trajectories from adolescence to early adulthood predicted criminal behavior among males in their mid-30s, adjusting for factors in early adolescence related to antisocial lifestyle that preceded regular marijuana use and co-occurring substance use (Pardini, Bechtold, et al., 2015). The authors found that individuals with chronic, high-frequency marijuana use patterns were at elevated risk for engaging in drug-related crimes; findings showed no significant differences in the risk of nondrug-related crimes for any typology of marijuana user relative to abstainers.

Given that most causal evidence supports a relationship between marijuana use and drug-related crime specifically, it seems plausible that some of the observed relationship between marijuana use and crime is tautological: Because use and possession of marijuana have historically been illegal, individuals who engaged in marijuana use might have been more likely to engage in illicit activity and to come into contact with the criminal justice system solely through the mechanism of illegal marijuana use. Indeed, although marijuana use is common among individuals arrested for crimes, a review of 200 studies on the marijuana-crime relationship found "little support for a contemporaneous, causal relationship between marijuana use and either violent or property crime" (Office of National Drug Control Policy, 2013, p. iv). In states where marijuana has been legalized, it is therefore likely that the relationship between marijuana use and criminal justice involvement is lower for adults, given that the risk of arrest for marijuana-related crimes significantly declines after legalization (Firth et al., 2019; Reed, 2018; Plunk et al., 2016).

Academic Outcomes

A substantial literature has documented a negative association of marijuana use with educational outcomes, including higher rates of truancy or absenteeism, poorer school performance, higher dropout rates, and failure to attend postsecondary education (Macleod et al., 2004; Lynskey and Hall, 2000). Analyses have demonstrated that these associations are substantially stronger among adolescents who exhibit heavy or escalating marijuana use trajectories during high school (Lynne-Landsman, Bradshaw and Ialongo, 2010). It is less clear whether these effects represent *causal* impacts of marijuana use or whether they reflect some shared risk factor or factors that influence both marijuana use and educational outcomes. Next, we describe the findings from studies that have attempted to better understand the mechanisms by which marijuana use might relate to worse educational outcomes.

Years of Education and High School Completion

Roebuck, French, and Dennis, 2004, evaluates the causal effect of marijuana use on dropping out of high school and on absenteeism using a two-stage instrumental variables approach, first predicting marijuana use at ages 12 to 18 (in 1997 and 1998) using three measures of religiosity. The authors' models showed that marijuana use was related to a small, but statistically significant, increase in the probability of dropping out of high school, with effects about twice as large for chronic versus nonchronic marijuana users (defined according to weekly use in the past year). However, in models that adjusted for alcohol use in the past year, the effects for nonchronic marijuana users became small and insignificant. Findings for the outcome of truancy were qualitatively similar.

McCaffrey et al., 2010, estimates the effect of marijuana use on dropping out of high school through propensity score models, matching users and nonusers on a wide range of covariates. Using data from a longitudinal survey of students in South Dakota collected from

1997 to 2004, the authors focused specifically on *persistent marijuana use*, which they defined as reporting marijuana use in the past month for both the 9th- and 10th-grade surveys, with one of those surveys indicating more than three episodes of use in the past year. In models without the propensity score adjustment, persistent marijuana use was associated with a more-than-fivefold risk of dropping out of high school. This effect remained significant, but was reduced by half, in the matched models. Adding controls for other high-school substance use attenuated the effect, and the relationship between marijuana use and dropping out remained positive but became statistically insignificant in the model that controlled for cigarette use in grades 8 through 10. Because cigarette use has not been shown to relate to educational outcomes, this result likely suggests the existence of an unobserved confounder that mediates the relationship between cigarette and marijuana use and also affects dropout probability.

Stuart and Green, 2008, estimates the effect of heavy marijuana use in adolescence (defined as using marijuana 20 times or more during adolescence) on adult outcomes. The authors used data from a prospective, longitudinal study of African Americans begun in the mid-1960s in the Woodlawn neighborhood of Chicago. Study participants were 16 to 17 years old in the first wave of the survey and were followed up with during young adulthood (at age 32) and middle adulthood (at age 42). Heavy marijuana use in adolescence was associated with significantly poorer education levels, as of middle adulthood. These findings are consistent with those of earlier work that used the same sample and found that heavy marijuana use in adolescence was associated with a significantly greater likelihood of dropping out of high school (Green and Ensminger, 2006).

Engberg and Morral, 2006, examines how marijuana use influenced schooling attendance during three-month intervals over the course of a school year through the use of fixed-effects models that estimated effects using within-individual changes in substance use. The authors found that any marijuana use was negatively associated with school attendance; in contrast, findings for other substances (e.g., alcohol, stimulants, hallucinogens) showed effects that varied depending on the quantity consumed. This estimation strategy indicates an effect of marijuana use on schooling attendance that is not driven by unobservable time-invariant characteristics of an individual, but it does not rule out time-varying confounders that might both increase the likelihood of using marijuana and increase truancy. However, a major limitation is that their study sample, which drew from a larger sample of adolescents ages 12 to 19 who had been admitted to an outpatient treatment program for marijuana or alcohol use disorder, is highly nonrepresentative, and thus these findings might not generalize to other settings.

Indeed, the authors of a more recent study using fixed-effects models to evaluate similar questions among a sample of Pittsburgh youth found substantially different results (Pardini, White, et al., 2015). They found no significant relationship between marijuana use (including monthly use) and attention problems or academic problems for males. There was some evidence that any level of marijuana use increased attention problems for females; however, once they ceased marijuana use, their attention problems returned to premarijuana-initiation levels. Interestingly, even in the purely associational models considered in this study (which controlled only for age trends), the associations between marijuana use and academic or attention problems observed for both males and females were only significant during the years of marijuana use; males and females who stopped using marijuana saw levels of academic or attention problems return to their premarijuana-initiation levels.

Using evidence from medical marijuana legalization from 2000 to 2014, Plunk et al., 2016, estimates whether living in a state with legal medical marijuana during high school age

(ages 14 to 18) predicted the likelihood of dropping out of high school. The authors did not find an association between adolescent exposure to a legal medical marijuana regime and high school noncompletion overall, although some subgroup analyses suggested increased dropout rates for those in older grades.[6]

Postsecondary Education Outcomes

Although the evidence for a negative relationship between heavy adolescent marijuana use and high-school academic outcomes appears to be relatively consistent, the effects of marijuana use on academic outcomes conditional on attending college are less clear. Indeed, given the seeming correlation between marijuana use and educational outcomes in high school, individuals who use marijuana during adolescence and subsequently enroll in college might be positively selected on cognitive ability or other unobserved factors. Additionally, if early initiation of marijuana use drives much of the relationship between adolescent consumption and educational outcomes, then the relationship between college marijuana use and postsecondary educational outcomes might look substantially different.

Most research evaluating the relationship between marijuana use in college and academic performance or college completion is correlational. For academic achievement, several studies have examined how marijuana use or marijuana use trajectories relate to college grade point average (GPA). A smaller set of studies has evaluated how marijuana use or marijuana use trajectories relate to college completion, time to graduation, or enrollment continuity. In general, these correlational studies show modest negative or statistically insignificant relationships between marijuana use in college and college GPAs or the likelihood of college completion (Bolin, Pate, and McClintock, 2017; Meda et al., 2017; Suerken et al., 2016; Arria et al., 2015; Hunt, Eisenberg, and Kilbourne, 2010).

A few studies have attempted to examine the direct causal relationship between marijuana use and postsecondary educational achievement.[7] Using evidence from medical marijuana legalization from 2000 to 2014, Plunk et al., 2016, estimates whether living in a state with legal medical marijuana during high school age (ages 14 to 18) predicted the likelihood of college nonenrollment, conditional on high school completion. Using models that controlled for national trends, average state effects, linear state-specific trends, and individual-level characteristics, the authors found that adolescent exposure to a medical marijuana law regime predicted a small but significant increase in college nonenrollment, conditional on high school completion. In addition, there were significant effects indicating that medical marijuana law exposure significantly increased the likelihood of college degree noncompletion, conditional on college enrollment. Another study (Wright and Krieg, 2018) examined how standardized grades and other measures of college academic performance changed after the legalization of recreational marijuana in Washington State among students who were of legal age to use marijuana recreationally (ages 21 and older). The authors' preferred model indicated that legal marijuana access led to a decline in standardized grades of about 0.016 standard deviations, which they note is roughly 50 percent of the estimated effect of legal access to alcohol. Although these

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[6]   In addition, there were significant effects indicating medical marijuana law exposure significantly increased the likelihood of college degree noncompletion, conditional on college enrollment.

[7]   See Marie and Zölitz, 2017, for an excellent study of the effects of marijuana policy changes on postsecondary academic achievement outcomes in the Dutch context. Using a natural experiment from a policy that differentially affected which students could access legal marijuana according to citizenship, the authors found that the academic performance of students who were no longer legally permitted to buy cannabis substantially increased.

findings are consistent with the associational studies discussed earlier that showed direct or indirect effects of marijuana use on postsecondary academic outcomes, one limitation of these quasi-experimental studies is that they do not have data that connect marijuana use outcomes and college performance outcomes, thus they must assume that the findings they observe represent causal effects of changes in marijuana use generated by legalization policy.

One additional study (Grant et al., 2012) used a discordant twin study design, comparing educational outcomes for twins who had discordant experiences with marijuana initiation. This design allows one to disentangle the effects of marijuana use on educational outcomes that are causal versus those that are related to shared environmental or shared genetic confounders. The study used data from the Vietnam Era Twin Registry, a national database of male-male twin pairs who served in the military between 1965 and 1975 and received follow-up surveys and interviews in 1987 and 1992, respectively. Their models assessed whether lifetime marijuana use or early initiation of marijuana use (defined as prior to age 18) affected the likelihood of completing 16 or more years of education (i.e., the typical time for receipt of a college degree), conditional on completion of high school. In the general sample, unadjusted and adjusted models showed a significant relationship between the marijuana use measures (as well as the alcohol and nicotine measures) and a lower probability of completing at least 16 years of education. However, after conducting the cotwin-control analyses (i.e., using twins discordant for substance use as their own controls), the marijuana use measures no longer showed a significant relationship, suggesting that the association between marijuana use and educational attainment was accounted for by some noncausal shared risk factor.

Job Performance

Zwerling, Ryan, and Orav, 1990, evaluates the association between testing positive for marijuana during preemployment drug testing and subsequent job termination, absenteeism, and disciplinary problems, using information from applicants for postal employment from 1986 to 1989. Using Cox proportional hazard models to conduct survival analysis, the authors found that employees who tested positive for marijuana had increased risk of termination (from involuntary turnover), accidents and injuries, reports of disciplinary action, and work absences. Estimated relative risks associated with a marijuana-positive test were moderate, ranging from a relative risk of 1.5 for work absence or disciplinary report to a relative risk of 2.1 for involuntary termination.[8] Although the estimated relationships are based on preemployment drug testing, it is not known whether the observed relationships reflect continued drug use after hiring. Furthermore, the study did not account for potential alcohol use or misuse, and thus it is unclear the extent to which alcohol use might confound some of the estimated relationships for marijuana.

These job turnover findings are similar to results from two studies using nationally representative survey data to evaluate the relationship of past-year marijuana use with job turnover. Hoffmann, Dufur, and Huang, 2007, shows that adults ages 22 to 37 who reported the use of marijuana in the past year had a significantly higher probability of job-to-job transitions, and males also had a significantly higher probability of experiencing a job-to-unemployment transition.[9] Okechukwu, Molino, and Soh, 2019, which compares longitudinal data from 2001

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[8]   In contrast, those who tested positive for cocaine only significantly differed from those with negative drug screens for the outcomes of injuries and work absences.

[9]   As in Zwerling, Ryan, and Orav, 1990, past-year use of cocaine showed no relationship with job loss.

to 2004 with cross-sectional data collected from 2012 to 2013, finds similar estimates, with individuals who reported marijuana use in the past year having 27 percent to 50 percent higher odds of experiencing involuntary job loss in adjusted models. Considering differential relationships by marijuana use frequency, the authors found that all levels of use frequency led to significantly increased probability of job loss when other factors were not adjusted for; however, in adjusted models, only daily users of marijuana showed significantly increased odds of involuntary job loss across the longitudinal and cross-sectional specifications.

The potential importance of considering specific marijuana use patterns was also highlighted in Brook, Lee, Finch, Seltzer, and Brook, 2013, which uses longitudinal data from African American and Puerto Rican students attending schools in East Harlem to estimate how marijuana use trajectories from age 14 to age 29 influenced work achievement and work absenteeism at approximately age 30. Growth mixture modeling yielded four marijuana use trajectories: no or low use, low but increasing use, low to moderate use, and chronic use (i.e., those whose use frequency increased from adolescence to early adulthood, peaking at more than weekly use). Models adjusted for gender and ethnicity showed no significant relationship between any marijuana use trajectory and work achievement (i.e., good job performance evaluations) or likelihood of skipping work.

Summary

The past three decades have seen dramatic changes in how state policies have regulated the possession, use, and distribution of marijuana. Although the legalization of the commercial sales and distribution of marijuana for recreational use has been a significant development, other state policies have had substantial impacts on the potential penalties, costs, and availability of marijuana. Although states remain varied in their approaches to marijuana policy, national attitudes toward marijuana have evolved significantly, including in states without recreational legalization (Hartig and Geiger, 2018). There have been significant declines in perceived risks associated with marijuana use and in perceived social disapproval of marijuana use among all age groups. Although these trends have been mirrored by the rising prevalence of marijuana use—including daily or near-daily use—among adults, marijuana use prevalence among adolescents has remained relatively stable. However, the use of marijuana remains relatively common among adolescents and young adults: In 2017, approximately 20 percent of youths ages 18 to 25 reported using marijuana in the past 30 days.

A substantial literature has shown that adolescent marijuana use is associated with several social and health factors that could be negatively related to job market performance, such as poor academic performance, mental health problems, and deviant behavior. However, many of these studies have suggested that these risk factors preceded marijuana use and therefore might reflect the characteristics of the youth population, who began involvement in marijuana use at an early age under a regime of prohibition. It is unclear whether those who initiate or continue marijuana use under legalized state policies differ in terms of underlying risk factors. Furthermore, in areas such as criminal justice involvement, marijuana legalization could serve to fundamentally change the relationship between marijuana use and the outcome of interest. Focusing on studies that have attempted to evaluate the causal relationship between marijuana use in adolescence or early adulthood and subsequent development of risk factors shows less-well-defined evidence. Some research supports the notion that high-frequency use of mari-

juana, particularly in early adolescence, might increase the likelihood of cognitive impairment, dropping out of high school, and the development of certain mental disorders (e.g., schizophrenia or other psychoses; anxiety, depressive, or bipolar disorders). However, this elevated risk might only occur for a subset of individuals who are predisposed to the development of such consequences, and the causal connection remains highly tenuous for many of these observed associations.

Despite these observed associations, evidence for how marijuana use relates to job performance is highly uncertain. Although some studies have shown negative relationships between marijuana use and job outcomes, these findings generally reflect relationships between *current* marijuana use status and labor market outcomes. We know little about how a history of marijuana use but current abstention relates to job performance. Furthermore, even studies of contemporaneous relationships highlight that specific patterns of marijuana use (i.e., heavy or chronic use) are likely more important to consider than simple binary categorizations of use versus no use.

Finally, it is important to emphasize that any implications of increasing youth marijuana use for subsequent health and social outcomes will hinge critically on whether marijuana is a substitute or complement for other substances, such as alcohol and opioids, that could be more strongly related with cognitive functioning and job performance, although this is outside the scope of this review (Yörük, 2015; Zacny, 1995; Blum, Roman, and Martin, 1993). If marijuana is a substitute for alcohol or opioids (i.e., if youth are using marijuana instead of these other substances), then the use of marijuana might relate to beneficial outcomes by reducing consumption of these other substances. In contrast, if marijuana is a complement to alcohol or opioids (i.e., if the use of marijuana increases the use of these other substances), then the use of marijuana might relate to more-deleterious outcomes through the combined effects of polysubstance use behaviors. Although the question of whether marijuana is a substitute for alcohol and opioids remains under debate (see Smart and Pacula, 2019, for a recent review), these behavioral relationships will be important to consider for evaluating the public health and social impacts of policies that might expand access to marijuana.

Trends in ADHD, Depression, and Anxiety Disorders

In this appendix, we review trends in ADHD, depression, and anxiety disorders in the general population from research primarily conducted in the past decade. We emphasize research on individuals ages 14 to 21 because we are interested in how changes in the diagnosis of these disorders might affect eligibility for military service. We review research into each condition's pathology, including timing of onset, whether the health issue is chronic, the efficacy of treatment, and the implication for the life course. When available, we highlight demographic and geographic variation in the diagnosis of these mental and behavioral health issues, as well as in treatment availability and prescribing patterns. First, we review how ADHD and depression relate to the Army's medical fitness standards.

Mental and Behavioral Health Fitness Standards for Enlistment

Medical standards for learning, psychiatric, and behavioral disorders at enlistment into the Army are defined in Army Regulation 40–501. We reviewed the five most recent versions of these standards, from 2003 to 2019. Potential enlistments are evaluated using current diagnoses or a verified medical history according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), to determine fitness. The standards are designed to ensure that new soldiers are capable of completing required training and performing duties without restriction, such as excessive time lost for treatment or hospitalization or location limitations (AR 40–501, 2019, Section 2-2). In June 2019, the Army aligned its medical standards for enlistment with DoDI 6130.03, 2018, which established enlistment standards for all services. Prior to this change, AR 40–501 enumerated medical enlistment standards, sometimes in ways that were not consistent with DoDI 6130.03.

Concerning ADHD, the Army's policy prior to June 2019 stated that an applicant with a prior diagnosis did not meet the medical fitness standards unless they could demonstrate passing academic performance and there had been no use of medication in the previous 12 months (AR 40–501, 2017, Section 2-27). Prior to the 2008 revision, the Army's medical enlistment standard did not directly reference ADHD, although reference was made to the DSM-IV diagnostic code (code 314) for identifying the various types of ADHD (i.e., combined type, predominantly hyperactive, or predominantly inattentive). The 2003 standard specifically mentioned that learning disorders that affected an individual's work or education after the age of 12, or that required current medication use to maintain sufficient skill levels, did not meet the standards for fitness (AR 40–501, 2003, Section 2-29). Between 2003 and 2008, the Army altered its policy on ADHD (i.e., the applicant must demonstrate passing academic or

occupational performance and not require medication to treat the condition in the previous 12 months) according to Krauss et al., 2006, making it easier for applicants with a history of ADHD to enlist. The authors showed that new recruits serving in the military with a diagnosis for ADHD were not statistically different from unaffected recruits along dimensions of promotion rates, comorbidity, or mental health–related discharges.[1] The Army's current policy, reflecting DoDI 6130.03, 2018, Section 5.28, is more restrictive when it comes to ADHD. An applicant does not meet the medical enlistment standard if they (1) required a recommended or prescribed education or work program after their 14th birthday, (2) have a history of comorbid mental disorders, (3) were prescribed medication within the past 24 months, and (4) have documentation of adverse educational or work performance (DoDI 6130.03, 2018).

Regarding depression, an applicant did not meet the Army's enlistment standards prior to June 2019 if they required outpatient care for longer than six months, required inpatient treatment in a hospital or residential facility, or experienced repeated impairment of work, social, or academic performance (AR 40–501, 2017). These standards had remained unchanged since 2003. Depression, similar to ADHD, was not specifically mentioned in the 2003 standards (a broad reference to its DSM-IV diagnostic code [300] was made). Since June 2019, the Army's enlistment standards for applicants with a history of depression are more stringent, except with regard to the total amount of outpatient care required. DoD disqualifies individuals with a history of depression if they (1) required outpatient care for more than 12 cumulative months, (2) experienced symptoms or treatment within the past 36 months, (3) required any inpatient treatment, (4) experienced any recurrence, or (5) experienced any suicidality (DoDI 6130.03, 2018).[2]

Prior to the 2008 revision of the Army's medical standards, anxiety disorders were subject to the same standards as depression and other mood and dissociative disorders. However, from 2008 to June 2019, anxiety disorders were referenced independent of depression and other mood disorders, and a specific subset of anxiety disorders was identified as not meeting enlistment standards (e.g., panic disorder with and without agoraphobia, social and simple phobia, obsessive-compulsiveness, and PTSD) without qualifying conditions (e.g., not requiring treatment in the past year). Under DoDI 6130.03, anxiety disorders are again held to the same standards as depression.

Any applicant for enlistment who is found to not meet the medical standards for enlistment is required to obtain a waiver (AR 601–210, 2016, Section 4-5). Applicants requiring a medical waiver for enlistment must meet the medical standards for retention in the service (AR 40–501, 2019, p. 3), which require an affected applicant to undergo an evaluation by a medical evaluation board. To obtain a waiver, an applicant must submit documentation, including evidence that the disqualifying condition has been successfully treated or providing sufficient justification for a waiver (AR 601–210, 2016, Section 4-5). Next, we document trends and the pathology of ADHD, depression, and anxiety disorders and discuss potential mechanisms by which enlistment supply might be constrained and evidence for whether these conditions are likely to influence performance or retention.

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[1] Krauss et al., 2006, compares a sample of applicants who were disqualified during the initial medical examination but who obtained a waiver for ADHD to enter active duty with a sample of controls matched on age (within one year), branch of service (Army, Air Force, Navy, or Marines), gender, race (African American, Caucasian, or other), and date basic training started.

[2] DoDI 6130.03 became more restrictive between 2010 and 2018, reducing the number of cumulative months of outpatient care received from 24 to 12 and adding conditions for recurrence and suicidality.

Attention-Deficit/Hyperactivity Disorder

ADHD is diagnosed when individuals exhibit any combination of symptoms that include inattention, hyperactivity, and impulsivity. Children must exhibit six or more symptoms of inattentiveness and six or more symptoms of hyperactivity and impulsivity; the minimum is five or more symptoms for adults (American Psychiatric Association, 2013). In addition, an individual must exhibit (1) several inattentive or hyperactive-impulsive symptoms before age 12;[3] (2) several symptoms in multiple settings; (3) evidence that symptoms interfere with, or reduce the quality of, social, school, or work functioning; and (4) evidence that the symptoms are not explained by another disorder (American Psychiatric Association, 2013). According to Visser et al., 2014, the median age of diagnosis for children with current ADHD as of 2011 was six, and the median age of diagnosis for severe, moderate, and mild ADHD was four, six, and seven, respectively.

Trends in Diagnosis

Several studies indicate a trend toward greater rates of diagnosis in children up to the age of 17. The data for these studies come from two nationally representative, repeated cross-sectional surveys: the National Survey of Children's Health (NSCH) and the National Health Interview Surveys (NHIS).[4] The NSCH is a periodic parent survey of the physical and emotional health of U.S. children, ages 0 to 17, as reflected in parent-reported ADHD diagnosis and treatment by health care providers.[5] The NHIS is an annual survey of one randomly selected child per household surveyed in the civilian, noninstitutionalized population and reported to interviewers, typically, by a parent or guardian. The methodologies across studies analyzing these surveys are similar. Unless otherwise stated, differences across subgroups are tested using either univariate weighted prevalence or odds ratios and chi-squared tests. When studying trends, linear regression or weighted logistic regression are used to determine significance. Unless otherwise stated, trend analysis only includes controls for time.

The primary ADHD outcome measure used when studying trends in diagnosis is prevalence. *Prevalence* is defined as the number of people in a sample with a specific characteristic (in this case, a mental or behavioral health disorder) divided by the number of people in the sample.[6] Prevalence is typically reported with reference to a time frame (e.g., within the past year). With reference to the studies reviewed below, only two studies (Visser et al., 2014; Danielson et al., 2018) specifically delineate between individuals with a current diagnosis for the condition and individuals who have ever been diagnosed (point prevalence and lifetime prevalence, respectively). In all other cases, we interpret from our review that prevalence refers to lifetime prevalence.

We begin by reviewing trends for children regardless of differences in gender, socioeconomic status, etc. and discuss trends by these subpopulations. Using data from the NSCH, Visser et al., 2014, and Collins and Cleary, 2016, find a 42 percent and 43 percent increase (respectively) in the estimated prevalence of ADHD. Specifically, Visser et al., 2014, finds that

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[3] The maximum diagnostic age was seven in the DSM-IV (1994) and five in the DSM-III (1980).

[4] Both are repeated cross-sectional studies, meaning they cannot be used to assess persistence.

[5] Initially, the NSCH was performed periodically (in 2003, 2007, and 2011). As of 2016, the survey is conducted on an annual basis. Data for 2017 are the most recent data available as of this writing.

[6] See National Institute of Mental Health, 2017.

the estimated prevalence of children ages 4 to 17 ever diagnosed with ADHD in 2003, 2007, and 2011 was 7.8 percent, 9.5 percent, and 11 percent, respectively. Collins and Cleary, 2016, includes estimates for the same periods of 8.5 percent, 10.4 percent, and 12.0 percent, respectively, for children ages 5 to 17. Over a slightly earlier time frame, Boyle et al., 2011, documents a 33 percent increase (from 5.69 percent to 7.57 percent) in the prevalence of children ages 3 to 17 ever diagnosed with ADHD from 1997 to 2008 using data from the NHIS. Using NHIS data from 1998 to 2016, Xu et al., 2018, estimates that the overall prevalence of ADHD among children ages 4 to 17 increased from 6.1 percent to 10.2 percent.[7] NSCH data from 2016 estimate the prevalence of ADHD among children ages 2 to 17 at 9.5 percent (Danielson et al., 2018).[8] Figure 5.1 in Chapter Five provides a graphical summary of trends in ADHD prevalence. Although there are differences in the estimated magnitude of ADHD prevalence, studies indicate a consistent trend toward greater ADHD diagnosis rates between 1997 and 2016. The rate of new diagnosis (i.e., incidence) of ADHD might shift after 2013 (Bachmann, Wijlaars, et al., 2017; Xu et al., 2018) because the maximum diagnostic age was increased from age 7 in the DSM-IV (American Psychiatric Association, 1994) to age 12 in the DSM-V (American Psychiatric Association, 2013).[9]

It is possible that reported prevalence of ADHD could reflect overdiagnosis or underdiagnosis of the condition. Several studies have documented that ADHD is misdiagnosed. These studies use the fact that many states establish a cutoff date for admission to kindergarten. If a school district sets its kindergarten age cutoff policy arbitrarily, then we would expect the rate of diagnosis of ADHD for children born in or around the cutoff date to be statistically similar, given that children are more likely to be at equivalent stages of behavioral and neurological development the closer they are in age. However, this cutoff has repeatedly been shown to have an influence on ADHD diagnoses in the United States (Elder, 2010; Evans, Morrill, and Parente, 2010), as well as in Canada, Iceland, Israel, Germany, and Finland (Schwandt and Wupperman, 2016; Sayal et al., 2017). In the United States, Evans, Morrill, and Parente, 2010, p. 658, using the NHIS, finds that "[c]hildren born just after the cutoff date are 2.1 percentage points less likely to be diagnosed with ADHD and 1.6% less likely to be treated with a stimulant, numbers that are roughly 25% smaller than their sample means." Elder, 2010, finds a similar, albeit larger, result using the cohort from the Early Childhood Longitudinal Study-Kindergarten, with a 3.2 percentage point higher rate of ADHD diagnosis before the cutoff as compared with after, which is equivalent to 50 percent of the sample mean.[10] Findings have been more mixed in Denmark, Sweden, and Taiwan, where prevalence of ADHD treatment is rarer (Sayal et al., 2017). ADHD diagnosis is often made by a pediatrician or family physi-

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[7]   Xu et al., 2018, uses a weighted logistic regression controlling for time, age, sex, and race/ethnicity.

[8]   Pastor et al., 2015, reaches the same estimate (9.5 percent) using the NHIS for pooled data from 2011 to 2013.

[9]   Thomas et al., 2015, finds that the prevalence of ADHD under the DSM-III-R (revised third edition; American Psychiatric Association, 1987) was lower than under the DSM-IV.

[10] From Elder, 2010, p. 643:

    The ECLS-K [Early Childhood Longitudinal Study-Kindergarten] is a National Center for Education Statistics (NCES) longitudinal survey that initially included 18,644 kindergarteners from over 1000 kindergarten programs in the fall of the 1998–1999 school year. Individuals were re-sampled in the spring of 1999, the fall and spring of the 1999–2000 school year (when most of the students were in first grade), and again in the spring of 2002, 2004, and 2007 (when most were in third, fifth, and eighth grade, respectively). NCES also interviewed parents and teachers in each survey wave.

cian and not by a mental health care specialist (Safer and Malever, 2000).[11] Mental disorders in children also often rely on multiple informants, including parents and teachers, and can be sensitive to how the diagnostician weighs the collected information (Merten, et al., 2017). The general finding in this literature is that "a diagnosis of ADHD is not solely based upon underlying biological conditions" (Evans, Morrill, and Parente, 2010, p. 671). More specifically, research suggests that the biological underpinnings of ADHD partly contribute to myriad behavioral symptoms that the diagnostic criteria aim to capture (Shaw, Gogtay, and Rapoport, 2010; Faraone and Larsson, 2019). Development occurs rapidly at young ages. The relative immaturity of younger children in a classroom could lead to younger children appearing to be too immature relative to their peers or to older children being underdiagnosed because their symptoms do not stand out. These findings, in which ADHD diagnosis rates are greater for individuals entering kindergarten at a younger age because of arbitrary cutoff dates, are generally interpreted as evidence of misdiagnosis (Merten et al., 2017).

There is limited research that addresses whether ADHD misdiagnosis reflects overdiagnosis or underdiagnosis of the disorder. ADHD requires a diagnosis from a clinician. Although such standards as the DSM are intended to provide an expert consensus of the characteristics associated with ADHD, there is no external criteria for examining validity (Merten et al., 2017). Studies that have looked for overdiagnosis define it as (1) diagnosis in which the conditions are not met and (2) false-positive cases occurring more often than false-negative cases, in which a diagnosis is not given although diagnostic criteria are fulfilled (Merten at al., 2017; Sciutto and Eisenberg, 2007). Studies before 2010 found no support for the claim that ADHD is overdiagnosed, despite public perception (Sciutto and Eisenberg, 2007). More recently, Merten at al., 2017, identifies one study indicating the overdiagnosis of ADHD. This study asked 1,000 German therapists to review a handful of case vignettes (Bruchmüller, Margraf, and Schneider, 2012). The authors found that 16.7 percent of therapists diagnosed an individual with ADHD despite the individual not meeting the full diagnostic criteria for the condition. Consistent with nationally representative studies, the authors found that boys were more likely than girls to be diagnosed with ADHD. Although studies using the age cutoff for kindergarten are not able to identify whether the estimated misdiagnosis rates reflect overdiagnosis or underdiagnosis, several authors believe that their results are consistent with overdiagnosis. Evans, Morrill, and Parente, 2010, p. 672, notes, among other potential reasons for this belief, that "while it is theoretically possible that older children would have symptoms that would not be detected by teachers, that notion is not consistent with the idea that children with ADHD have severe and uncontrollable behavioral problems." Schwandt and Wuppermann, 2016, looks for higher injury rates, a finding in past studies of youth with undiagnosed ADHD, and finds no evidence of higher injury rates among older students in a grade cohort.

ADHD diagnosis differs by gender, race, location, and health insurance status. Visser et al., 2014; Boyle et al., 2011; Collins and Cleary, 2016;[12] Xu et al., 2018; Danielson et al., 2018; and Pastor et al., 2015, find that boys are diagnosed with ADHD at a significantly

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[11]   In addition, Evans, Morrill, and Parente, 2010, p. 659, notes, "Safer and Malever (2000) found that of Maryland public school students taking methylphenidate (i.e., Ritalin) at school 63% had prescriptions from pediatricians, 17% from family practitioners, and only 11% received a prescription from a psychiatrist."

[12]   Collins and Cleary, 2016, uses a multivariate, weighted logistic regression to calculate odds ratios relative to a base group. The weighted logistic regression controlled for differences in race/ethnicity, gender, age, health insurance status, family status, income level, neighborhood indicators, and time trends. The authors also use a weighted logistic regression, adjusting for race/ethnicity to study overall trends in prevalence and by subgroups.

higher rate than girls (see Figures 5.2 and 5.3 in Chapter Five). From 1997 to 2008, Boyle et al., 2011, estimates the prevalence of ADHD in boys at 9.51 percent versus 3.73 percent in girls. From 2003 to 2011, Visser et al., 2014, documents that the rate for boys ever diagnosed with (i.e., lifetime prevalence) and with a current diagnosis of (i.e., point prevalence) ADHD was more than double the rate than it was for girls: The prevalence of boys ever diagnosed with ADHD was 15.1 percent, compared with 6.7 percent for girls (12.1 percent versus 5.5 percent for current diagnosis for boys and girls, respectively). Because the authors are using the same data set as Visser et al., 2014, Collins and Cleary, 2016, reaches similar estimates, albeit 1 percent to 2 percent higher (likely because of different age ranges studied). Xu et al., 2018, finds a consistent pattern over a longer time frame using the NHIS. The authors find that prevalence for boys increased from 9 percent to 14 percent from 1998 to 2016, while the prevalence for girls increased from 3 percent to 6 percent over the same period.

The same studies have found differences in ADHD prevalence along racial and ethnic dimensions. White and black non-Hispanic children are diagnosed with ADHD at higher rates than children from a Hispanic background (Boyle et al., 2011; Collins and Cleary, 2016; Visser et al., 2014; Xu et al., 2018; Pastor et al., 2015). Specifically, Visser et al., 2014, estimates that the prevalence of ADHD among Hispanic children is half the prevalence among non-Hispanic children, despite all these groups experiencing increasing trends (Collins and Cleary, 2016). This finding is corroborated by Xu et al., 2018 (see Figures E.1, E.2, and E.3). Collins and Cleary, 2016, finds that racial and ethnic variation is not sufficient for explaining the differences observed in rates of ADHD. Instead, the authors state that socioeconomic status, family status (i.e., parental marital situation), and insurance status were "highly influential" (Collins and Cleary, 2016, p. 57). For example, Collins and Cleary, 2016, finds that children who are

Figure E.1
Percentage of White (Non-Hispanic) Children Ever Diagnosed with ADHD

Figure E.2
Percentage of Black (Non-Hispanic) Children Ever Diagnosed with ADHD

Figure E.3
Percentage of Hispanic/Latino Children Ever Diagnosed with ADHD

not living with two parents (either biological or adoptive) have a higher prevalence of ADHD after controlling for covariates, both overall and by racial/ethnic background (with the exception of Hispanic families, for which only children living in a home with a single mother have a statistically higher prevalence). Boyle et al., 2011, similarly states that the observed differences are likely caused by health insurance status, access to health care, and other factors (such as language barriers). Collins and Cleary, 2016, finds that children who do not speak English as their primary language experience ADHD at a lower prevalence than children who do.

ADHD prevalence varies across U.S. states, with rates of parent-reported current ADHD exceeding 9 percent among children ages 4 to 17 in the southeastern and Midwest regions of the United States (Visser et al., 2014). Florida, Illinois, and Missouri are regional exceptions. The Southwest and Pacific coast all experience ADHD at much lower rates for this population. Xu et al., 2018, finds that all regions of the United States (Northeast, Midwest, South, and West) experienced increasing rates of ADHD diagnosis among children ages 4 to 17.[13] Despite all regions reporting 5 percent to 7 percent prevalence in 1998, the Western United States experienced the smallest increase in ADHD prevalence compared with the rest of the United States, only reaching 7 percent prevalence by 2016. The three remaining regions range from 10.3 percent to 12.2 percent (see Table E.1 for the full estimates from Xu et al., 2018). Xu et al., 2018, attributes the overall rise in ADHD diagnosis rates as possibly resulting from greater public awareness of the condition and increased access and referral to health services. Analyzing data from the NSCH in 2016, Danielson et al., 2018, also finds that the Western United States has lower rates of ADHD compared with other regions of the United States and that rural regions have higher rates than urban regions (the difference between the Western United States and the Northeast was not statistically significant at 5 percent, however).

Table E.1
Estimates of ADHD Prevalence, by U.S. Geographic Region

Years	Northeast	Midwest	South	West
1997–1998	5.5%	6.9%	6.6%	5.0%
1999–2000	5.1%	6.4%	8.1%	5.0%
2001–2002	7.3%	7.5%	8.4%	4.9%
2003–2004	6.5%	8.3%	8.0%	5.8%
2005–2006	6.3%	8.6%	8.7%	5.2%
2007–2008	7.2%	9.4%	9.5%	5.3%
2009–2010	9.2%	10.1%	10.7%	5.4%
2011–2012	8.3%	10.5%	11.5%	6.6%
2013–2014	9.5%	10.5%	11.0%	5.6%
2015–2016	10.3%	12.2%	11.0%	7.0%

SOURCE: Xu et al., 2018, pool data across years.

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[13] The authors do not state this finding outright, so we infer that these regions reflect the U.S. Census Bureau's four regions.

A finding that has received attention is that children on Medicaid (i.e., public insurance) experience ADHD at higher rates than children on employer-sponsored health insurance (Nyarko et al., 2017; Hoagwood et al., 2016; Boyle et al., 2011; Visser et al., 2014; Pastor et al., 2015), with some differences on the order of 6 to 7 percentage points (Nyarko et al., 2017). However, ADHD diagnosis is associated with Medicaid qualification, and the resulting differences might be attributable to a greater percentage of children and adolescents living below the poverty line experiencing the disorder or more children with ADHD becoming eligible for Medicaid because of their diagnosis (Nyarko et al., 2017). Relatedly, ADHD prevalence varies along income levels. Boyle et al., 2011; Collins and Cleary, 2016; and Visser et al., 2014, find that the prevalence of ADHD for children is highest among children living below (or closer to) the poverty line, despite documenting increasing trends in prevalence across all income groups. Contrary to this finding, however, Boyle et al., 2011, finds no difference in the rate of ADHD between individuals pooled across survey years below and above 200 percent of the poverty line. Figures E.4 through E.6 document trends in health insurance status, and Figures E.7 and E.8 document trends in income level.

Trends in Medication Use

ADHD is considered a treatable disorder, with the options for treatment being behavioral therapy and prescription medications. According to the Centers for Disease Control and Prevention (CDC), stimulants are an effective treatment to reduce symptoms for approximately 70 percent to 80 percent of children.[14] As a result of the increase in diagnoses of ADHD, the

Figure E.4
Percentage of Children with ADHD Who Have Private Health Insurance

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[14]   See CDC, 2019b.

Figure E.5
Percentage of Children with ADHD Who Have Medicaid, State Children's Health Insurance Program, or Children's Health Insurance Program

Figure E.6
Percentage of Children with ADHD Who Have No Insurance

Figure E.7
Percentage of Children with ADHD Who Are Below 200 Percent of the Federal Poverty Line

NOTE: FPL = federal poverty line.

Figure E.8
Percentage of Children with ADHD Who Are Above 200 Percent of the Federal Poverty Line

NOTE: FPL = federal poverty line.

use of prescription medication to treat the condition is on the rise. Hales et al., 2018, finds that ADHD medication use increased by 0.15 percent every two years in the United States, from 2.5 percent in 1999 to 3.5 percent in 2014. In a cross-country analysis from 2005 to 2012, Bachmann, Wijlaars, et al., 2017, also finds an increase in the use of prescription ADHD medication in the United States (from 3.3 percent to 3.7 percent), with a similar overall rate to Hales et al., 2018. Bachmann, Wijlaars, et al., 2017, states that the increase in the rate of medication use could be explained by several factors, including greater use of health services, increased rate of medicated ADHD patients, or an increase in the pharmacological treatment episodes for children and adolescents. Given that the Army requires individuals to be off of medication for 24 months prior to enlisting, the number of individuals not meeting this enlistment medical standard can be expected to rise. Figure E.9 summarizes trends in medication use.

Studies find that, similar to prevalence rates, children in the Western United States are prescribed medication at lower rates than the rest of the United States and that the Midwest and South use medication at higher rates (Visser et al., 2014; Danielson et al., 2018). However, Danielson et al., 2018, finds that the Southern United States is the only region that is statistically different from the West. Differences were, however, statistically significant when looking at behavioral treatment or other forms of mental health counseling in the past 12 months. The Western United States uses these other forms of treatment at statistically higher rates than the Midwest or South. The same can be said for rural regions using less behavioral treatment and mental health counseling compared with urban regions. Danielson et al., 2018, does not provide an explanation for these findings related to geography; the authors only document the trends in the data. However, they do note that specifications in the survey related to the

Figure E.9
Trends in ADHD Medication Use for Children

mode of the survey and the phrasing of the questions asked might have influenced how parents report these types of treatments across regions.

There is considerable variation in medication use across countries. Bachmann et al., 2017, also finds increases in the use of prescription ADHD medication from 2005 to 2012 for the Netherlands (1.8 percent to 3.9 percent), Germany (1.3 percent to 2.2 percent), Denmark (0.4 percent to 1.5 percent), and the United Kingdom (0.3 percent to 0.5 percent), with the greatest increase occurring in the ages 15 to 19 group. This variation reflects, in part, differing beliefs in how to go about treating the condition. For example, in the United Kingdom, psychosocial treatments are advocated as the first line in treating the condition, in contrast to the United States (Hinshaw et al., 2011). Hinshaw et al., 2011, also notes that differences in health care systems (i.e., public versus private) dictate a country's policy for treating ADHD.

Persistence

ADHD is a persistent, chronic condition (Fabiano et al., 2009; Langley et al., 2010; Biederman, Petty, Clarke, et al., 2011). Several studies have documented this persistence, with estimates ranging from 21.9 percent (Agnew-Blais et al., 2016) to 86.5 percent (van Lieshout et al., 2016) of childhood cases lasting into adulthood (see Table E.2). One possible explanation for this wide range is that the samples studied in Biederman, Petty, Clarke, et al., 2011, and van Lieshout et al., 2016, have an average age of onset of less than four years old. ADHD tends to be diagnosed at younger ages in more-severe cases, and severe cases are more likely to persist into adulthood (Kessler et al., 2009; Biederman, Petty, Clarke, et al., 2011). Another contributing factor to the wide variance in estimates is the small sample sizes, which reflect the difficulty of maintaining a longitudinal sample necessary to accurately measure persistence of a specific condition. Findings using samples in which the average age of onset or diagnosis is close to national estimates are at the lower end of the range (22 percent to 29 percent).

Treatment of ADHD does not seem to be affected by the age of diagnosis. For example, McCarthy et al., 2012, finds that the percentage of individuals in the United Kingdom continuing treatment at age 18 was fairly similar for individuals diagnosed in childhood (ages 6 to 12) and in adolescence (ages 12 to 17), at 38.5 percent and 43 percent, respectively; the median duration of treatment was 5.9 and 1.6 years, respectively.

As noted earlier, there are two approaches to treating ADHD: behavioral therapy and prescription medication. The most common medications used to treat ADHD are stimulants, which are found to assist in managing and reducing symptoms in 70 percent to 80 percent of children (CDC, 2019b). Behavioral therapy is designed to help children identify positive behaviors and skills and express their feelings. Behavioral therapy also includes "parent training," which is designed to strengthen a child's relationship with their parents (CDC, 2019a). Research, however, is mixed on whether treatment mitigates the duration of the disorder. Van Lieshout et al., 2016, finds that pharmacological treatment had no long-term impact on overall functioning or symptom severity in follow-up interviews of individuals with ADHD.[15] Biederman, Petty, Clarke, et al., 2011, further finds no association between treatment persistence and treatment type (i.e., counseling only, medication only, or both) or age of initial treatment, a finding corroborated by Molina, Hinshaw, et al., 2009, which finds that random

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[15] More evidence for this can be found in Molina, Hinshaw, et al., 2009. The authors find that individuals treated for ADHD in childhood remained less well off than the local comparison group at the eight-year follow-up and were no different from unmedicated children with ADHD in the study.

Table E.2
Studies That Include Estimates of Persistence of Childhood ADHD into Later Life

Study: Research Design/Data	Country	Age			Prevalence Estimate	Follow-Up Group		
		Of Onset (O) or Diagnosis (D)	At Baseline	At Follow-Up		With ADHD	Comparison	Total
Agnew-Blais et al., 2016: Environmental Risk Longitudinal Twin Study	England	7 years (D), median	5	18	21.90%	247	No comparison group	247
Barbaresi et al., 2013: 41 public and private schools in Minnesota Independent School District 535. Prospective study.	United States	10.4 years (D), mean	N/A[a]	27	29.30%	232	4,946	5,178
Biederman, Petty, Clarke, et al., 2011: 11-year follow-up study	United States[b]	2.6–2.8 years (O), mean	10.2–12.1	22.2	76.00%	112	105	217
Klein et al., 2012: Prospective, 33-year follow- up study, with masked clinical assessment	United States[b]	Not specified	8.3	41.4–41.5	22.20%	135	136	271
McCarthy et al., 2012: The Health Improvement Network	United Kingdom	Not specified	N/A[c]	N/A[c]	41.30%	610	No comparison group	610
van Lieshout et al., 2016: 6-year follow-up study	Netherlands	2.25 years (O), mean	11.41	17.36	86.50%	347	No comparison group	347

[a] Study did not involve an initial survey but instead examined medical records of participants. Individuals in the sample had to live in Rochester, Minn., until at least age 5 and be born between 1976 and 1982.

[b] We assume the United States for Biederman, Petty, Clarke, et al., 2011, and Klein et al., 2012, because Massachusetts General Hospital and New York University Langone Medical Center approved the studies.

[c] Study included individuals in the age ranges of 6 to 12 and 13 to 17 and did not specify average ages. The study followed individuals in the 6 to 12 age range mostly until age 21, with a few additional observations for ages 22 to 23. Individuals in the 13 to 17 age range were mostly followed until age 22, with some additional observations for ages 23 to 28.

assignment to different treatment groups in the Multimodal Treatment of ADHD Study did not yield differences in observed outcome variables at an eight-year follow-up. Fabiano et al., 2009, and Daley et al., 2014, find behavioral treatment and modification interventions to be effective for treating ADHD, particularly when it comes to training parents of children with ADHD and managing behavior. However, behavioral treatment alone was not found to be as effective as treatment with medication alone or with combined treatment, which allows for lower doses of medication (Hinshaw and Arnold, 2015). Hinshaw and Arnold, 2015, further finds that although short-term benefits (e.g., training for parents and teachers for dealing with children diagnosed with ADHD to provide regular reinforcement and promote children's self-regulation) exist, there is no evidence for long-term benefits (i.e., sustained behavioral and cognitive benefits) of both behavioral treatment and medication use. Use of combined treatment (both medication and psychotherapy) is on the rise (Hoagwood et al., 2016). Specifically, Hoagwood et al., 2016, documents an increase in the use of combined treatment by 73.5 percent from 2001 to 2010, from 18.5 percent to 32.1 percent for Medicaid-funded treatment. Psychotherapy-alone treatment increased by 109.4 percent, from 3.2 percent to 6.7 percent, over the same period, and medication-alone treatment declined by 18.4 percent, from 65.2 percent to 53.2 percent.

Outcomes Associated with ADHD

Studies have examined different lifetime outcomes for whether they are associated with ADHD. These studies use different methods and samples and define outcomes and comparison groups differently. The studies reviewed take one of two forms: a meta-analysis or a longitudinal follow-up study. Meta-analyses are typically conducted using a random-effects model to estimate an average odds (risk) ratio across studies, whereas longitudinal follow-up studies use chi-squared analysis of subgroups, calculate odds ratios directly from their data, or use regression analysis. Both methodologies yield consistent findings across long-term outcomes. To summarize this literature, we documented outcomes, comparison groups, methods, controls, samples, and estimated relationships with ADHD from 11 studies. In most cases (with the exception of Erskine et al., 2016, and Fredriksen et al., 2014), the studies restricted their comparison samples to match the ADHD samples at least by age. Some studies required additional matching on sex, social class, and geographic residence, and some studies restricted their sample population to race (e.g., white males), so matching on this demographic is implied. We identify the direction of significant and consistent relationships with ADHD and explicable relationships for differences in magnitude. Most of these relationships are associative, meaning that they could reflect unaccounted factors that might otherwise explain the relationship between ADHD and the outcome. We summarize the relationships documented by these studies, providing point estimates when they are consistent.

Research on academic and occupational outcomes indicates that individuals diagnosed with ADHD reach lower levels of achievement than their non-ADHD counterparts (none of the studies to be mentioned examine the role of treatment on long-term outcomes). Starting with educational outcomes, several studies document that individuals with ADHD (particularly boys diagnosed between the ages of 6 and 12 in the case of Klein et al., 2012) were less likely to graduate from high school (Klein et al., 2012; Erskine et al., 2016; Fredriksen et al., 2014) or to go on to complete postsecondary education (Hechtman et al., 2016; Klein et al., 2012; Erskine et al., 2016). Estimates are fairly consistent across these studies, with Hechtman et al., 2016, finding that individuals without ADHD were four times more likely to have a

bachelor's degree. Klein et al., 2012, finds that individuals with ADHD were approximately three times more likely to have a high school degree as their highest level of educational attainment (six times as likely for a GED) and were 30 percent less likely to have a bachelor's degree compared with individuals without ADHD. Erskine et al., 2016, estimates that individuals with ADHD are 3.7 times more likely to fail out of high school and 6.5 times more likely to have no tertiary education.

In addition to lower graduation rates, Klein et al., 2012; Hechtman et al., 2016; and Altszuler et al., 2016, find that being diagnosed with ADHD is significantly associated with lower income, with Klein et al., 2012, estimating an uncontrolled difference of about $40,000 at the median. Altszuler et al., 2016, finds a difference in annual earnings of $4,100 (significant at 10 percent) after controlling for gender, race, work status (including unemployment), and education. Incorporating education and differences in work status, Altszuler et al., 2016, projects that individuals diagnosed with ADHD in childhood earn $543,000 less over their lifetime than otherwise similar individuals earn. The authors cite work by Barkley, Murphy, and Fischer, 2008; Kuriyan et al., 2013; and Mannuzza et al., 1993, which find that individuals with ADHD are less likely than their non-ADHD peers to be in high status jobs because of less postsecondary academic attainment, as a potential explanation for this gap in lifetime earnings. Biederman, Petty, Woodworth, et al., 2012, also finds that men who had ADHD as children were significantly more likely to be financially dependent on their parents,[16] and, when financially independent, they experienced lower rates of college graduation and lower socioeconomic status compared with the socioeconomic status of their parents or guardians.

Additional findings include increased likelihood of being fired or impulsively quitting a job (Hechtman et al., 2016) and poorer occupational outcomes (Biederman, Petty, Woodworth, et al., 2012; Klein et al., 2012).[17] In a 16-year longitudinal follow-up study, Hechtman et al., 2016, finds that individuals with ADHD, despite having a similar number of jobs, quit or were fired at around double the rate of the local comparison group and spent an average of 41 fewer days at their jobs, controlling only for age at follow-up.[18] Relatedly, Erskine et al., 2016, finds that individuals with ADHD were about four times more likely to have been dismissed from employment and two times more likely to experience unemployment. That is not to say that individuals with ADHD perform poorly in their jobs. In a 33-year follow-up study, Klein et al., 2012, finds that the individuals in the study group with ADHD as a whole were likely to be performing at a satisfactory level at their occupations and in their social functioning.[19] However, the non-ADHD comparison group was performing significantly better in both categories. For both occupational and social functioning, individuals with ADHD were performing between an average and good level, while the local comparison group was performing between a good and very good level. It is important to keep in mind that several of

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[16] Altszuler et al., 2016, reaches a similar conclusion, although its study group is not limited to men.

[17] In Klein et al., 2012, *occupational outcomes* refer to an occupational attainment scale (ranging from 1 to 8), according to Hollingshead and Redlich. Occupational function is rated on a 1 through 6 scale (1 being superior, 6 indicating poor) for the previous six months. In Biederman, Petty, Woodworth, et al., 2012, occupational level is measured on a scale from 1 to 9, with increasing numbers indicating higher occupational levels.

[18] Bernardi et al., 2012, also finds that individuals with ADHD are 3.53 times more likely to quit a job without having a contingency plan after controlling for sociodemographic characteristics.

[19] Klein et al., 2012, measures social functioning on a scale of 1 to 6, with 1 indicating superior social functioning and 6 indicating poor social functioning.

the studies referenced are either longitudinal follow-up studies or meta-analyses and therefore might not be representative samples. Hechtman et al., 2016, however, analyzes data from the Multimodal Treatment Study of Children with ADHD and is a representative sample of the population.

Regarding social outcomes, individuals diagnosed with childhood ADHD were more likely to have interactions with law enforcement and the judicial system (Mohr-Jensen and Steinhausen, 2016; Erskine et al., 2016), to have a higher risk of suicide (Barbaresi et al., 2013; Ljung et al., 2014; Klein et al., 2012; Erskine et al., 2016), to experience substance abuse disorder (Molina, Howard, et al., 2018; Klein et al., 2012; Erskine et al., 2016) and to develop nicotine or tobacco dependence (Klein et al., 2012; Erskine et al., 2016).[20] Individuals with ADHD were 1.7 to 3.6 times more likely to be arrested, depending on the crime associated with the arrest (Klein et al., 2012; Erskine et al., 2016; Mohr-Jensen and Steinhausen, 2016). Individuals with ADHD were two times more likely to be convicted (Erskine et al., 2016), with an RRR of 3.3 (Mohr-Jensen and Steinhausen, 2016). Finally, individuals with ADHD were estimated to be 1.6 to 4.3 times more likely to be incarcerated (Hechtman et al., 2016; Erskine et al., 2016) with an RRR of 2.9 (Mohr-Jensen and Steinhausen, 2016). Ljung et al., 2016, finds that individuals with ADHD were 3.62 and 5.91 times as likely to attempt and complete suicide (respectively) compared with a control group, even when controlling for comorbidity. Individuals with ADHD experience nicotine or tobacco dependence (or are daily smokers) at 2.08 to 2.64 the rate of individuals without ADHD (Klein et al., 2012; Erskine et al., 2016; Molina, Howard, et al., 2018).

The presence of multiple conditions (i.e., comorbidities) coinciding with ADHD is not uncommon and could explain heightened rates of negative observed outcomes, such as increased risk of incarceration, risk of suicide, and substance abuse. Across the board, studies find that individuals with ADHD are more likely to have conduct disorder, antisocial personality disorder, and substance use disorders, with the exception of alcohol use disorder (Hechtman et al., 2016; Klein et al., 2012; Erskine et al., 2016; Molina, Howard, et al., 2018). Using the National Epidemiologic Survey on Alcohol and Related Conditions,[21] Bernardi et al., 2012, finds that adults with ADHD are significantly more likely to be diagnosed with any psychiatric disorder even after controlling for sociodemographic factors (adjusted odds ratio = 7.57), with the exception of alcohol abuse (adjusted odds ratio = 0.87). Mannuzza, Klein, and Mouton, 2008, finds that, even in the absence of comorbidity (e.g., conduct disorders), people diagnosed with ADHD are more likely to partake in criminal behavior because of an increased risk of developing antisocial behavior and substance use disorders.

Major Depressive Disorder and Anxiety Disorders

Major depressive disorder (MDD) is a mood disorder. It is diagnosed when an individual experiences five or more of the following symptoms during the same two-week period:

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[20]   Molina, Howard, et al., 2018, finds that individuals with ADHD are more likely to be daily smokers than are individuals without ADHD.

[21]   The National Epidemiologic Survey on Alcohol and Related Conditions is a nationally representative, cross-sectional survey of the civilian noninstitutionalized population ages 18 and older.

- depressed mood most of the day, nearly every day
- markedly diminished interest in pleasure in all, or almost all, activities most of the day, nearly every day
- significant weight loss when not dieting or weight gain, or a decrease or increase in appetite
- slowing down of thought and a reduction of physical movement
- fatigue or loss of energy all day, nearly every day
- feelings of worthlessness or excessive or inappropriate guilt nearly every day
- diminished ability to think or concentrate, or indecisiveness, nearly every day
- recurrent thoughts of death or suicidal ideation (American Psychiatric Association, 2013).

Other symptoms include irritability, difficulty sleeping, or psychosomatic symptoms (such as aches and pains, headaches, or digestive issues).[22]

Depression includes both MDD (described above) and persistent depressive disorder (dysthymia). Persistent depressive disorder is diagnosed when individuals experience MDD for at least two years (American Psychiatric Association, 2013).

Anxiety disorders are characterized by excessive fear and anxiety. Anxiety disorders include generalized anxiety disorder, panic disorder, specific phobia, agoraphobia, social anxiety disorder, obsessive-compulsive disorder, and separation anxiety disorder.[23] Generalized anxiety disorder is characterized by excessive anxiety or worrying, difficulty concentrating, irritability, and somatic symptoms (such as muscle tension, sleep issues, and fatigue; Locke, Kirst, and Shultz, 2015). However, a diagnosis for generalized anxiety disorder only requires that at least three of the symptoms exist and that they are present for a majority of days over six months (Locke, Kirst, and Shultz, 2015).[24]

The onset of depression is likely to occur in adolescence (Keyes et al., 2019). In one study of female adolescents ages 12 to 20 in the Southwestern United States, the onset of past-year MDD (i.e., past-year period prevalence) was highest at age 16, with 5.3 percent of the sample having a diagnosis for the condition (Rohde, Beevers, et al., 2009). In the same study, minor depression was highest at age 14, with 6.4 percent of the sample having a diagnosis for the condition.[25] Essau et al., 2018, and Salk et al., 2016, find no evidence in their sample populations for a difference between girls and boys in the age of onset for depression. Salk et al., 2016, however, finds that girls experience depression and symptom severity at greater rates than boys throughout adolescence.

Most mood and anxiety disorders typically emerge in early adolescence and adulthood, with the exception of separation anxiety and some phobias (de Girolamo et al., 2012). Using 2001–2004 data from the National Comorbidity Survey Adolescent Supplement, Merikangas

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[22] See National Institute of Mental Health, 2018.

[23] See American Psychiatric Association, 2017.

[24] Diagnosis in children only requires one of the symptoms.

[25] Rohde, Beevers, et al., 2009, defines *minor depression* as an individual reporting the presence of all symptoms of MDD, with at least one reported at a subthreshold level.

et al., 2010, finds the median age of onset to be 13 for mood disorders and six for many anxiety disorders.[26]

Trends in Diagnosis
Data Sources

Several surveys have been used to study trends in depression and anxiety disorders, including the NSDUH, the NSCH, the NHIS, and the MTF survey.

In the NSDUH, children and adults are asked specific questions, depending on their age, about their mental-health service use, including receipt of inpatient and outpatient services over the past 12 months, number of visits for outpatient services, and number of nights spent in inpatient services. Children are specifically asked about the sources from which they receive mental health services, including services received at school, in juvenile detention, in prison, or in jail in the past year. The NSDUH also asks respondents questions based on the criteria used to diagnose depression, which allows for a "diagnosis" of a major depressive episode without a diagnosis from a mental health professional; this method allows one to calculate nationally representative estimates of depression in the general population.

To evaluate depression symptoms, the MTF survey uses a set of six items from the Bentler Medical and Psychological Functioning Inventory depression scale. The survey asks students to rate the following on a scale of 1 to 5, where 1 means "disagree" and 5 means "agree" (reverse scale applies when noted):

- Life often seems meaningless.
- I enjoy life as much as anyone (reverse scale).
- The future often seems hopeless.
- It feels good to be alive (reverse scale).
- I feel that I can't do anything right.
- I feel my life is not very useful.

Like the NSDUH, the MTF survey does not specifically follow a protocol meant to diagnose major depressive episodes but does identify symptoms associated with depression. Studies using the MTF rely on the first four survey questions to measure depressive symptom because they are associated with two MDD symptoms: feelings of worthlessness or excessive or inappropriate guilt and recurrent thoughts of death or suicidal ideation (Keyes et al., 2019).

Although the NSDUH and MTF survey ask children and adolescents directly about their mental health status, the NSCH and NHIS collect data from parents about their child. In the case of depression and anxiety, parents report whether a doctor or health care professional has informed them that their child suffers from the condition. Consequently, we expect that NSDUH and MTF estimates of depression prevalence are more likely to reflect overall depression rates, whereas the NSCH and NHIS are more likely to reflect diagnosed depression rates.

Most of the studies we examined typically focus on depression instead of anxiety; unlike ADHD, depression is not measured in a consistent way across these studies. Studies using the NSDUH, NSCH, or NHIS report lifetime, period, and point prevalence of the condition in the population (for example, Mojtabai, Olfson, and Han, 2016; Weinberger et al., 2018;

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[26] Anxiety disorders in the National Comorbidity Survey Adolescent Supplement include panic disorder, agoraphobia, social phobia, specific phobia, generalized anxiety disorder, PTSD, and separation anxiety.

Bitsko et al., 2018). Studies using the NHIS and NSCH also report past and current diagnosis of MDD, whereas studies using the NSDUH report the occurrence and frequency of major depressive episodes. Those using the MTF look at self-reported average depression symptom scores over time (for example, Keyes et al., 2019; and Twenge et al., 2018). Methodologically, these studies all typically use linear or logistic regression methods to examine trends, controlling for demographic characteristics.

Depression Estimates

We begin this section, like we did with the section on ADHD, by discussing trends for depression and anxiety for children overall, and we follow this up with a discussion of trends for various subpopulations. Using the NSDUH, Mojtabai, Olfson, and Han, 2016, finds a statistically significant increase in 12-month major depressive episodes in adolescents (ages 12 to 17), from 8.7 percent in 2005 to 11.3 percent by 2014, following a period of relative stability between 2005 and 2011. The authors also find a more modest increase, from 8.8 percent to 9.6 percent, for young adults (ages 18 to 25). Using the same data, Weinberger et al., 2018, also finds an increase in the prevalence of depression for the same age groups from 2005 to 2015. The authors also document that the rate of increase in the prevalence of depression for adolescents was significantly greater than it was for every other age group considered. In contrast, Bitsko et al., 2018, does not find any evidence of increasing rates of lifetime or point prevalence for depression among children ages 6 to 17 using data from the NSCH.

Figure E.10 summarizes these data. As discussed above, the differences between the NSDUH and NSCH estimates are likely due to the fact that the NSDUH estimates are based on respondents' answers to survey questions, whereas the NSCH relies on parent-reported diagnoses from a doctor or health-care professional.

Using the MTF survey, Keyes et al., 2019, and Twenge et al., 2018, estimate a decline in average self-reported symptoms of depression among U.S. students ages 13 to 18 from 1991 to 2012 (see Figure E.11). However, they also find a sharp increase immediately after 2012.[27] This increase is due to differences in depression by gender, as Figure E.12 (from Mojtabai, Olfson, and Han, 2016, using NSDUH data) and Figures E.13 and E.14 (from Twenge et al., 2018, using MTF data) show. As these data show, girls experienced a large increase in the prevalence of depression and self-reported depressive symptoms starting in 2012 across both surveys. Furthermore, it is clear that girls experience depression at higher rates than boys do, as we noted earlier in this review (Salk et al., 2016). Weinberger et al., 2018, reports similar results, although its findings are for the entire sample (individuals ages 12 and older), and it does not report differences in gender at more-granular age classifications.[28]

Mojtabai, Olfson, and Han, 2016, and Twenge et al., 2018, offer similar explanations for the increase in depression for girls and not boys. Mojtabai, Olfson, and Han, 2016, states

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[27]   Keyes et al., 2019, sums across six items for each individual and then averages across the sample; Twenge et al., 2019, takes the average of the six items for each individual and then averages across the sample.

[28]   Thapar et al., 2012, finds that, for both current and lifetime prevalence, females experience depression at higher rates than males across several large-scale studies, including the National Comorbidity Survey, the Great Smoky Mountain Study, the Oregon Adolescent Depression Project, and the Dunedin Longitudinal Study. The only study in which males showed higher rates of depression was for boys age 11 in the Dunedin Longitudinal Study. However, Thapar et al., 2012, does not publish confidence intervals or conduct statistical tests, so we cannot determine whether males and females were statistically different from one another.

Figure E.10
Estimates of Depression Prevalence Among U.S. Youth

Figure E.11
Estimates of Self-Reported Symptoms of Depression Among U.S. Youth

Figure E.12
Depression Prevalence Among U.S. Youth, by Gender

SOURCE: Mojtabai, Olfson, and Han, 2016.

Figure E.13
Self-Reported Mean Depression Symptom Scores Among U.S. Youth, by Gender

SOURCE: Twenge et al., 2018.

Figure E.14
Percentage of U.S. Youth with High Levels of Depressive Symptoms, by Gender

SOURCE: Twenge et al., 2018.

that this difference is likely the result of differing rates of exposure to certain risk factors. Specifically, the authors suggest that this increase for girls might be the result of increased cyberbullying caused by girls spending more time using mobile phones and texting applications than is spent by boys.[29] Twenge et al., 2018, finds a correlation between the increase in systems of depression and screen-based activities. For example, increases in using social media, viewing television, and reading internet news are positively correlated with a higher depressive symptom score, while increases in in-person social interaction, religious service attendance, sports and exercise, time spent doing homework, and print media reading are associated with lower depressive symptom scores.[30] These findings persist when controlling for demographic characteristics.

Mojtabai, Olfson, and Han, 2016, and Twenge et al., 2018, find similar trends across race and ethnicity (Figures E.15, E.16, and E.17). As Figure E.16 shows, both white (non-Hispanic) and black (non-Hispanic) children show stable, if not declining, trends in self-reported systems until 2012, after which both groups experience increases. Hispanic children also show an increase after 2012. Because Twenge et al., 2018, does not have data for this subgroup prior

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[29] Chen et al., 2017, finds that smartphone addiction in boys is characterized by the use of playing games, whereas girls' addiction is characterized by greater use of multimedia and social networking applications. This study was conducted on a group of medical students in 2016 at Wannan Medical College in China.

[30] In a study of adults in the United States ages 19 to 32, Lin et al., 2016, finds a positive correlation between time spent using social media and odds for depression. Relatedly, Dhir et al., 2018, finds that compulsive or excessive use of social media can lead to fatigue, which is a predictor of depression. The authors used two cross-sectional samples of adolescents ages 12 to 18 in Northern India for their study.

to 2009, it is not clear whether earlier trends for Hispanics mirror those for other racial and ethnic groups.

There is some ambiguity about which racial or ethnic group experiences higher rates of depression. Despite having higher average depressive symptom scores and a greater proportion of individuals with high depressive symptoms (Figures E.16 and E.17), Figure E.15 shows depression prevalence for Hispanics at or below that of white children. Rohde, Beevers, et al., 2009, on the other hand, finds no difference in the rate of MDD between groups; however, minority female adolescents experienced minor depressive episodes at 1.6 times the rate of white female adolescents and were typically younger at the time of onset of the disorder. Relatedly, Coley, O'Brien, and Spielvogel, 2019, finds that Hispanic children have higher symptoms of depression compared with white children across the 8th, 10th, and 12th grades.

Finally, there is some evidence that socioeconomic conditions are associated with depression. Twenge et al., 2018, finds that individuals with a lower socioeconomic status (according to their mother's highest level of educational attainment) have higher average depression symptom scores. Coley, O'Brien, and Spielvogel, 2019, also finds that the socioeconomic status of both an adolescent's family and school is inversely related to depression symptoms. Bitsko et al., 2018, concludes that children living below 200 percent of the federal poverty line have a current diagnosis for depression or anxiety at higher rates than children living above 200 percent of the federal poverty line. However, after adjusting for demographic characteristics, Ghandour et al., 2019, estimates that children living at or below the federal poverty line have

Figure E.15
Depression Prevalence Among U.S. Youth, by Race and Ethnicity

SOURCE: Mojtabai, Olfson, and Han, 2016.

Figure E.16
Self-Reported Mean Depression Symptom Scores Among U.S. Youth, by Race and Ethnicity

SOURCE: Twenge et al., 2018.

Figure E.17
Self-Reported Symptoms of Depression Among U.S. Youth, by Race and Ethnicity

SOURCE: Twenge et al., 2018.

a *lower* prevalence of a current anxiety diagnosis than children living at or above 400 percent of the federal poverty line.[31]

Anxiety Estimates

As noted earlier, studies typically do not focus on trends in anxiety disorder diagnoses in the general population. However, Bitsko et al., 2018, finds that both lifetime and point prevalence of children ages 6 to 17 with an anxiety diagnosis increased from 2007 to 2012. Over this period, estimates of lifetime prevalence increased from 5.5 percent to 6.4 percent, and estimates of point prevalence increased from 3.5 percent to 4.1 percent.

Ghandour et al., 2019, uses data from the NSCH in 2016 and, combined with the data from Bitsko, et al., 2018, provides a picture of longer-term trends in anxiety diagnoses. Ghandour et al., 2019, finds a prevalence rate of current anxiety diagnoses of 7.1 percent in 2016, a 73 percent increase in children ages 3 to 17 with a current anxiety diagnosis from the Bitsko et al., 2018, estimate of 4.1 percent in 2012. Bitsko et al., 2018, p. 402, states that the increase observed from 2003 to 2012 could be the result of "improved identification of anxiety, increased diagnosis of mild anxiety, or increased mental health service use."

Trends in Medication Use

In a recent meta-analysis, Piovani, Clavenna, and Bonati, 2019, estimates the prevalence of antidepressant use among children and adolescents in North America to be 1.5 percent. In the United States, Bachmann, Aagaard, et al., 2016, presents estimates very close to those of Piovani, Clavenna, and Bonati, 2019. The authors find that the prevalence of antidepressant medication use increased by 26.1 percent from 2006 to 2012 (from 1.26 percent to 1.58 percent) for children under the age of 19. In a study of Canadian children under the age of 19 from 1983 to 2007, Meng, D'Arcy, and Tempier, 2014, finds that the prevalence of children who were prescribed at least one antidepressant increased from 5.9 per 1,000 in 1983 to 15.4 per 1,000 in 2007, with the most pronounced increases for children ages 10 to 14 and 15 to 19. John, Marchant, Fone, et al., 2016, finds that the rate of antidepressant prescribing in the United Kingdom declined from 2004 to 2010 (relative to 2003 levels) but then increased from 2011 to 2013.

Many studies in the literature tend to discuss medication use under the umbrella of psychotropic medications, which include antidepressants but also anxiolytics (which are used to treat anxiety), sedatives, and medications for ADHD (Jonas, Gu, and Albertorio-Diaz, 2013). Using data from the Medical Expenditure Panel Survey, Olfson, Druss, and Marcus, 2015, finds that the use of psychotropic medications increased between 1996–1998 and 2010–2012, from 9.2 percent to 13.3 percent.[32] John, Marchant, McGregor, et al., 2015, finds that prescriptions for anxiolytics have increased relative to 2003 levels, while prescriptions for hypnotics stayed relatively constant over the same period.

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[31] Ghandour et al., 2019, states that having access to a provider who can make a proper diagnosis could explain this lower prevalence. Furthermore, the authors state that children from lower income households were less likely to receive treatment for behavioral health issues from a mental health provider and were more likely to be treated in a primary care setting, which might not be equipped for treating behavioral health issues.

[32] The Medical Expenditure Panel Survey is a combined survey of a nationally representative sample of households and insurance data from public and private employers. It collects data on health conditions and status, the use of medical services, access to care, health insurance coverage, employment, and income. See Agency for Healthcare Research and Quality, 2019.

Recurrence

Depression and anxiety are recurrent mental health conditions. In a study of the Oregon Adolescent Depression Project, Rohde, Lewinsohn, et al., 2013, finds a cumulative recurrence rate of 53 percent for participants who experienced MDD, with the highest rate of recurrence between the ages of 18 and 24. Kovacs, Obrosky, and George, 2016, also finds a high cumulative probability of recurrence, independent of the number of prior depressive episodes, in its 15-year follow-up study of children ages 8 to 13 at baseline. Specifically, using Cox proportional hazards models, the authors find the cumulative probability of a second, third, and fourth depressive episode to be 72 percent, 91 percent, and 80 percent, respectively.[33] In an analysis of the Christchurch Health and Development study, McLeod, Horwood, and Fergusson, 2016, finds that individuals with adolescent depression were more likely to experience major depression in adulthood.[34]

For anxiety, Essau et al., 2018, finds that the probability of recurrence of anxiety is not statistically different across gender, unlike the finding that girls experience anxiety and depression at higher rates than boys. Furthermore, Essau et al., 2018, finds that anxiety disorders that manifest in childhood have similar recurrence rates at adolescence, emerging adulthood, and adulthood (of 8 percent, 9 percent, and 8 percent, respectively).[35] In a study of 430 adults ages 18 to 65 in the Netherlands, Scholten et al., 2013, finds that 23.5 percent of participants experienced a recurrence of their remitted disorder (participants included had a remitted anxiety disorder at baseline) or the incidence of a new anxiety disorder at the two-year follow-up.

Zhou et al., 2015, finds that there are several forms of therapy that are beneficial in treating depressive disorders. However, cognitive behavioral therapy (CBT) and interpersonal therapy were significantly more effective treatments during short-term follow-up than other forms of therapy.[36] In a randomized study of treatment options, Kennard et al., 2009, finds that the rate of recovery[37] at 36 weeks is 55 percent for fluoxetine (a selective serotonin reuptake inhibitor) alone, 64 percent for CBT alone, and 60 percent for a combined treatment, compared with a control group receiving acute treatment.[38] Rapee, Schniering, and Hudson, 2009,

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[33]   Kovacs, Obrosky, and George, 2016, controls for gender, socioeconomic status, family status, age of onset, age at each recurrence, comorbidity, family mental health status and history, and treatment. The authors estimate the median duration between first and second major depressive episodes to be 4.21 years, 2.82 years between second and third episodes, and 4.58 years between third and fourth episodes.

[34]   Adolescence was defined as ages 14 to 16, and adulthood was defined as ages 30 to 35.

[35]   Essau et al., 2018, uses data from the Oregon Adolescent Depression Project on 816 individuals who completed the four follow-up assessments.

[36]   CBT is a treatment technique that teaches patients to recognize that psychological problems are partly the result of "faulty, or unhelpful ways of thinking" and "learned patterns of unhelpful behavior" (American Psychological Association, undated). CBT teaches patients how to change their thinking patterns in such a way as to reframe their emotional responses and learn techniques to cope by replacing harmful or irrational thoughts with rational thoughts and behaviors (American Psychological Association, undated; American Psychiatric Association, 2019). CBT involves practicing newly developed skills by purposefully exposing oneself to stress-inducing stimuli. Interpersonal therapy is a method of treatment geared toward helping individuals learn "healthy ways to express emotions and ways to improve communication and how they relate to others" (American Psychiatric Association, 2019).

[37]   *Recovery* is defined as maintaining a remission status at the specified number of weeks. *Remission* is defined as maintaining a Children's Depression Rating Scale-Revised (CDRS-R) score of 28 or lower. The CDRS-R is a clinician-rated scale of 17 items that are rated on a scale of 1 to 5 or of 1 to 7 (Kennard et al., 2009).

[38]   Kennard et al., 2009, uses a combination of intention-to-treat analysis and generalized estimating equations to analyze remission rates, controlling for site, treatment, time, time-by-treatment interaction, and patient-level random effects.

also finds that skills-based therapies are successful in reducing symptoms in disorders, with 55 percent to 60 percent of individuals recovering from diagnosis following treatment compared with a control group.

Outcomes Associated with Depression and Anxiety

Both depression and anxiety can have significant implications for an individual's lifetime and social outcomes, with several studies finding negative impacts on an individual's employment prospects and overall productivity.[39] For example, using the National Comorbidity Survey Replication study, Birnbaum et al., 2010, finds that individuals with depression were 1.6 times as likely to be unemployed compared with nondepressed respondents. In an analysis of Canadians with MDD, Rizvi et al., 2015, documents high rates of unemployment and disability, from 30.3 percent to 42.1 percent across the provinces (unemployment rates alone ranged from 13.2 percent in Alberta to 21.1 percent in Quebec). Using a labor-market-supply model and data from the Medical Expenditure Panel Survey, Peng, Meyerhoefer, and Zuvekas, 2016, finds that depression decreases an individual's probability of employment by 2.4 percent.

Using data from the National Comorbidity Survey Replication study, both Chatterji, Alegria, and Takeuchi, 2011, and Banerjee, Chatterji, and Lahiri, 2017, find that individuals with a psychiatric disorder (including, but not limited to, MDD and anxiety disorders) were less likely to be in the labor force and, conditional on being in the labor force, were less likely to be employed. Specifically, Chatterji, Alegria, and Takeuchi, 2011, finds that men with a psychiatric disorder are 9 percent less likely to be in the labor force and 14 percent less likely to be employed.[40] For women, these likelihoods are 19 percent and 13 percent lower, respectively. Banerjee, Chatterji, and Lahiri, 2017, estimates that an increase in an individual's mental illness score (calculated from a latent variable equation as part of a larger structural labor-market model) decreases the likelihood of employment by 19 percent for men and by 10 percent for women.

There are also estimates in the literature on the impact of depression and other mental disorders on workplace productivity (presenteeism) and absenteeism, which can vary by severity of condition. For example, Birnbaum et al., 2010, finds that depression can have significant impacts on self-reported measures of work performance, with moderate-to-severely depressed respondents indicating they felt 4–5 percent less productive than mild and nondepressed respondents indicated. Furthermore, severely depressed workers are more likely to miss at least one day of work compared with other depressed and nondepressed respondents (Birnbaum et al., 2010; Peng, Meyerhoefer, and Zuvekas, 2016; Banerjee, Chatterji, and Lahiri, 2017). Jain et al., 2013, finds evidence of a positive association between depression and absenteeism and presenteeism: The fewer symptoms an individual has, the more productive they appear to be.

Despite these observed relationships with productivity, Chatterji, Alegria, and Takeuchi, 2011, and Peng, Meyerhoefer, and Zuvekas, 2016, do not observe a relationship between psychiatric disorders or depression and work hours or earnings. However, Pettit et al., 2009, develops a "chronic course index" using principal components analysis on MDD ill time, number of

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[39] Studies using data from nationally representative surveys control for demographics including, age, race and ethnicity, gender, etc. McLeod, Horwood, and Fergusson, 2016, uses a sample from the same birth cohort.

[40] Chatterji, Alegria, and Takeuchi, 2011, uses two-state probit and least squares models, controlling for demographic characteristics, health status, and local employment conditions.

episodes (both major and minor depressive), age of onset for major depression, and lifetime history of dysthymia. The authors conclude that this index is correlated with household income. McLeod, Horwood, and Fergusson, 2016, finds that the severity of adolescent depression is associated with a statistically significant decline in net weekly personal income.[41]

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[41] Neither Pettit et al., 2009, nor McLeod, Horwood, and Fergusson, 2016, finds a statistically significant association with educational attainment.

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Army enlistment standards are intended to ensure that applicants are able to perform military duties successfully and to select those who are the most trainable and adaptable to service life. However, these standards might also inadvertently screen out individuals who could have had successful careers if mitigating factors had been considered. Waiver authority provides the Army with the ability to reconsider initially disqualified applicants and make them eligible to enlist.

Two trends of relevance to Army waiver policy are the dramatic expansion of the legalization of marijuana at the state level and the rising prevalence of attention-deficit/ hyperactivity disorder (ADHD), anxiety disorders, and depression among children. Army standards continue to stipulate that applicants who test positive for marijuana require a waiver to be eligible for enlistment, and applicants with a history of ADHD, depression, or anxiety will not meet enlistment standards and might not even qualify for a waiver, depending on their specific case.

To provide information on how the Army can strengthen its waiver policy, especially in light of these societal trends, RAND researchers conducted empirical analyses of the performance of recent recruits who receive waivers, including (but not limited to) those with a documented history of marijuana, ADHD, or depression/anxiety. The authors also examined the extent to which increasing the share of recruits who receive waivers (or who have a documented history of marijuana, ADHD, or depression/anxiety) affects the overall performance of that accession cohort.

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