OPA Report No. 2022-085
March 2022

QUALIFIED MILITARY AVAILABLE (QMA) TECHNICAL REPORT

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INTRODUCTION AND BACKGROUND

Knowing the number of American youth eligible and available for military service is critical information for the Department of Defense (DoD) to plan its recruiting policy. As such, DoD periodically estimates the proportion of the population ages 17–24 who are intellectually, medically, and behaviorally qualified to enlist in the U.S. Military without a waiver and are free from family commitments that would prevent them from successfully performing military duties (e.g., sole provider for dependents). In addition to estimating the size of the eligible population and reasons for ineligibility, DoD estimates the Qualified Military Available (QMA) population, or those youth who are both eligible for military service and not currently enrolled in college (i.e., available).

As the DoD's official estimates for youth eligibility and disqualifier rates, the QMA Study estimates are essential for each of the Services/Components as well as various DoD stakeholders who must have a relevant and valid estimate of the readiness of the population(s) from which the Military recruits. Accurate estimates that account for all major categories of disqualifications and the overlap among them, at the national and ZIP code levels, play a key role in understanding current recruiting conditions and providing data necessary to making strategic decisions to increase the efficiency and effectiveness of the Services' recruiting efforts and DoD programs and policies.

PREVIOUS QMA STUDIES

The Lewin Group (Lewin) developed a model, the QMA Estimator, for the Office of the Secretary of Defense (OSD) Accession Policy (AP) Directorate and the Joint Market Analysis and Research Council (JMARC) in 2005 that estimated eligibility by gender, race/ethnicity, and education at the ZIP code level. These earlier iterations of the QMA study included disqualification rate estimates that were based on only a few of the many disqualifiers and did not account for overlap of disqualifiers in all cases due to the lack of data to estimate the correlations.

In 2013, the eligibility estimates were updated to incorporate a more extensive list of disqualifying circumstances, including various health conditions, criminal/judicial background, presence of dependents, and Armed Forces Qualification Test (AFQT) scores. Additionally, the methodology was significantly changed from the previous study in order to account for the overlap among eligibility categories. Given the underlying model changes to the 2013 model, it was ultimately not comparable to previous models. As such, a key objective for the 2020 QMA study was to create not only an updated model, but one that applied similar methodological approach and therefore provided estimates that could be compared to those estimated in 2013.

OBJECTIVES FOR THE 2020 QMA STUDY

The primary goal of the 2020 QMA study was to develop updated national and ZIP code-level eligibility and qualified and available estimates for the nation's youth as well as for specific subgroups of interests (e.g., gender.) This was to be accomplished using more recent data, drawing from identical variables (where available) with the goal of replicating the 2013 QMA study methodology as closely as possible, to allow for metrics to be compared across the two years. In addition to determining how many youth would be disqualified for aptitude based on scoring in the lowest percentile (1–9) on the AFQT (Cat. V), the study also estimated the percentage of the youth population likely to score in each AFQT category (I–V) if they were to take the Armed

Forces Vocational Aptitude Battery (ASVAB). The goal of the AFQT model was similar to the eligibility model in that it intended to obtain results for each AFQT category that can be projected to ZIP codes.

OVERVIEW OF DATA SOURCES

DATA SOURCES FOR DISQUALIFYING FACTORS

JAMRS used the same seven broad disqualification categories used in 2013: medical/physical, overweight, mental health, drugs, conduct, dependents, and aptitude, using the following DoD Instructions (DoDI):

- DoDI 1304.26 "Qualification Standards for Enlistment, Appointment, and Induction," March 23, 2015 (Incorporating Change 3, October 26, 2018)
- DoDI 6130.03, "Medical Standards for Appointment, Enlistment, or Induction in the Military Services," May 6, 2018
- DoDI 1308.3, "DoD Physical Fitness and Body Fat Programs Procedures," November 5, 2002

The 2020 QMA study used the most recent data for the same surveys used in the previous QMA study:

- The Center for Disease Control and Prevention's (CDC) National Health and Nutrition Examination Survey (NHANES), 2015–2018
- National Survey on Drug Use and Health (NSDUH), 2019
- DoD Joint Advertising Market Research & Studies Youth Poll (YP) Surveys, 2019–2020 (YP43–45)
- Military Entrance Processing Command (MEPCOM) Production Applicant Files, FY12–FY19 (AFQT database)
- Profile of American Youth 1997 (PAY97)
- Woods & Poole (W&P) Economics, Inc. Projections (2018), 2020 Population Estimates
- U.S. Census Bureau, American Community Survey (ACS) 5-year Estimates (2014–2018)

This section outlines the filter variables used to identify the target population and weighting variables applied for each data set.

NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY (NHANES)

NHANES, a program of studies designed to assess the health and nutritional status of adults and children in the United States, was used to estimate the prevalence of more than 30 health conditions. NHANES is fielded annually and is a nationally representative sample of about 5,000 adults and children combining interviews and physical examinations, using weighted observations each year to represent the U.S. civilian noninstitutional population. In order to have a substantial sample size to estimate medical/physical ineligibility of 17–24-year-olds by gender, race/ethnicity, and education, we used four years of NHANES data, 2015–2018 (two 2-year cycles: 2015–2016; 2017–2018) and applied exam weights. Data were filtered by age, prior military service, and exam weight using the specific variables and coding for filters below. Observations with a value of 0 for the four-year exam weight were excluded in accordance with the NHANES analytical guidelines, which indicate that cases with a 0 examination weight should be treated as missing when the examination data are analyzed as is the case with the data used for this effort. NHANES interview variables were also used in combination with exam variables for certain medical conditions, and NHANES guidelines suggest that in cases where all variables come from the interview and exam, then the sample used should reflect only those with non-0 exam weights and exam weights should be used in the analysis.

- Age: RIDAGEYR

- Removed observations < 17 and > 24
- Prior military service: DMQMILIT
  - Removed observations where DMQMILIT = 1
- Weight: WTMEC4YR
  - Removed observations where WTMEC4YR = 0
  - Per NHANES analytic guidelines, a combined sample weight was calculated based on the sample weights of the combined survey cycles. The 4-year sample weight was computed by dividing the 2-year sample weights by two (the number of 2-year cycles in the analysis).
    - WTMEC4YR = WTMEC2YR / 2

Table 1. NHANES Data Observations

Survey Wave	Total *N*	Ages 17–24 *N*	Filtered Sample Size*
2015–2016	9,971	871	827
2017–2018	9,254	840	787
Total 4-year	19,225	1,711	1,614

*Filters: Removed observations DMQMILIT = 1, WTMEC4YR = 0

NATIONAL SURVEY ON DRUG USE AND HEALTH (NSDUH)

The NSDUH is an annual survey of about 70,000 civilian noninstitutionalized adults and children on issues related to tobacco, alcohol, and drug use, mental health, and other health-related issues in the United States. We used 2019 data for 17–25-year-olds (the closest age range available in the data for the target 17–24 year-old population), and survey weights were applied to all estimates using the weight variable, ANALWT_C. Specific variables and coding for filters are listed below.

- Age: AGE2
  - Removed observations < 17 and > 25
- Prior military service: SERVICE
  - Removed observations where SERVICE = 1

Table 2. NSDUH Data Observations

Survey Wave	Total *N*	Ages 17–25 *N*	Filtered Sample Size*
2019	56,136	16,452	16,242

*Filters: Removed observations SERVICE = 1.

DOD YOUTH POLL (YP)

The DoD Youth Poll (YP) is a continuously fielding, nationally representative survey of youth ages 16–24 administered by JAMRS that, in addition to its core metrics on youth propensity and attitudes toward military service, also tracks medical/physical health, dependents, drug usage, and conduct disqualifiers. Survey weights were applied to all estimates using the weight variable, NATIONAL_WT.

Three waves of YP data that fielded through 2019 and early 2020 were used:

- DoD Youth Poll 43 Spring 2019 (January–June 2019)
- DoD Youth Poll 44 Summer 2019 (May–October 2019)
- DoD Youth Poll 45 Fall 2019 (September 2019–February 2020)

Specific variables and coding for filters applied to the aggregated data set are listed below.

- Age: AGE
  - Removed observations where age = 16

Table 3. Youth Poll Data Observations

YP Survey Wave	Total *N*	Ages 17–24 *N*	Filtered Sample Size*
YP 43 Spring 2019	4,731	4,362	4,312
YP 44 Summer 2019	4,940	4,423	4,411
YP 45 Fall 2019	4,411	3,857	3,830
Total (2019)	14,082	12,642	12,553

*Filters: Observations missing data for the weight variable were excluded from the analysis. Final sample sizes for models will be lower due to missing data across model variables (e.g., education, ZIP code-level predictor variables).

APPLICANT FILE

Aptitude-based disqualification was obtained from the MEPCOM applicant database for FY12–FY19, similar to the range of applicant data used in the 2013 model (FY98–FY06). The MEPCOM applicant file is a self-selected database, including youth who have applied to join the Military. It includes information on applicants' AFQT percentile and AFQT category, as well as geographic information (home of record ZIP code), and demographic information about each applicant, including age, gender, race/ethnicity, and level of education at the time of application. Observations were limited to individuals ages 17–24 with a valid AFQT score (i.e., individuals with a score of "0" were removed).

Nearly one-third of the records in the FY12–FY19 MEPCOM applicant file were duplicate records (which were identified based on applicant name, social security number, and date of birth). Each record was then assigned a unique ID number so that personally identifiable information (PII) variables could be removed from the data set. With each duplicate, the percentage of applicants within AFQT Category V tended to decrease, suggesting that repeated applicants with different AFQT scores could potentially bias the distribution toward more positive test scores. However, only a small percentage of the duplicate records (around 5%) had a different AFQT test date, which suggests that the differences we observed across applications in terms of AFQT scores is most likely people self-selecting out the process of re-applying as opposed to taking the AFQT again. Keeping the first application only based on application date (i.e., removing duplicate observations from the file) produced rates by AFQT category most closely aligned with those reported in the 2013 documentation and aligns with the goal of estimating the number youth who would qualify without a waiver and score in each category if they were to apply. As such, duplicate observations were removed from the data, such that if the same individual had multiple AFQT scores listed, only the earliest test score was used. The following filters were applied to the MEPCOM applicant file:

- Age: APPL_AGE_QY
  - Removed observations < 17 and > 24
- AFQT Category Code: APT_AFQT_CAT
  - Removed observations where AFQT = 0

Table 4. MEPCOM FY12–FY19 Applicant Observations

Filters Applied	*N*
Full database	3,907,636
Duplicate records removed	2,832,557
Remove age < 17 and > 24	2,464,510
Remove AFQT=0	2,448,953
Remove records with incomplete demographic data (**Final filtered Sample Size***)	2,423,570

*Filters: Missing data in gender, race/ethnicity, education, and home of record ZIP code. Analyses were limited to U.S. ZIP codes; observations with U.S. territory ZIP codes were removed from the data. Note that the codes "NULL," "F" (declined to respond), "G" (identification pending), and "blank/" are all variants of being missing.

PROFILE OF AMERICAN YOUTH 1997 (PAY97)

The Profile of American Youth survey data collected in 1997 are the most recent nationally representative data on the AFQT. As such, it was used in the eligibility model to ensure that AFQT estimates represented the general youth population. In implementing the 2020 AFQT model, we used a weighting approach whereby all applicants' responses in the MEPCOM data were weighted such that they better represented the youth population data observed in the PAY97 data.

AMERICAN COMMUNITY SURVEY (ACS)

Data from the U.S. Census Bureau's American Community Survey (ACS) were added to models using applicant and YP data to provide data on socioeconomic characteristics of the ZIP code in which the applicant/respondent lives, including the ZIP code's median family income, poverty rate, percentage non-White residents, percentage of residents with a college degree, and whether the ZIP code is in a Metropolitan Statistical Area (MSA). This information was used to identify predictors associated with potential sociological differences between geographic areas that could assist in classifying disqualification rates in ZIP codes.

Table 5. ACS 2018 5-Year Estimates Observations

Filters Applied	*N*
Full database	33,120
U.S. ZIP Codes	32,989
Final Filtered Sample Size*	25,659

*Filters: Analyses were limited to U.S. ZIP codes; observations with U.S. territory ZIP codes were removed from the data. Missing values in any ZIP code-level variable.

WOODS & POOLE (W&P)

Woods & Poole (W&P) uses Census data and other sources to estimate the size of the U.S. population by year between the decennial censuses at different levels of disaggregation, including the county level and the ZIP code level. In addition to estimating the total population in a ZIP code, W&P estimates the population in each of 400 cells defined by the different combinations of gender, age group, education level, and race/ethnicity in our analysis. W&P 2018 projections for the 2020 youth population ages 17–24 were used as the foundation of national and ZIP code estimates.

DISQUALIFICATION FACTORS

The 2020 QMA study measured the seven broad disqualification categories for applicants to military service identified in the previous QMA study: medical/physical, overweight, mental health, drugs, conduct, dependents, and aptitude, using the same data sources and specific variables from the previous study to estimate prevalence rates for each category. This section describes the criteria for disqualification overall and by category, and outlines the data used to estimate prevalence rates for the specific disqualifying factors within each category.

The prevalence data used to estimate disqualification rates, in many cases, served two different purposes. Primarily, we were interested in obtaining a *national standard* estimate for a specific medical disqualifier. This national standard estimate is the highest quality estimate that we could obtain from available data for the youth population. These national standard estimates are used as target values for poststratification in the military eligibility estimation process. Secondarily, YP data were used as a source for estimating both disqualifier overlap as well as in a statistical model used for projecting estimates down to ZIP codes.

BASIC ELIGIBILITY CRITERIA

AGE

DoD Instruction (DoDI) 1304.26, which establishes the basic military qualification standards, determines age requirements in Enclosure 3 (2a): "to be eligible for Regular enlistment, the minimum age for enlistment is 17 years and the maximum age is 42 years." The QMA effort is focused on estimating eligibility within the core active duty recruiting market, youth ages 17–24; 88% of non-prior service new recruits in FY20 were ages 17–24.

EDUCATION

DoDI 1304.26 E2 (2c) states that "possession of a high school diploma is desirable, although not mandatory, for enlistment in any component of the Military Services. Section 520 of Reference (d) states that a person who is not a high school graduate may not be accepted for enlistment in the Military Services unless the score of that person on the Armed Forces Qualification Test (AFQT) is at or above the thirty-first percentile." As such, the QMA study estimates eligibility and AFQT performance by education group to provide a complete picture of qualification and availability for service.

MEDICAL/PHYSICAL CRITERIA

National Standard Data: NHANES

DoDI 6130.03 "Medical Standards for Appointment, Enlistment, or Induction in the Military Services," and DoDI 1308.3, "DoD Physical Fitness and Body Fat Programs Procedures," govern the medical and physical criteria for military enlistment, including disqualifying applicants with medical/physical conditions that would impact an individual's ability to successfully complete the requirements of service. The conditions detailed below are included because they address the particular guidelines outlined in the DoDIs and because enough data were available to estimate condition prevalence. Physical health-based disqualifiers for the 2020 eligibility model, collectively referred to as medical/physical disqualifiers, were obtained from the same study used in 2013, the NHANES, from the most recently available waves (survey years 2015 through 2018).

In total for the 2020 QMA study, 17 different disqualifying factors were used to represent disqualification for medical/physical health reasons (see Table 6). The majority of these medical/physical health disqualifiers were

the same disqualifiers used with the prior QMA study in 2013. Specific information on data changes between 2013 and 2020 and their impact on the comparability of the underlying models can be found in Appendix A.

Table 6 lists the conditions used to estimate medical/physical disqualification in the 2020 model, including references to the relevant DoDI and the type of NHANES data used to estimate the prevalence of the condition (there are three possible types of NHANES data: physical exam, in-person interview, and clinical laboratory).

Table 6. Medical/Physical Disqualifiers in 2020

QMA 2020: NHANES 2015–2018
Anemia [DoDI 6130.03 22 (a), Interview]
Asthma [DoDI 6130.03 10 (e), Interview]
Cancer [DoDI 6130.03 29, Interview]
Diabetes [DoDI 6130.03 24 (b), Exam & Interview]
Diseases [DoDI 6130.03 12 (d), 13 (m), 14 (i), 23 (b), Exam & Interview]
Respiratory Diseases [DoDI 6130.03 10, Interview]
Hearing [DoDI 6130.03 6, Exam & Interview]
Heart Conditions [DoDI 6130.03 11, Interview]
Height [DoDI 1308.3 E2, Exam]
Hypertension [DoDI 6130.03 20 (b), Exam]
Physical Limitations [DoDI 6130.03 16, 17, 18, Interview]
Oral Health [DoDI 6130.03 8, Exam]
Overweight [DoDI 1308.3 E2, Exam]*
Stroke [DoDI 6130.03 26 (a), Interview]
Discontinued in NHANES
Underweight [DoDI 1308.3 E2, Exam]
Vision [DoDI 6130.03 4 (a) (c), Interview]

* In prior QMA studies, Overweight has been separated from other medical/physical disqualifiers due to the high percentage of the youth population estimated to be overweight by DoD Standards in DoDI 1308.3 Section 6.2. In 2020, Overweight was also considered a standalone disqualifying condition.

The following describes the variables and criteria used to estimate prevalence for each condition to disqualify an individual from military service.

Anemia

DoDI 6130.03 22 (a) disqualifies applicants with "current hereditary or acquired anemia."

Data/variables used:

MCQ053: "During the past 3 months, {have you/has SP} been on treatment for anemia, sometimes called "tired blood" or "low blood" [Include diet, iron pills, iron shots, transfusions as treatment.]?"

"Yes" responses (MCQ053 == 1) were counted as disqualified.

Asthma

DoDI 6130.03 10 (e) disqualifies applicants for "history of airway hyper responsiveness including asthma, reactive airway disease, exercise-induced bronchospasm or asthmatic bronchitis, after the 13th birthday."

Data/variables used:

MCQ035 [asked of respondents who reported they have ever had asthma]: "{Do you/Does SP} still have asthma?"

"Yes" responses (MCQ035 = 1) were counted as disqualified.

The exam variable used to measure asthma in 2013 was no longer available in 2020. The above proxy was used as it produced the closest prevalence estimate to the original variable. More information on variable changes from 2013 can be found in Appendix A.

Cancer

DoDI 6130.03 29 specifies that "current or benign tumors and malignancies that would reasonably be expected to interfere with function, to prevent properly wearing the uniform or protective equipment, or would require frequent specialized attention" to be disqualifying. Additionally, applicants are disqualified if they have any history of malignancy, history of cutaneous malignancy before the 25th birthday, including but not limited to basal cell carcinoma and squamous cell carcinoma, and history of the following skin cancers at any age: malignant melanoma, Merkel cell carcinoma, sebaceous carcinoma, Paget's disease, extramammary Paget's disease, microcystic adnexal carcinoma, other adnexal neoplasms, and cutaneous lymphoma including mycosis fungoides.

Data/variables used:

A general interview question from NHANES about medical history for cancer or malignancy was used to assess this disqualifier.

MCQ220: "{Have you/Has SP} ever been told by a doctor or other health professional that {you/s/he} had cancer or a malignancy of any kind?" [Asked of respondents aged 20 and up.]

"Yes" responses (MCQ220 = 1) were counted as disqualified.

Diabetes

DoDI 6130.03 24 (b) disqualifies individuals with diabetic disorders, including history of diabetes mellitus, unresolved pre-diabetes mellitus (within the last two years), gestational diabetes mellitus, and current persistent glycosuria, when associated with impaired glucose metabolism or renal tubular defects.

DoD guidelines follow diabetic standards defined by the American Diabetes Association (ADA), which classifies individuals based on result of blood tests. The normal range for the glycohemoglobin test, or hemoglobin A1c, a blood test that checks the amount of sugar (glucose) bound to the hemoglobin in the red blood cells, is less than 5.7%.

Table 7. Criteria for the Screening and Diagnosis of Prediabetes and Diabetes

Test Type	Prediabetes	Diabetes
A1C	5.7–6.4% (39–47 mmol/mol)	≥6.5% (48 mmol/mol)*
Fasting plasma glucose	100–125 mg/dL (5.6–6.9 mmol/L)	100–125 mg/dL (5.6–6.9 mmol/L)*
2-hour plasma glucose during 75-g oral glucose tolerance test	140–199 mg/dL (7.8–11.0 mmol/L)	≥ 200 mg/dL (11.1 mmol/L)*
Random plasma glucose	-	≥ 200 mg/dL (11.1 mmol/L)*

*In the absence of unequivocal hyperglycemia, diagnosis requires two abnormal test results from the same sample or in two separate samples.
**Only diagnostic in a patient with classic symptoms of hyperglycemia or hyperglycemic crisis.
Source: American Diabetes Association 2021 Standards of Care

Data/variables used:

DIQ010: "{Other than during pregnancy, {have you/has SP}/{Have you/Has SP}} ever been told by a doctor or health professional that {you have/{he/she/SP} has} diabetes or sugar diabetes?"

"Yes" responses (DIQ010 = 1) were counted as disqualified.

LBXGH: Clinical laboratory test for Glycohemoglobin (%)

Individuals with test result > 5.75 were counted as disqualified.

Diseases

DoDI 6130.03 disqualifies applicants for various types of diseases, such as hepatitis, herpes simplex virus type 2, which were matched to data available from the NHANES clinical lab tests. Individuals with the following diseases were considered to be medically disqualified:

Data/variables used:

The NHANES disease disqualifier is composed of three diseases (i.e., hepatitis B, C, and D; herpes simplex virus type 2; HIV).

Hepatitis B:

LBDHBG: Hepatitis B surface antigen test

Positive lab test result (LBDHBG = 1) were counted as disqualified.

Hepatitis D:

LBDHD: Hepatitis D antibody (anti-HDV)

Positive lab test result (LBDHD = 1) were counted as disqualified.

Hepatitis C:

LBXHCG: Hepatitis C Genotype %in% 1:3

(DQ = 0);

LBXHCR: Hepatitis C RNA

Positive lab test result (LBXHCR = 1) were counted as disqualified.

LBDHCI: Hepatitis C Antibody (confirmed)

Positive lab test result(LBDHCI = 1) were counted as disqualified.

LBDHCI: = 1;

HEQ030: "Has a doctor or other health professional ever told {you/SP} that {you have/s/he/SP has} Hepatitis C? (Hepatitis is a form of liver disease. Hepatitis C is an infection of the liver from the Hepatitis C virus (HCV).)"

"Yes" responses (HEQ030 = 1) were counted as disqualified.

HEQ040: "Please look at the drugs on this card that are prescribed for Hepatitis C. {Were you/ Was/s/he/SP} ever prescribed any medicine to treat Hepatitis C?"

"Yes" responses (HEQ040 = 1) were counted as disqualified.

Herpes Simplex Virus Type 2:

LBXHE2: Positive lab test result (LBXHE2 = 1) were counted as disqualified.

HIV:

LBXHIVC = 1; LBXHNAT = 1

Since 2013, NHANES has changed the way they measure HIV, HS-2 and Hep C. Proxies were used for HIV, HSV-2, Hep C; however, large changes were not observed. More information on variable changes from 2013 can be found in Appendix A.

Hearing

DoDI 6130.03 6 specifies that applicants' audiometric hearing levels are measured by audiometers calibrated to the standards in American National Standards Institute S3.6-2010. Applicants are disqualified if current hearing threshold levels in either ear exceed:

1) Pure tone at 500, 1,000, and 2,000 cycles per second for each ear of more than 25 decibels (dB) on the average with any individual level greater than 30 dB at those frequencies.
2) Pure tone level more than 35 dB at 3,000 cycles per second or 45 dB at 4,000 cycles per second for each ear.

History of using hearing aids is also disqualifying.

Table 8. DoD Standard for Hearing Sensitivity

Frequency	Decibel Threshold
500Hz	35dB
1000 Hz	35dB
2000 Hz	35dB
Mean (500, 1000, 2000)	30dB
3000 Hz	45dB
4000 Hz	55dB

Data/variables used:

Several variables from the examination and questionnaire sections of NHANES were used to assess hearing.

Audiometry Component with Decibel Thresholds:

AUXU500L > 35
AUXU1K1L > 35
AUXU2KL > 35
AUXL_MEAN > 30
AUXU3KL > 45
AUXU4KL > 55
AUXU500R > 35
AUXU1K1R > 35
AUXU2KR > 35
AUXR_MEAN > 30
AUXU3KR > 45
AUXU4KR > 55

Interview: AUQ054: "These next questions are about {your/SP's} hearing. Which statement best describes {your/SP's} hearing (without a hearing aid, personal sound amplifier, or other listening devices)? Would you say {your/his/her} hearing is excellent, good, that {you have/s/he has} a little trouble, moderate trouble, a lot of trouble, or {are you/is s/he} deaf?"

Responses of "moderate hearing trouble" and above (AUQ054= 4; 5: A lot of trouble, or 6: Deaf) were counted as disqualified.

The hearing disqualifier is made up of two components (i.e., an audiometry component among youth ages 17–19 and a self-assessment of general hearing). Although both measures are available in NHANES 2015–2018, the audiometry component is only available for years 2015–2016. The limited availability of the measure did not have a significant impact on prevalence estimates, as data are still available for two of the four years of data collection and it is only a minor component in overall disqualification. More information on variable changes from 2013 can be found in Appendix A.

Heart Conditions

DoDI 6130.03 11 establishes various heart-related issues that disqualify applicants from service, such as history of valvular conditions listed in the current American Heart Association (AHA) guidelines and evidenced by echocardiogram within the last 12 months, any history of pacemaker or defibrillator implantation, coronary artery disease, myocardial infarction (heart attack), congestive heart failure, and unexplained ongoing or recurring cardiopulmonary symptoms (e.g., chest pain or heart palpitations).

Data/variables used:

The Medical Conditions questionnaire assesses heart-related medical history for respondents ages 20 and older, several of which were combined to disqualify respondents. Responses of "1: Yes" to any of the following were counted as disqualified:

Has a doctor or other health professional ever told {you/SP} that {you/s/he} had…
MCQ160B: "congestive heart failure?"
MCQ160C: "coronary heart disease?"
MCQ160D: "angina, also called angina pectoris?"
MCQ160E: "a heart attack (also called myocardial infarction)?"

Height

DoDI 1308.3 E2 notes that Military Services shall use a standardized body mass index (BMI) table for height–weight screening. Height standards are established by the Services. Men who are between 60 and 80 inches in height, and women who are between 58 and 80 inches tall, may enlist without a waiver.

Data/variables used:

The body measures component of the NAHNES examination data was used to estimate height by gender.

BMXHT: Standing Height (cm)

For female youth (RIAGENDR = 2), respondents with measured height below 58 in/147.32 cm (BMXHT < 147.32) or above 80 in/203 cm (BMXHT > 203) were counted as disqualified.

For male youth (RIAGENDR = 1), respondents with measured height below 60 in/152.4 cm (BMXHT < 152.4) or above 80 in/203 cm (BMXHT > 203) were counted as disqualified.

Hypertension

DoDI 6130.03 20 (b) disqualifies potential applicants with current or medically managed hypertension. It defines hypertension as "systolic pressure greater than 140 millimeters of mercury (mmHg) or diastolic pressure greater than 90 mmHg confirmed by manual blood pressure cuff averaged over two or more properly measured,

seated, blood pressure readings on separate days within a 5-day period (isolated, single-day blood pressure elevation is not disqualifying unless confirmed on 2 separate days within a 5-day period)."

Data/variables used:

Blood pressure examination: Individuals who were examined for NHANES had up to four blood pressure readings (three consecutive BP readings are obtained; if a blood pressure measurement is interrupted or incomplete, a fourth attempt may be made). We computed an average blood pressure score within each individual using all available readings, and disqualified respondents with an average systolic pressure greater than 140 mm Hg or an average diastolic pressure greater than 90 mm Hg.

BPXSY1: Systolic Blood pressure (first reading) mm Hg
BPXSY2: Systolic Blood pressure (second reading) mm Hg
BPXSY3: Systolic Blood pressure (third reading) mm Hg
BPXSY4: Systolic Blood pressure (fourth reading if necessary) mm Hg

Responses over 140 mm Hg (BPXSY1/BPXSY2/BPXSY3/BPXSY4 > 140) were counted as disqualified.

BPXDI1: Diastolic Blood pressure (first reading) mm Hg
BPXDI2: Diastolic Blood pressure (second reading) mm Hg
BPXDI3: Diastolic Blood pressure (third reading) mm Hg
BPXDI4: Diastolic Blood pressure (fourth reading if necessary) mm Hg

Responses over 90 mm Hg (BPXDI1/ BPXDI2/BPXDI3/BPXDI4 > 90) were counted as disqualified.

Physical Limitations

DoDI 6130.03 16–18 disqualifies applicants for spine and sacroiliac joint conditions, upper extremity conditions, and lower extremity conditions, which limit range of motion, prevent the individual from physical activity or requires frequent treatment, requires external support, causes pain, or requires medication for longer than six weeks.

Data/variables used:

NHANES provides respondent-level interview data on functional limitations caused by long-term physical, mental, and emotional problems or illness, several of which were combined to disqualify respondents for physical limitations.

PFQ059: "{Are you/Is SP} limited in any way in any activity because of a physical, mental or emotional problem?"

"Yes" responses (PFQ059 = 1) were counted as disqualified.

PFQ054: "Because of a health problem, {do you/does SP} have difficulty walking without using any special equipment?"

"Yes" responses (PFQ054 = 1) were counted as disqualified.

PFQ020: "Do you/Does SP} have an impairment or health problem that limits {your/his/her} ability to {walk, run or play} {walk or run}?"

"Yes" responses (PFQ020 = 1) were counted as disqualified.

Responses of "2: Some difficulty" and above (2: Some difficulty, 3: Much difficulty, 4: Unable to do) to any of the following questionnaire items (asked of respondents aged 20 and older) were counted as disqualified:

By {yourself/himself/herself} and without using any special equipment, how much difficulty {do you/does SP} have…

PFQ061B: "walking for a quarter of a mile [that is about 2 or 3 blocks]?"

PFQ061C: "walking up 10 steps without resting?"

PFQ061H: "walking from one room to another on the same level?"

Oral Health

DoDI 6130.03 8 disqualifies applicants on the basis of oral health for several dental conditions impacting oral health, such as untreated issues causing interference to jaw function or chewing of a normal diet (e.g., severe misalignment of teeth or jaw bones), joint disorders and mouth pain symptomatic or requiring treatment in the last year, and orthodontic appliances unless treatment will be completed before beginning service.

Data/variables used:

To assess the presence of disqualifying dental and oral health conditions in the NHANES data, we used the NHANES oral health examination component, specifically a variable from the dental care recommendations portion that summarizes results of a whole mouth assessment conducted by dental examiners (licensed dentists), in terms of whether any significant conditions (e.g., decayed teeth with pain/swelling, fractures) were present at the time of exam.

OHARNF: "No significant findings" [from oral health exam]

Values of "No" (OHARNF = 2), indicating there were that there were significant oral health problems found, were counted as disqualified.

Stroke

DoDI 6130.03 26 (a) disqualifies applicants for any history of cerebrovascular diseases such as stroke or aneurysm. The DoDI lists a history of other neurological disorders, such as neurodegenerative disorders impacting the brain, spinal cord, peripheral nerves, or muscles, and chronic nervous system disorders (e.g., multiple sclerosis, Tourette's syndrome), as disqualifying.

Data/variables used:

MCQ160F: "Has a doctor or other health professional ever told {you/SP} that {you/s/he} . . .had a stroke?" [Asked of respondents aged 20 and up]

"Yes" responses (MCQ160F = 1) were counted as disqualified.

Respiratory Diseases

DoDI 6130.03.10 disqualifies applicants for several conditions impacting lungs and chest wall, and respiratory system, including chronic obstructive pulmonary disease (including but not limited to bullous or generalized pulmonary emphysema or chronic bronchitis), history of tuberculosis (active pulmonary tuberculosis in the previous two years or any history of active or latent tuberculosis infection without reliable documentation of adequate treatment), history of nocturnal ventilation support, respiratory failure, or any requirement for chronic supplemental oxygen use, history of recurrent infectious pneumonia after the 13th birthday, and other respiratory conditions that prevent satisfactorily performing duty or require chronic treatment.

Data/variables used:

NHANES interview questions on past and current respiratory illness were used to determine disqualification:

MCQ160G: "Has a doctor or other health professional ever told {you/SP} that {you/s/he} . . .had emphysema?"

"Yes" responses (MCQ160G = 1) were counted as disqualified.

MCQ170K [asked of respondents who reported they have ever had chronic bronchitis]: "{Do you/Does SP} still . . . have chronic bronchitis?"

"Yes" responses (MCQ170K = 1) were counted as disqualified.

The Respiratory Diseases disqualifier (previously "Tuberculosis and Collapsed Lung" and "Emphysema and Chronic Bronchitis") had several 2013 components that were no longer available. Tuberculosis and collapsed lung data are no longer available within NHANES data and no close proxies were identified. However, even though a sufficient proxy was not found, the unavailability of data does not significantly impact the prevalence of respiratory diseases due to a low prevalence of tuberculosis and collapsed lung within the young adult population, comorbidity with other medical disqualifiers, and the role that NHANES medical disqualifier played in the model as a poststratification factor. More information on variable changes from 2013 can be found in Appendix A.

Underweight

DoDI 1308.3 Enclosure 2 establishes an allowable range of BMI standards, and the Services set specific standards within that range, with the 19.0 being the required minimum BMI standard followed by all Services.

Table 9. DoD Minimum Screening Weights Based on Selected BMI Standards

Minimum Weights for BMI of 19.0

Height (in.)	Weight (lb.)
58	91
59	94
60	97
61	100
62	104
63	107
64	110
65	114
66	117
67	121
68	125
69	128
70	132
71	136
72	140
73	144
74	148
75	152

Height (in.)	Weight (lb.)
76	156
77	160
78	164
79	168
80	173

Data/variables used:

The body measures component was used to estimate BMI (calculated from height and weight measurements taken during the same exam):

BMXBMI: Body Mass Index (calculated as weight in kilograms divided by height in meters squared, and then rounded to one decimal place).

Respondents with BMI under 19 were counted as disqualified (BMXBMI < 19)

These estimates were weighted using the examination weight, and pregnant women were removed from the calculations using the NHANES exam pregnancy variable (RIDEXPRG = 1).

Vision

DoDI 6130.03.4 (a) (c) provides specific vision benchmarks that disqualify applicants: "Current distant visual acuity of any degree that does not correct with spectacle lenses to at least 20/40 in each eye, current near visual acuity of any degree that does not correct to 20/40 in the better eye, current refractive error (hyperopia, myopia, astigmatism) in excess of -8.00 or +8.00 diopters spherical equivalent or astigmatism in excess of 3.00 diopters."

Data/variables used:

DLQ020: {Are you/Is SP} blind or {do you/does he/does she} have serious difficulty seeing even when wearing glasses?

"Yes" responses (DLQ020 = 1) were counted as disqualified.

The vision disqualifier in 2013 used NHANES exam variables measuring visual acuity with objective refraction in each eye (VIDLOVA, VIDROVA) to disqualify respondents with visual acuity that did not correct with spectacle lenses to at least 20/40 in each eye, to align exactly with the DoD vision standards. These exam variables were no longer available in 2020, so a proxy interview variable on respondents' difficulty seeing was used. More information on variable changes from 2013 can be found in Appendix A.

Not Included in 2020 Medical/Physical Conditions: Pregnancy

Pregnancy through six months after the completion of the pregnancy is considered a disqualifying condition in DoDI 6.130.03.13 (k). However, pregnancy was not included as a disqualifying condition in the 2020 eligibility model as it was unclear from the 2013 QMA technical documentation whether it was included in the model as a disqualifying medical/physical condition. The 2013 technical documentation did not include pregnancy with the other medical/physical conditions when describing each condition in detail, including the specific NHANES variables and values used to estimate prevalence of the condition and disqualification. Although Lewin Group provided estimates of pregnancy disqualification for female youth in Appendix B of the 2013 technical report, pregnancy status is not available in the YP data used to estimate correlations between conditions in the model. As such, we assume that pregnancy was estimated from NHANES data but not included in the model as a disqualifying condition.

With the goal of replicating the 2013 model as closely as possible, we calculated weighted estimates for medical/physical disqualification in the 2013 NHANES data overall and among female youth, with and without pregnancy as a disqualifying condition to compare these replicated estimates to assess which was closest to the reported medical/physical disqualification in 2013. These estimates were based on the NHANES exam pregnancy variable (RIDEXPRG: Pregnancy status at the time of exam-for females between 20 and 44 years of age) and the interview pregnancy question (RHD143, which asks female respondents between 20 and 44 years of age whether they are currently pregnant). We determined that the medical/physical estimates that did not include pregnancy as a disqualifying condition aligned more closely with those reported in 2013, and as such, we excluded pregnancy from the 2020 model.

Total Medical/Physical Disqualifier

Using the NHANES data described above, JAMRS obtained prevalence estimates of medical/physical disqualifiers for 17–24-year-olds by gender, race/ethnicity, and education, combining disqualifying factors from the NHANES such that having at least one of the disqualifying conditions results in the respondent being disqualified. One of these estimates, the overall/total 17–24-year-old estimate from the NHANES data, was used as a poststratification factor for the primary eligibility model, which was based on the YP data to estimate disqualifier overlaps. Specifically, the marginal probability of disqualification for medical/physical conditions as estimated from the YP was adjusted such that it matched the probability of being disqualified for medical/physical reasons as obtained from the NHANES prior to computing disqualifier overlap probabilities at the national level. The table below provides the 2020 overall medical/physical disqualification estimates by gender and race/ethnicity. Disqualification estimates for the specific medical conditions within the overall medical/physical category for all youth and by gender, race/ethnicity and education, are provided in Appendix B.

Table 10. 2020 Percentage Disqualified from Military Service for Medical/Physical Conditions

Gender	Race/Ethnicity	Mean	*N*	CL for Mean	
				Lower 95%	Upper 95%
Total	White, Non-Hispanic	31.4%	451	26.4%	36.3%
	Black, Non-Hispanic	43.9%	360	38.2%	49.6%
	Asian, Non-Hispanic	31.6%	198	24.1%	39.1%
	Other Race, Non-Hispanic	38.5%	112	25.6%	51.3%
	Hispanic	29.9%	493	25.3%	34.5%
	Total (All youth)	33.1%	1,614	30.0%	36.1%
Male	White, Non-Hispanic	25.6%	206	18.4%	32.9%
	Black, Non-Hispanic	38.7%	184	31.0%	46.4%
	Asian, Non-Hispanic	29.1%	121	19.7%	38.5%
	Other Race, Non-Hispanic	34.2%	54	15.0%	53.5%
	Hispanic	26.1%	234	19.7%	32.5%
	Total (all male youth)	28.1%	799	23.8%	32.5%
Female	White, Non-Hispanic	36.8%	245	30.0%	43.6%
	Black, Non-Hispanic	49.4%	176	41.1%	57.7%
	Asian, Non-Hispanic	34.6%	77	22.6%	46.7%
	Other Race, Non-Hispanic	41.7%	58	24.5%	59.0%
	Hispanic	33.8%	259	27.3%	40.4%
	Total (all female youth)	38.0%	815	33.7%	42.2%

Source: NHANES 2015–2018

YP Data

YP data were also used as a source for estimating overlap and producing a model that could yield ZIP code-level estimates of military eligibility and other individual disqualifiers.

The medical/physical health ineligibility YP estimate was inferred from respondents' answers to survey questions indicating that they had ever been treated, diagnosed, or seen by a medical professional for (a) asthma (MDRQ5A_Q), (b) diabetes (MDRQ5B_Q), (c) high or low blood pressure (MDRQ5D_Q), (d) glaucoma or blindness in either eye (MDRQ5E_Q), (e) cancer or malignancies of any kind (MDRQ5F_Q), (f) total, unilateral, or bilateral hearing loss (MDRQ5G_Q), (g), skin or allergic disorder (MDRQ5I_Q), (h) neurological disorder (MDRQ5J_Q), or (i) heart disorder (MDRQ5K_Q). Responses were deemed *not* ineligible for medical/physical health reasons only if the respondent reported *not* having been treated, diagnosed, or seen by a medical professional for all medical conditions included in the survey. Any other pattern of responses was omitted from the analysis as we could not be certain that the respondent did not have a response suggesting they might be ineligible.

Although the YP data did include several questions on key disqualification factors outlined in the DoDI, the YP is not as comprehensive as the NHANES and is not a definitive source for estimates of prevalence for medical/physical health conditions. As such, the YP data's prevalence estimates likely underestimate the total disqualification rate in the youth population and our estimates using the YP-based model were poststratified to the corresponding NHANES values as outlined in the methodology section.

OVERWEIGHT

National Standard Data: NHANES

Due to the high percentage of the youth population classified overweight according to the BMI standards in the DoDI 1308.3, the overweight disqualification was separated from other medical/physical disqualifiers. DoDI 1308.3 (Enclosure 1.1.3), establishes an allowable range of BMI standards and the Services set specific standards within that range. DoD guidelines require the Services to set maximum BMI requirements no lower than 25.0 and no higher than 27.5. BMI summarizes weight in relation to height and is widely used as a proxy for body fat. It is calculated as weight (in kilograms) divided by the square of height (in meters); or with pounds and inches, BMI=704.5 x weight (lbs.)/height (in.).[2]

We used a general standard under which youth would be eligible to join at least one of the Services, which disqualifies men and women with a BMI greater than 27.5. In the DoDI, BMI is not by itself disqualifying, as applicants who exceed weight standards from BMI must undergo body fat measurement to determine qualification (disqualifying male applicants with body fat percentage over 26% and female applicants with body fat percentage over 36%). Because the NHANES body measurement procedures and included measurements do not align with the body fat assessment procedures outlined in DoDI 1308.3, Enclosure 3, we used BMI as a predictor of body fat.

Data/variables used:

The NHANES body measures component was used to estimate BMI (calculated from height and weight measurements taken during the same exam):

BMXBMI: Body Mass Index (calculated as weight in kilograms divided by height in meters squared, and then rounded to one decimal place).

Respondents with BMI over 27.5 were counted as disqualified (BMXBMI > 27.5)

These estimates were weighted using the examination weight, and pregnant women were removed from the calculations using the NHANES exam pregnancy variable (RIDEXPRG = 1).

Prevalence estimates of the overweight disqualification were obtained for 17–24-year-olds by gender, race/ethnicity, and education. The table below provides the 2020 overweight disqualification estimates by gender and race/ethnicity. We removed pregnant women from the calculations using the NHANES exam pregnancy variable RIDEXPRG.

Table 11. 2020 Percentage Disqualified from Military Service for Overweight

Gender	Race/Ethnicity	Mean	*N*	CL for Mean	
				Lower 95%	Upper 95%
Total	White, Non-Hispanic	31.0%	442	26.0%	36.0%
	Black, Non-Hispanic	36.7%	354	31.0%	42.3%
	Asian, Non-Hispanic	23.7%	196	16.6%	30.7%
	Other Race, Non-Hispanic	41.7%	110	29.1%	54.4%
	Hispanic	46.2%	483	41.3%	51.2%
	Total (All youth)	35.4%	1,585	32.3%	38.5%
Male	White, Non-Hispanic	29.8%	206	22.3%	37.4%
	Black, Non-Hispanic	26.7%	184	19.5%	33.8%
	Asian, Non-Hispanic	24.0%	121	15.0%	33.0%
	Other Race, Non-Hispanic	42.1%	54	23.7%	60.5%
	Hispanic	48.7%	234	41.6%	55.9%
	Total (all male youth)	34.1%	799	29.5%	38.6%
Female	White, Non-Hispanic	32.1%	236	25.5%	38.7%
	Black, Non-Hispanic	47.7%	170	39.3%	56.1%
	Asian, Non-Hispanic	23.2%	75	11.9%	34.5%
	Other Race, Non-Hispanic	41.4%	56	24.1%	58.7%
	Hispanic	43.5%	249	36.6%	50.4%
	Total (all female youth)	36.8%	786	32.6%	41.1%

Source: NHANES 2015–2018

YP Data

Ineligibility due to being overweight was also initially computed using the YP data as it would allow for estimating overlap and producing a model that could yield ZIP code-level estimates of eligibility and other individual disqualifiers.

Overweight ineligibility estimates were inferred from respondents' answers to survey questions indicating that their BMI, as computed from their answers to WEIGHT_R (lbs.) and HEIGHT_R (in.), is greater than 27.5.

Respondents missing either height or weight were omitted from the analysis as their BMI could not be ascertained. Respondents that were coded as upper/lower outliers (height outliers: -95: Upper outlier > 96 inches, -94: Lower outlier < 24 inches; weight outlier: -94: Lower outlier < 51 pounds) were excluded from the analysis. Survey misprints (value of -91) were also excluded when present.

BMI was calculated as follows: $\left({Weight(lbs)}/{Height(in)^2}\right) \times 704.5$

Note: In the 2013 QMA documentation, and in DoDI 1308.03 (Enclosure 1.1.3), the cited BMI equation for use with English units is BMI=704.5 x weight/height where weight is in pounds and height is in inches. The CDC guidelines notes a conversion multiplier of 703 instead of 704.5, but to remain consistent with 2013 model and the DoDI, the same formula above was used to calculate BMI in the YP data for the 2020 model.

Similar to the medical/physical health disqualifiers, the YP's self-reported height and weight are less accurate than the NHANES's examination-based BMI computation. Consequently, the YP's rate of estimated ineligibility for being overweight is not likely to be as accurate as the estimate obtained from the NHANES. Like the medical/physical health disqualifier, the YP model estimate for being overweight was poststratified to the NHANES values.

MENTAL HEALTH

National Standard Data: NSDUH

The DoDI 6130.03 (28) disqualifies applicants for conditions such as depressive disorder, suicidal behavior, and any history of mental disorders that "may reasonably be expected to interfere with or prevent satisfactory performance of military duty."

Respondents in the NSDUH were disqualified from military service for mental health if they reported serious psychological distress within the past year (SPDYR) or reported receiving specialty mental health services in the past year because of a diagnosed mental disorder (SMHMEND2). Disqualification proportions were calculated using all respondents ages 17–25.

JAMRS obtained prevalence estimates of mental health disqualifiers for 17–24-year-olds by gender, race/ethnicity, and education using NSDUH data. As in the 2013 methodology, disqualifying factors from the NSDUH were combined such that having at least one of the disqualifying mental health conditions results in the respondent being disqualified. These estimates from the NSDUH data were used as a poststratification factor for the primary eligibility model, which was based on YP data to estimate disqualifier overlaps. The table below provides the 2020 overall mental health disqualification estimates by gender and race/ethnicity.

Table 12. 2020 Percentage Disqualified From Military Service for Mental Health

Gender	Race/Ethnicity	Mean	N	CL for Mean	
				Lower 95%	Upper 95%
Total	White, Non-Hispanic	27.1%	8,405	25.9%	28.3%
	Black, Non-Hispanic	21.0%	2,267	18.9%	23.0%
	Asian, Non-Hispanic	21.6%	818	18.0%	25.1%
	Other Race, Non-Hispanic	27.3%	1,119	23.2%	31.4%
	Hispanic	21.2%	3,633	19.4%	23.0%
	Total (All youth)	24.6%	16,242	23.7%	25.4%
Male	White, Non-Hispanic	20.6%	4,139	19.0%	22.2%
	Black, Non-Hispanic	15.7%	1,090	13.0%	18.4%
	Asian, Non-Hispanic	15.3%	404	11.3%	19.4%
	Other Race, Non-Hispanic	23.0%	566	17.9%	28.1%
	Hispanic	16.9%	1,778	14.5%	19.3%
	Total (all male youth)	18.9%	7,977	17.8%	20.0%
Female	White, Non-Hispanic	33.6%	4,266	31.8%	35.4%
	Black, Non-Hispanic	25.9%	1,177	22.7%	29.0%
	Asian, Non-Hispanic	27.0%	414	21.5%	32.5%
	Other Race, Non-Hispanic	32.1%	553	25.7%	38.5%
	Hispanic	25.5%	1,855	22.9%	28.2%
	Total (all female youth)	30.2%	8,265	28.9%	31.5%

Source: NSDUH 2019

YP Data

Disqualification due to mental health was also computed using the YP data for the purpose of estimating overlap and producing a model that could yield ZIP code-level estimates of eligibility and other individual disqualifiers.

Mental health ineligibility estimates were inferred from responses noting that the respondent had ever been treated, diagnosed, or seen by a medical professional for a mental or psychological illness (MDRQ5_H_Q). Respondents who provided invalid responses were omitted from the analysis.

The YP's mental health disqualifier is broad and does not ask about experiencing distress even if not treated for it specifically as does the NSDUH. It is then likely that the mental health disqualifier for the YP will underestimate the rate of disqualification for mental health reasons. This disqualifier was then poststratified to the NSDUH's values in the eligibility estimation process.

DRUG USE

National Standard Data: NSDUH

DoDI 6130.03 disqualifies applicants for "current or history of alcohol dependence (303), drug dependence (304), alcohol abuse (305.0), or other drug abuse (305.2 thru 305.9)…"

To obtain the prevalence of disqualification for drug use, NSDUH data were used. As in 2013, disqualification was determined by marijuana use within the past 30 days, any use of illicit drugs, and any positive response to substance abuse criteria (specific variable names and coding rules can be found in Appendix D):

- Respondent reported having serious problems due to substance use at home, work or school
- Respondent reported using substance regularly and then did something where substance use might have put them in physical danger
- Respondent reporting substance use causing actions that repeatedly got them in trouble with the law
- Respondent reported having problems caused by substance use with family or friends and continued to use substance even though it was thought to be causing problems with family and friends

Prevalence estimates of the drug use disqualification were obtained for 17–24-year-olds by gender, race/ethnicity, and education. The table below provides the 2020 drug disqualification estimates by gender and race/ethnicity.

Table 13. 2020 Percentage Disqualified From Military Service for Drug Use

Gender	Race/Ethnicity	Mean	*N*	CL for Mean	
				Lower 95%	Upper 95%
Total	White, Non-Hispanic	34.4%	8,405	33.1%	35.7%
	Black, Non-Hispanic	31.6%	2,267	29.2%	34.0%
	Asian, Non-Hispanic	19.1%	818	15.7%	22.5%
	Other Race, Non-Hispanic	35.9%	1,119	31.9%	40.0%
	Hispanic	29.1%	3,633	27.0%	31.1%
	Total (All youth)	31.9%	16,242	31.0%	32.9%
Male	White, Non-Hispanic	36.6%	4,139	34.7%	38.4%
	Black, Non-Hispanic	34.5%	1,090	30.9%	38.0%
	Asian, Non-Hispanic	20.1%	404	15.4%	24.8%
	Other Race, Non-Hispanic	35.2%	566	29.7%	40.7%
	Hispanic	32.3%	1,778	29.3%	35.3%
	Total (all male youth)	34.3%	7,977	33.0%	35.7%
Female	White, Non-Hispanic	32.3%	4,266	30.5%	34.1%
	Black, Non-Hispanic	29.0%	1,177	25.8%	32.1%
	Asian, Non-Hispanic	18.3%	414	13.4%	23.2%
	Other Race, Non-Hispanic	36.8%	553	30.8%	42.8%
	Hispanic	30.8%	42.8%	23.0%	28.5%
	Total (all female youth)	25.8%	1,855	23.0%	28.5%

Source: NSDUH 2019

YP Data

Disqualification due to drug use was, like the other disqualifiers discussed above, computed using the YP data for the purpose of estimating overlap and producing a model that could yield ZIP code-level estimates of eligibility and other individual disqualifiers.

Drug use ineligibility was inferred from responses indicating that the respondent did not believe they would pass a drug test (DRG1_Q). Respondents who provided invalid responses (e.g., values of -99 [refused], -91 [survey misprint], -97 [multiple response]) were omitted from the analysis.

The YP's drug use disqualifier was quite general and did not ask respondents about the use of specific illicit drugs. It was also incumbent on the respondent to determine whether or not they believe they could pass a drug

test as opposed to whether or not they have consumed an illicit drug. In combination, the drug use disqualifier for the YP could have underestimated drug use-based disqualification. Drug use disqualification was thus poststratified to the NSDUH's values in the eligibility estimation process.

CONDUCT

National Standard Data: YP

DoDI 1304.26 Enclosure 3 (2h) disqualifies applicants based on conduct in order to "minimize entrance of persons who are likely to become disciplinary cases, security risks, or who are likely to disrupt good order, morale, and discipline. The Military Services are responsible for the defense of the Nation and should not be viewed as a source of rehabilitation for those who have not subscribed to the legal and moral standards of society at-large." These disqualifiers include judicial restraint, significant criminal records such as a felony conviction or multiple misdemeanor convictions, and prior separation from the Military not under honorable conditions. As a minimum, applicants are considered ineligible if they:

(1) Are under any form of judicial restraint (bond, probation, imprisonment, or parole);
(2) Have a significant criminal record;
(3) Have a state or federal conviction, or a finding of guilty in a juvenile adjudication, for a felony crime of rape, sexual abuse, sexual assault, incest, any other sexual offense, or when the disposition requires the person to register as a sex offender. In these cases, the enlistment, appointment, or induction will be prohibited and no waivers are allowed;
(4) Have been previously separated from the Military Services under conditions other than honorable or for the good of the Military Service concerned;
(5) Have exhibited antisocial behavior or other traits of character that may render the applicant unfit for service; or
(6) Receive an unfavorable final determination by the DoD Consolidated Adjudication Facility on a completed National Agency Check with Law and Credit (NACLC) or higher-level investigation, which is adjudicated to the National Security Standards in accordance with Executive Order 12968, Reference (j), during the accession process.

In the case of conduct-related disqualification, the national standard was the YP data that were also used to estimate overlap and produce a model that could yield ZIP code-level estimates of eligibility and other individual disqualifiers. Hence, no poststratification was required for conduct-related disqualification. Conduct-related ineligibility estimates were inferred from responses indicating that the respondent was under any judicial restraint (LAW3_Q), had two or more misdemeanors (LAW6_Q), or had one or more felony charges or convictions (LAW7_Q). Respondents were classified as being *not* ineligible only if they reported not falling into the disqualifying ranges of the three variables for all three variables. All other respondents were omitted from the analysis.

Table 14. 2020 Percentage Disqualified From Military Service for Conduct

Gender	Race/Ethnicity	Mean	*N*	CL for Mean	
				Lower 95%	Upper 95%
Total	White, Non-Hispanic	4.6%	7,522	3.9%	5.3%
	Black, Non-Hispanic	9.6%	914	6.7%	12.4%
	Asian, Non-Hispanic	4.1%	688	1.9%	6.3%
	Other Race, Non-Hispanic	8.3%	844	5.2%	11.3%
	Hispanic	5.9%	2,231	4.4%	7.4%
	Total (All youth)	5.8%	12,382	5.2%	6.5%
Male	White, Non-Hispanic	5.5%	3,823	4.4%	6.6%
	Black, Non-Hispanic	15.5%	390	10.3%	20.8%
	Asian, Non-Hispanic	6.0%	341	2.1%	9.9%
	Other Race, Non-Hispanic	9.1%	395	4.5%	13.6%
	Hispanic	7.1%	1,091	4.8%	9.4%
	Total (all male youth)	7.4%	6,122	6.3%	8.4%
Female	White, Non-Hispanic	3.7%	3,699	2.8%	4.6%
	Black, Non-Hispanic	5.2%	524	2.2%	8.2%
	Asian, Non-Hispanic	2.2%	347	0.2%	4.2%
	Other Race, Non-Hispanic	7.5%	449	3.4%	11.6%
	Hispanic	4.8%	1,139	2.9%	6.7%
	Total (all female youth)	4.3%	6,259	3.5%	5.1%

Source: Youth Poll Waves 43, 44, 45. Note: Missing values on the gender and race/ethnicity variables mean that sample size sums within a subpopulation may not be equal to the total sample sizes.

DEPENDENTS

National Standard Data: YP

DoDI 1304.26 Enclosure 3 (2g) disqualifies applicants based on marriage status and number of dependents: "The Military Services may not enlist married individuals with more than two dependents under the age of 18 or unmarried individuals with custody of any dependents under the age of 18." Similar to the conduct disqualification, the national standard for disqualification of dependents was the YP data, which was also used to estimate overlap and produce a model that could yield ZIP code-level estimates of eligibility and other individual disqualifiers. Again, no poststratification was required for conduct-related disqualification.

Dependents-based eligibility estimates were inferred from responses indicating that the respondent was married on DEM3 with more than two children on DM18B or any other non-missing response on DEM3 with one or more children on DEM18B. Respondents who provided invalid responses (e.g., values of -99 [refused], -91 [survey misprint], -97 [multiple response]) to either question were omitted from the analysis.

Table 15. 2020 Percentage Disqualified From Military Service for Dependents

Gender	Race/Ethnicity	Mean	*N*	CL for Mean	
				Lower 95%	Upper 95%
Total	White, Non-Hispanic	4.3%	7,622	3.6%	5.1%
	Black, Non-Hispanic	11.5%	926	8.5%	14.4%
	Asian, Non-Hispanic	1.7%	700	0.5%	2.9%
	Other Race, Non-Hispanic	6.8%	851	3.9%	9.6%
	Hispanic	7.1%	2,256	5.5%	8.7%
	Total (All youth)	5.9%	12,520	5.3%	6.6%
Male	White, Non-Hispanic	2.8%	3,889	1.9%	3.6%
	Black, Non-Hispanic	9.8%	399	5.4%	14.1%
	Asian, Non-Hispanic	2.3%	352	0.1%	4.5%
	Other Race, Non-Hispanic	4.4%	397	0.8%	8.1%
	Hispanic	5.2%	1,101	3.1%	7.2%
	Total (all male youth)	4.2%	6,215	3.3%	5.0%
Female	White, Non-Hispanic	6.0%	3,733	4.9%	7.2%
	Black, Non-Hispanic	12.8%	527	8.8%	16.8%
	Asian, Non-Hispanic	1.1%	348	0.0%	2.2%
	Other Race, Non-Hispanic	9.1%	454	4.7%	13.4%
	Hispanic	9.1%	1,154	6.6%	11.5%
	Total (all female youth)	7.7%	6,304	6.7%	8.8%

Source: Youth Poll Waves 43, 44, 45. Note: Missing values on the gender and race/ethnicity variables mean that sample size sums within a subpopulation may not be equal to the total sample sizes.

APTITUDE

DoDI 1304.26 Enclosure 3 (2.d) disqualifies applicants based on aptitude by their scores on the AFQT derived from the ASVAB. Applicant scores are grouped into percentile categories; persons who score in AFQT Category V (percentiles 1–9) are ineligible to enlist.

In accordance with section 520 of Reference (d), the number of persons who enlist in any Armed Force during any fiscal year (i.e., accession cohort) who score in AFQT Category IV (percentiles 10–30) may not exceed 20% of the total number of persons enlisted by Service.

By definition, 9% of the target population should score in percentiles 1–9; thus, at the national level we can assume a 9% ineligibility rate due to poor aptitude alone. However, the 9% is not equally distributed across various demographic groups or geographic areas. In practice, the Services need to be able to identify and avoid areas with pockets of individuals who tend to score lower than Category III.

Individuals within the MEPCOM Applicant file were disqualified if they scored within Category V on the AFQT. The proportion was calculated by limiting observations to individuals ages 17–24 with a valid AFQT score (i.e., individuals with a score of "0" were removed). If the same individual had multiple AFQT scores listed, then only the earliest test score was used.

YP-based aptitude eligibility estimates were inferred from a respondent reporting having received "Mostly C's," "Mostly C's and D's," or "Mostly D's and lower" in high school (EDU5) as an approximation of lower aptitude and likelihood of scoring in AFQT Category V, as the YP survey does not include a direct measure of aptitude qualification. Nine percent of YP respondents reported receiving mostly C's and below, which is the same

percentage disqualified for being AFQT Category V, suggesting that the high school grades YP item is a close proxy for AFQT-based aptitude. Respondents who were younger than 17 years old, refused to answer the question, gave multiple responses, or indicated they were never in high school were excluded from the analysis. Survey misprints (value of -91) were also excluded when present.

METHODOLOGY/MODELING APPROACH

ELIGIBILITY MODEL

The eligibility model was intended to provide a series of parameter estimates that could be used to quantify both the marginal (i.e., independent) rates of disqualification as well as the correlation (i.e., overlap) between the seven disqualifying factors that were a focus in this work consistent with the methodology used in 2013. The statistical model used to quantify the parameter estimates was a survey design-adjusted multivariate probit (MVP) model using a combination of YP and ACS data. The YP data were advantageous for use in this study as they contained a version of each disqualifying factor that could be modeled as a dependent variable in the MVP to obtain marginal rates and correlations.

The MVP model used several YP respondent-level demographic characteristics as independent variables predicting the disqualifying factors. These respondent-level independent variables included:[1]

- Gender (GENDER)
  - Male
  - Female*
- Age (AGE)
  - 17–19*
  - 20
  - 21
  - 22
  - 23–24
- Race/Ethnicity (RACE_ETH)
  - Non-Hispanic White
  - Non-Hispanic Black
  - Non-Hispanic Asian
  - Hispanic*
  - Non-Hispanic Other
- Educational attainment (EDU2_R, EDU3_Q)
  - High school-enrolled
    - EDU2_R: 9th, 10th, or 11th Grade High School
  - High school senior
    - EDU2_R: 12th Grade High School
  - Associate degree
    - EDU2_R: Vocational, business, or trade school; Junior or community college
  - College-enrolled
    - EDU2_R: 1st, 2nd, 3rd, 4th, or 5th year college/university; Graduate or professional school
  - Non-high school graduate*
    - EDU2_R: Any response not selected above
    - EDU3_Q: Less than High School, Some High School
  - GED graduate

[1] Educational attainment was more complex and how each was coded and from which variable is included; respondents were coded as missing only when missing both EDU2_R and EDU3_Q.

        - EDU2_R: Any response not selected above
        - EDU3_Q: Completed GED
    - High school graduate
        - EDU2_R: Any response not selected above
        - EDU3_Q: Completed High School diploma; Some college
    - College graduate
        - EDU2_R: Any response not selected above
        - EDU3_Q: Bachelor's degree, Masters, doctorate, or professional degree

Note that the asterisked level of the four independent variables served as the reference category in the model. These respondent-level independent variables, as well as how they were used in the MVP model in terms of how they were coded, followed from the way these data are available in the W&P ZIP code-level population estimates. To be specific, the coding of each respondent-level independent variable matched the way that W&P population estimates are represented in the data. This allowed the MVP model's results to be applied using W&P data and thus be projected down to ZIP codes. Hence, the coding of these variables followed from the intention to use these data to produce small area estimates.

In addition to respondent-level independent variables, several characteristics related to the geographic area in which the YP respondent lived were used as independent variables. Each of the geographic area-based variables that were used were obtained from the ACS 5-year estimates from 2018 and aggregated to the ZIP Code Tabulation Area (ZCTA) level. Geographic characteristics included:

- Percentage of the residents of the ZCTA who had income below the poverty line
- Percentage of the residents of the ZCTA who had graduated from a four-year college (of those who were at least 25 years old)
- Percentage of the residents of the ZCTA who did not identify as being non-Hispanic White
- The natural logarithm of the median income among ZCTA residents
- Whether the ZCTA was in an MSA

The MVP model was survey design-adjusted using the YP's survey weights to adjust the marginal rates and correlations for the YP's survey design and to ensure representativeness of the parameter estimates to the youth population.[2] The survey weights for the three waves of the YP used in the eligibility model were not adjusted when merged together for estimation as they represented nearly identical youth populations separated in time by only a few months. As such, the scale of the weights across waves was relatively similar and our team determined that adjustment was not necessary.

In order to align with the approach taken in 2013, the MVP predictive model for aptitude disqualification was replaced with a probit model estimated on the MEPCOM applicant data. This model predicted the likelihood of being in AFQT Category V versus all other AFQT categories (i.e., disqualification based on aptitude). This model is described in greater detail in the AFQT Category Modeling section below.

[2] The MVP model, while accepting survey weights, does not accept sampling strata or finite population corrections. Consequently, standard errors for this model are not adjusted for these survey design features.

ELIGIBILITY ESTIMATION

The eligibility estimates at the national and ZIP code level were obtained using a cumulative probability estimator based on the multivariate normal/Gaussian distribution combined with the results from the MVP model. The primary objective of this estimation was to obtain the probability across all seven disqualifiers that youth have no disqualifying factors and are thus eligible for military service.

Estimating military eligibility at the national level proceeded using the marginal probabilities of each disqualifier as obtained from their *national standard* data source (i.e., NHANES for physical/medical and overweight; NSDUH for drug use and mental health; YP for conduct and dependents; PAY97 for aptitude) translated into *Z*-scores for use by the probability estimator. The estimated correlation matrix between the disqualifiers from the eligibility/MVP model were used as the correlation matrix for the probability estimator. Finally, the *Z*-scores were scaled to ensure that the cumulative probability estimate produced by the probability estimator provided the joint probability that all seven disqualifiers were false (i.e., the *Z*-scores were multiplied by -1 to reflect them over the origin; cumulative probability was taken to start at negative infinity) and, thus, that the youth were not disqualified on any factor/eligibility. The probability value obtained was used as the eligibility estimate.

All 127 different combinations of disqualifiers being true and false (including the condition where all disqualifiers were true) were also computed at this stage.

Estimating eligibility by ZIP code followed from the estimates at the national-level but differed in how the *Z*-scores for each disqualifier were computed. At the ZIP code level, the eligibility/MVP model was used to obtain linear predicted values, or model-implied *Z*-scores, for all combinations of the five respondent-level independent variables for each ZIP code. Thus, each ZIP code had 400 different *Z*-scores representing all possible combinations of the respondent characteristics. These characteristics were produced as sums of the different MVP coefficients that represented each demographic combination's model-implied *Z*-score. For example, the model-implied *Z*-score for the combination of demographics that represented all four reference levels (i.e., female, non-High School graduates, who were 17–19 and Hispanic) the model-implied *Z*-score was the model intercept. By contrast, the model-implied *Z*-score for *male*, non-High School graduates, who were 17–19 and Hispanic, was the sum of the model intercept and the male MVP model coefficient. Hence, all 400 combinations were built from similar sums for all seven disqualifiers.

Within a ZIP code across all 400 combinations of demographic model-implied *Z*-scores, the geographic independent variables' effects were also added to make geography-based adjustment to disqualification. Specifically, the sums of the products of each geographic independent variable with its model coefficient was added to the model-implied *Z*-scores for each demographic combination to obtain a final model-implied *Z*-score for that ZIP code–demographic combination for all seven disqualifiers.

Before finalizing the ZIP code–demographic combination-level model-implied *Z*-scores, a set of final adjustments for each ZIP code–demographic combination were made to ensure that the marginal probabilities for each disqualifier matched with the national standard data source. To do so, each ZIP code–demographic combination was adjusted several times to such that the national population size-weighted ZIP code–demographic combination proportion of disqualified for each disqualifier matched with the national standard

data source. These adjustments were applied by first[3] transforming the model-implied *Z*-scores into probabilities and then multiplying each ZIP code–demographic combination's probability by the ratio of the national standard value over the disqualifier's current population-weighted mean probability. The adjusted probability values were then re-*Z*-transformed. This series of adjustments ensured that the population-weighted mean probability matched with the known national standard value.

We found that the national standard adjustments described above inflated or restricted variance in the model-implied *Z*-scores relative to their original values as predicted from the eligibility /MVP model—in some cases substantially. As such, we also adjusted the spread of the national standard-adjusted model-implied *Z*-scores by centering the scores at 0, and multiplying the scores by the ratio of the standard deviation of the original model-implied *Z*-scores over the standard deviation of the national standard-adjusted model-implied Z-scores. This adjustment ensured that the variability by ZIP code–demographic combination was sufficient and mirrored the extent that was produced by the eligibility /MVP model initially. The process of adjusting to the national standard and then adjusting for variability was repeated several times to ensure balance between these two, somewhat competing, goals. The final adjusted model-implied *Z*-scores were used to produce all joint disqualification probabilities for all ZIP code–demographic combinations.

In summary, the adjustments described above are intended to ensure that the ZIP code–demographic combination-level data meet two criteria. First, that the weighted average of the disqualifier rates for each disqualifier matches the known national standard value. This will ensure that the estimated eligibility rates will reflect the rate of disqualification for each reason from the highest-quality source available. Second, that the disqualifier rates across all ZIP code–demographic combination produce sensible values. This will ensure that the ranges for the ZIP code–demographic combinations show sufficient variation and do not fall within an excessively small, or large, range.

AFQT CATEGORY MODELING

The AFQT Category model, similar to the eligibility model, was intended to provide a series of parameter estimates that could be used to quantify the probability AFQT Category membership in the youth population. The statistical model used to quantify the parameter estimates was a multinomial logit (MNL) model using a combination of MEPCOM applicant and ACS data.

The MEPCOM applicant data used in this study extended from April 16, 2007, to September 30, 2019, with most records occurring after January 1, 2012, and included 3,907,636 records. Applicants to service can re-apply after having re-taken the ASVAB and such repeated applicant records are reflected in the applicant data. For the present work, it was important that we have a single observation represent each applicant. To do so, we opted to use only the first application the applicant had for service. Thus, in the instance that an applicant had multiple records in the data, the record with the oldest application date was used as the retained record for that applicant. After filtering out repeated observations, 2,832,557 records remained.

As compared to the eligibility modeling, the AFQT Category modeling estimated a series of four different MNL models, including different numbers and types of independent variables to fit to the MEPCOM applicant data. All four MNL models used a set of respondent-level demographic characteristic independent variables to predict

[3] An initial adjustment was applied to all model-implied *Z*-scores such that they were multiplied by the ratio of the *Z*-transformed national standard probability over population-weighted mean model-implied *Z*-score. This was done to avoid issues with obtaining out of range probabilities in subsequent steps.

AFQT Category membership. These respondent-level independent variables were identical to those used by the eligibility model, which included:[4]

- Gender (PN_SEX_CD)
  - Male
  - Female*
- Age (APPL_AGE_QY)
  - 17–19*
  - 20
  - 21
  - 22
  - 23–24
- Race/Ethnicity (PN_RACE_CD, PN_ETHNIC_CD)
  - Non-Hispanic White
    - PN_RACE_CD: White
    - PN_ETHNIC_CD: Any response other than "Hispanic Origin"
  - Non-Hispanic Black
    - PN_RACE_CD: Black or African American
    - PN_ETHNIC_CD: Any response other than "Hispanic Origin"
  - Non-Hispanic Asian
    - PN_RACE_CD: Asian
    - PN_ETHNIC_CD: Any response other than "Hispanic Origin"
  - Hispanic*
    - PN_RACE_CD: Any response
    - PN_ETHNIC_CD: Hispanic Origin
  - Non-Hispanic Other
    - PN_RACE_CD: Any response *not* covered in other identities and excluding "Declined to Respond," "Identification Pending (used in mortuary affairs and graves registration)," and blank/NULL responses.
    - PN_ETHNIC_CD: Any response other than "Hispanic Origin"
- Educational attainment (APPL_EDU_DSG)
  - High school-enrolled
    - Attending high school, junior or less
  - High school senior
    - Attending high school, senior
  - Associate degree
    - Associate degree; Professional nursing diploma
  - College-enrolled
    - Completed one semester of college, no high school diploma; One year of college certificate of equivalency; 1–2 years of college, no degree; 3–4-year college, no degree
  - Non-high school graduate*

[4] Educational attainment and race/ethnicity were more complex and how each was coded and from which variable is included; respondents were coded as missing for race/ethnicity only when responding as "Declined to Respond," "Identification Pending (used in mortuary affairs and graves registration)," or blank/NULL on PN_RACE_CD, and any response other than "Hispanic Origin" on PN_ETHNIC_CD.

        - Non-high school graduate; Secondary school credential near completion; High school certificate of attendance; Completed high school - No diploma; Completed High School but did not pass the high school exit exam
    - GED graduate
        - Test-based equivalency diploma; Occupational program certificate; Correspondence school diploma; High school certificate of attendance; Home study diploma; Adult education diploma; ARNG Challenge Program GED Certificate; Other Non-traditional High School Credential
    - High school graduate
        - High school diploma
    - College graduate
        - Baccalaureate degree; 1 or more years of graduate school, no degree; Master's degree; Post master's degree; First professional degree; Doctorate degree; Post doctorate degree

Again, the asterisked level of the four independent variables served as the reference category in the model and the coding of the variables followed from the intention to use these variables for small area estimation. These four respondent-level independent variables were used alone in the first MNL model/AFQT Model 1.

The second MNL model used all four respondent-level independent variables as AFQT Model 1 but also included characteristics related to the geographic area in which the applicant lived. Again, similar to the eligibility model, AFQT Model 2 used ACS's ZCTA-level data, including:

- Percentage of the residents of the ZCTA who had income below the poverty line
- Percentage of the residents of the ZCTA who had graduated from a four-year college (of those who were at least 25 years old)
- Percentage of the residents of the ZCTA who did not identify as being non-Hispanic White
- The natural logarithm of the median income among ZCTA residents
- Whether the ZCTA was in an MSA

The third MNL model used the same independent variables as AFQT Model 2 but also included dummy/indicator codes representing the U.S. Census Division in which the applicant lived. U.S. Census Division was determined by using a ZCTA-to-FIPS code crosswalk provided by the U.S. Census Bureau. The Northeast Census Division was used as the reference level for AFQT Model 3's Census Division indicator codes.

A fourth and final MNL model was estimated that was identical to AFQT Model 3 except that the U.S. Census Division indicator codes were exchanged with indicator codes representing each applicants' U.S. state of residence. Like U.S. Census Division, U.S. state was determined by using a ZCTA-to-FIPS code crosswalk provided by the U.S. Census Bureau. Alabama was used as the reference level for AFQT Model 4's state indicator codes.

A goal of the AFQT Category modeling was to represent the probability of AFQT Category membership among the general American youth population as opposed to the population of youth who choose to apply for service and have records with MEPCOM. As such, prior to estimating all four MNL models, all observations in the applicant data were assigned a weight to adjust their results away from their characteristics in the applicant population and toward the characteristics of the broader youth population. Data from PAY97, the most recent

nationally representative data on which a sample of American youth took the AFQT, was used to poststratify the MEPCOM applicant data. The PAY97 data were used to generate a poststratification weight as the ratio of the proportion in the youth sample (i.e., the PAY97) to the applicant sample that was in each race/ethnicity category within each AFQT Category (see Table 16). For example, 7.4% non-Hispanic White applicants in the data were in AFQT Category I. By contrast, 10.3% of non-Hispanic White respondents in the PAY97 data were in AFQT Category I—a 40% underrepresentation which, hence, has resulted in a ratio of 1.40.

Table 16. AFQT Distribution by Race/Ethnicity in FY12–FY19 Applicant Data and PAY97

AFQT Category	Race/Ethnicity	Applicant Data	PAY97 Data	Ratio
I	White, Non-Hispanic	7.4%	10.3%	1.40
	Black, Non-Hispanic	1.1%	1.3%	1.17
	Asian, Non-Hispanic	8.5%	13.5%	1.58
	Other, Non-Hispanic	5.5%	2.9%	0.53
	Hispanic	2.6%	1.7%	0.65
II	White, Non-Hispanic	40.5%	34.6%	0.85
	Black, Non-Hispanic	16.9%	10.3%	0.60
	Asian, Non-Hispanic	35.0%	16.9%	0.48
	Other, Non-Hispanic	36.2%	27.7%	0.76
	Hispanic	27.1%	10.6%	0.39
IIIA	White, Non-Hispanic	24.2%	17.0%	0.70
	Black, Non-Hispanic	21.2%	12.7%	0.60
	Asian, Non-Hispanic	21.5%	18.5%	0.86
	Other, Non-Hispanic	25.6%	15.2%	0.59
	Hispanic	25.1%	10.7%	0.42
IIIB	White, Non-Hispanic	21.0%	18.4%	0.88
	Black, Non-Hispanic	35.2%	21.6%	0.61
	Asian, Non-Hispanic	22.6%	15.6%	0.69
	Other, Non-Hispanic	22.6%	17.6%	0.78
	Hispanic	30.2%	19.2%	0.64
IV	White, Non-Hispanic	6.2%	15.4%	2.49
	Black, Non-Hispanic	21.2%	31.6%	1.49
	Asian, Non-Hispanic	10.3%	25.8%	2.51
	Other, Non-Hispanic	8.7%	25.0%	2.86
	Hispanic	12.9%	35.6%	2.76
V	White, Non-Hispanic	0.8%	4.4%	5.36
	Black, Non-Hispanic	4.2%	22.5%	5.30
	Asian, Non-Hispanic	2.1%	9.8%	4.69
	Other, Non-Hispanic	1.2%	11.6%	9.53
	Hispanic	2.0%	22.2%	10.88

A second weight was also formed which was the ratio of the proportion in the youth sample to the applicant sample that were in each race/ethnicity category (see Table 17). Again, as an example, 53.0% of the applicants were non-Hispanic White whereas 68.1% of respondents in the PAY97 data were non-Hispanic White—a 28.5% underrepresentation which, hence, has resulted in a ratio of 1.29.

Table 17. Distribution of Race/Ethnicity in FY12–FY19 Applicant Data and PAY97

Race/Ethnicity	Applicant Data	PAY97 Data	Ratio
White, Non-Hispanic	53.0%	68.1%	1.29
Black, Non-Hispanic	21.8%	13.0%	0.60
Asian, Non-Hispanic	3.8%	2.8%	0.73
Other, Non-Hispanic	3.2%	2.9%	0.90
Hispanic	18.2%	13.2%	0.72

These two weights were multiplied together and applied to the multinomial logit model for all AFQT applicants. To continue the example, the final weight applied to non-Hispanic White applicants in AFQT Category I was 1.40*1.29 for a total estimate of underrepresentation of 81% and thus a PAY97 weight of 1.81.

Prior to estimating the models, the applicant data were randomly split into training and testing subsets, both comprising 50% of the eligible records stratified by AFQT Category. All four models were estimated on the training subset and all model postestimation procedures (i.e., marginal effects) were applied to the test set.

In addition to the MNL models predicting each AFQT category, the four models described above were also estimated using a probit model predicting the likelihood of being in Category V versus all other AFQT categories to characterize the likelihood of aptitude disqualification. The details of estimation were identical to those of the four models above except for the dependent variable as well as the form of the statistical model applied to the data. Our intent was to use one of the applicant-based aptitude disqualifier probit models as a replacement for the YP-based MVP model's aptitude disqualifier equation for ZIP code-level predictions consistent with the 2013 methodology.

AFQT CATEGORY ESTIMATION

The AFQT Category estimates at the national level were taken as the PAY97-weighted proportions of applicants in each AFQT Category as estimated from the MEPCOM data.

The AFQT Category estimates at the ZIP code level were obtained using a multinomial logit transformation based on the five prediction equations in the retained AFQT Category model number four. Similar to the eligibility ZIP code-level estimates, ZIP code-level AFQT Category estimates were generated with linear predicted values/log relative risk for all combinations of the applicant-level independent variables for each ZIP code. Each ZIP code had 400 different log relative risk scores representing all possible combinations of the applicant characteristics for all five predictive equations (e.g., the log relative risk of being in Category I vs. Category II/the reference category). These characteristics were produced as sums of the different MNL coefficients that represented each demographic combination's log relative risk for that predictive equation.

Again, like the eligibility estimates, within a ZIP code across all 400 combinations of demographic model-implied log relative risk scores, the geographic independent variables' effects were also added to make geography-based adjustment to AFQT Category estimates. Specifically, the sums of the products of each geographic independent variable, including state indicator variables representing the applicant's state of residence, with its model coefficient was added to the log relative risk for each demographic combination to obtain a log relative risk for that ZIP code–demographic combination for all five predictive equations.

The five log relative risks were back-transformed using the inverse multinomial function to obtain the probability of being in Categories I, IIIA, IIIB, IV, and V for a ZIP code–demographic combination. One minus

the sum of the other five probabilities was taken as the probability of being in Category II for that a ZIP code–demographic combination.

QMA AND QUALITY QMA ESTIMATION

The national QMA estimate, (i.e., youth who are qualified and available, defined as not currently enrolled in college) presented in the Model Results Estimates section was calculated using the final 2020 QMA data set that provided eligibility and disqualifier rate estimates for each ZIP code split by race/ethnicity, gender, age, and education (more information on the final 2020 QMA data set, can be found in Appendix E).
To calculate QMA nationally, the following steps were taken:

1) Multiplied the eligibility probability estimate by the population size for each unique ZIP-Race/Eth-Gender-Age-Education combination. This initial step resulted in the size of the population for each ZIP code-by-demographic category that was eligible.

2) Summed the estimates obtained through Step 1 to identify the number of youth who are eligible but not college-enrolled (i.e., summed eligibility estimates across all ZIP-Race/Eth-Gender-Age-Education combinations, except those where education is "college-enrolled"). This step provided the size of the population nationally that is eligible and not college-enrolled, or the QMA population estimate.

3) Divided the population count obtained through Step 2 (i.e., the national QMA population estimate) by the total number of youth nationally. This provided the proportion of all youth who are QMA.

The national High-Quality QMA (i.e., youth who are QMA and in AFQT Cat. I–IIIA) estimate was calculated again using the final 2020 QMA data set that provided estimates for each ZIP code split by race/ethnicity, gender, age, and education, through the following steps:

1) Estimated the eligible population within each AFQT category for each ZIP-Race/Eth-Gender-Age-Education combination. This was done by forming five different products that adjusted for the impossibility that anyone in Category V could be in the eligible population. For example, as applied to estimating the eligible population for AFQT Category I youth, the eligible population within each ZIP code-by-demographic category was multiplied by the ratio of the ZIP code-by-demographic category that was AFQT Category I out of the sum of the proportions of all the AFQT Categories except V.

2) Combined the estimates for AFQT Cat. I–IIIA and eligible into a single *eligible and Cat. I–IIIA* population estimate for each unique ZIP-Race/Eth-Gender-Age-Education combination.

3) Summed the estimates obtained in Step 2 to identify the number of youth who are eligible and Cat. I–IIIA but not college-enrolled (i.e., summed eligibility and high-quality estimates across all ZIP-Race/Eth-Gender-Age-Education combinations, except those where education is "college-enrolled"). This step provided the size of the population nationally that is eligible, high-quality, and not college-enrolled, or the High-Quality QMA population.

4) Divided the population count obtained through Step 3 (i.e., the national High-Quality QMA population estimate) by the total number of youth nationally. This provided the proportion of all youth who are High-Quality QMA. These steps were also followed for the other education and AFQT categories to calculate other combinations of education level and AFQT category presented in the national pie chart (presented at the end of the following section).

MODEL RESULTS ESTIMATES

NATIONAL ESTIMATES: ELIGIBILITY

Youth may be disqualified for service for more than one reason; in 2020, 44% of youth were disqualified for multiple reasons. The eligibility methodology allows us to estimate the percentage of youth who are ineligible due to any set of criteria: drugs and conduct; drugs and aptitude; drugs, conduct, and aptitude, etc. The table below includes the overall probability that youth have zero disqualifiers (i.e., are eligible), and of those who are ineligible, the percentage of youth disqualified for all 127 possible combinations of disqualifiers.

Table 18. Possible Combinations of Disqualification Categories

Disqualification Categories	Mean
Eligible for Service (Qualified, No Disqualifiers)	**23.17%**
Medical/Physical, Mental Health, Overweight, Drugs, Conduct, Dependents, Aptitude	0.01%
Mental Health, Overweight, Drugs, Conduct, Dependents, Aptitude	0.01%
Medical/Physical, Overweight, Drugs, Conduct, Dependents, Aptitude	0.01%
Medical/Physical, Mental Health, Drugs, Conduct, Dependents, Aptitude	0.01%
Medical/Physical, Mental Health, Overweight, Conduct, Dependents, Aptitude	0.01%
Medical/Physical, Mental Health, Overweight, Drugs, Dependents, Aptitude	0.04%
Medical/Physical, Mental Health, Overweight, Drugs, Conduct, Aptitude	0.04%
Medical/Physical, Mental Health, Overweight, Drugs, Conduct, Dependents	0.03%
Overweight, Drugs, Conduct, Dependents, Aptitude	0.01%
Mental Health, Drugs, Conduct, Dependents, Aptitude	0.01%
Mental Health, Overweight, Conduct, Dependents, Aptitude	<0.01%
Mental Health, Overweight, Drugs, Dependents, Aptitude	0.03%
Mental Health, Overweight, Drugs Conduct, Aptitude	0.03%
Mental Health, Overweight, Drugs, Conduct, Dependents	0.02%
Medical/Physical, Drugs, Conduct, Dependents, Aptitude	0.01%
Medical/Physical, Overweight, Conduct, Dependents, Aptitude	<0.01%
Medical/Physical, Overweight, Drugs, Dependents, Aptitude	0.03%
Medical/Physical, Overweight, Drugs Conduct, Aptitude	0.03%
Medical/Physical, Overweight, Drugs, Conduct, Dependents	0.02%
Medical/Physical, Mental Health, Conduct, Dependents, Aptitude	<0.01%
Medical/Physical, Mental Health, Drugs, Dependents, Aptitude	0.03%
Medical/Physical, Mental Health, Drugs, Conduct, Aptitude	0.05%
Medical/Physical, Mental Health, Drugs, Conduct, Dependents	0.03%
Medical/Physical, Mental Health, Overweight, Dependents, Aptitude	0.03%
Medical/Physical, Mental Health, Overweight, Conduct, Aptitude	0.03%
Medical/Physical, Mental Health, Overweight, Conduct, Dependents	0.02%
Medical/Physical, Mental Health, Overweight, Drugs, Aptitude	0.35%
Medical/Physical, Mental Health, Overweight, Drugs, Dependents	0.12%
Medical/Physical, Mental Health, Overweight, Drugs, Conduct	0.14%
Drugs, Conduct, Dependents, Aptitude	0.02%
Overweight, Conduct, Dependents, Aptitude	0.01%
Overweight, Drugs, Dependents, Aptitude	0.06%
Overweight, Drugs Conduct, Aptitude	0.05%
Overweight, Drugs, Conduct, Dependents	0.05%
Mental Health, Conduct, Dependents, Aptitude	<0.01%
Mental Health, Drugs, Dependents, Aptitude	0.03%
Mental Health, Drugs Conduct, Aptitude	0.05%

Disqualification Categories	Mean
Mental Health, Drugs Conduct, Dependents	0.04%
Mental Health, Overweight, Dependents, Aptitude	0.02%
Mental Health, Overweight, Conduct, Aptitude	0.02%
Mental Health, Overweight, Conduct, Dependents	0.02%
Mental Health, Overweight, Drugs, Aptitude	0.24%
Mental Health, Overweight, Drugs, Dependents	0.10%
Mental Health, Overweight, Drugs Conduct	0.12%
Medical/Physical, Conduct, Dependents, Aptitude	<0.01%
Medical/Physical, Drugs, Dependents, Aptitude	0.03%
Medical/Physical, Drugs, Conduct, Aptitude	0.04%
Medical/Physical, Drugs, Conduct, Dependents	0.03%
Medical/Physical, Overweight, Dependents, Aptitude	0.04%
Medical/Physical, Overweight, Conduct, Aptitude	0.02%
Medical/Physical, Overweight, Conduct, Dependents	0.03%
Medical/Physical, Overweight, Drugs, Aptitude	0.31%
Medical/Physical, Overweight, Drugs, Dependents	0.13%
Medical/Physical, Overweight, Drugs, Conduct	0.11%
Medical/Physical, Mental Health, Dependents, Aptitude	0.02%
Medical/Physical, Mental Health, Conduct, Aptitude	0.03%
Medical/Physical, Mental Health, Conduct, Dependents	0.02%
Medical/Physical, Mental Health, Drugs, Aptitude	0.37%
Medical/Physical, Mental Health, Drugs, Dependents	0.14%
Medical/Physical, Mental Health, Drugs, Conduct	0.23%
Medical/Physical, Mental Health Overweight, Aptitude	0.35%
Medical/Physical, Mental Health Overweight, Dependents	0.16%
Medical/Physical, Mental, Health, Overweight, Conduct	0.13%
Medical/Physical, Mental Health, Overweight, Drugs	1.52%
Conduct, Dependents, Aptitude	0.01%
Drugs, Dependents, Aptitude	0.07%
Drugs, Conduct, Aptitude	0.10%
Drugs, Conduct, Dependents	0.09%
Overweight, Dependents, Aptitude	0.08%
Overweight, Conduct, Aptitude	0.05%
Overweight, Conduct, Dependents	0.06%
Overweight, Drugs, Aptitude	0.55%
Overweight, Drugs, Dependents	0.27%
Overweight, Drugs, Conduct	0.25%
Mental Health, Dependents, Aptitude	0.02%
Mental Health, Conduct, Aptitude	0.03%
Mental Health, Conduct, Dependents	0.03%
Mental Health, Drugs, Aptitude	0.33%
Mental Health, Drugs, Dependents	0.14%
Mental Health, Drugs Conduct	0.26%
Mental Health, Overweight, Aptitude	0.26%
Mental Health, Overweight, Dependents	0.14%
Mental Health, Overweight, Conduct	0.12%
Mental Health, Overweight, Drugs	1.19%
Medical/Physical, Dependents, Aptitude	0.03%
Medical/Physical, Conduct, Aptitude	0.03%
Medical/Physical, Conduct, Dependents	0.03%
Medical/Physical, Drugs, Aptitude	0.39%

Disqualification Categories	Mean
Medical/Physical, Drugs, Dependents	0.18%
Medical/Physical, Drugs, Conduct	0.22%
Medical/Physical, Overweight, Aptitude	0.48%
Medical/Physical, Overweight, Dependents	0.27%
Medical/Physical, Overweight, Conduct	0.16%
Medical/Physical, Overweight, Drugs	1.73%
Medical/Physical, Mental Health, Aptitude	0.32%
Medical/Physical, Mental Health, Dependents	0.16%
Medical/Physical, Mental Health, Conduct	0.19%
Medical/Physical, Mental Health, Drugs	2.24%
Medical/Physical, Mental Health, Overweight	2.48%
Dependents, Aptitude	0.09%
Conduct, Aptitude	0.08%
Conduct, Dependents	0.12%
Drugs, Aptitude	0.89%
Drugs, Dependents	0.49%
Drugs, Conduct	0.64%
Overweight, Aptitude	0.94%
Overweight, Dependents	0.64%
Overweight, Conduct	0.39%
Overweight Drugs	3.48%
Mental Health, Aptitude	0.31%
Mental Health, Dependents	0.18%
Mental Health, Conduct	0.23%
Mental Health, Drugs	2.27%
Mental Health, Overweight	2.13%
Medical/Physical, Aptitude	0.52%
Medical/Physical, Dependents	0.33%
Medical/Physical, Conduct	0.28%
Medical/Physical, Drugs	3.09%
Medical/Physical, Overweight	4.57%
Medical/Physical Mental Health	3.27%
Aptitude	1.36%
Dependents	1.05%
Conduct	0.92%
Drugs	8.32%
Overweight	10.66%
Mental Health	3.63%
Medical/Physical	7.35%

The next set of tables summarize results from the eligibility MVP models. Table 19 provides MVP model estimate coefficients, standard errors, and p-values for the included variables for each of the given disqualification criterion. Negative coefficients suggest that members of the displayed subgroup are less likely to be disqualified for that condition compared to the reference group (e.g., male youth are less likely than female youth to be disqualified for medical/physical, mental health, overweight, and dependents). Positive coefficients indicate a higher likelihood of being disqualified on that reason compared to the reference group (e.g., male youth are more likely to be disqualified for drugs, conduct, and aptitude, compared to female youth).

Table 19. Model Results for Seven Condition Multivariate Probit Model

Variable		Medical/ Physical	Mental Health	Overweight	Drugs	Conduct	Dependents	Aptitude
Constant	Coefficient	1.495	-0.137	2.201	-2.219	0.683	1.408	-1.848
	Standard Error	1.570	1.738	1.694	2.309	2.770	3.339	2.475
	p-value	0.341	0.937	0.194	0.337	0.805	0.673	0.455
Gender (Reference group = Female)								
Male	Coefficient	**-0.214**	**-0.517**	**-0.124**	**0.210**	**0.234**	**-0.436**	**0.332**
	Standard Error	0.034	0.039	0.037	0.049	0.063	0.077	0.056
	p-value	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Age (Reference group = Age 17–19)								
20	Coefficient	-0.002	0.032	0.041	0.018	0.200	**0.450**	**0.303**
	Standard Error	0.058	0.062	0.061	0.077	0.107	0.132	0.099
	p-value	0.979	0.608	0.506	0.815	0.061	0.001	0.002
21	Coefficient	0.119	**0.151**	**0.171**	0.158	0.172	**0.475**	**0.209**
	Standard Error	0.064	0.067	0.067	0.088	0.116	0.130	0.103
	p-value	0.061	0.024	0.011	0.072	0.137	0.000	0.043
22	Coefficient	0.101	**0.170**	0.120	**0.226**	0.122	**0.558**	0.001
	Standard Error	0.064	0.070	0.067	0.086	0.119	0.123	0.111
	p-value	0.115	0.015	0.074	0.009	0.304	0.000	0.994
23–24	Coefficient	0.095	**0.126**	**0.218**	0.083	**0.277**	**0.776**	**0.205**
	Standard Error	0.056	0.063	0.058	0.075	0.099	0.111	0.092
	p-value	0.090	0.044	0.000	0.269	0.005	0.000	0.026
Education (Reference group = Non-High School [HS] Graduate)								
HS-Enrolled	Coefficient	-0.202	**-0.520**	**-0.416**	**-0.872**	**-1.025**	**-0.730**	**-0.850**
	Standard Error	0.130	0.142	0.136	0.159	0.182	0.216	0.150
	p-value	0.120	0.000	0.002	0.000	0.000	0.001	0.000
HS Senior	Coefficient	**-0.264**	**-0.480**	**-0.457**	**-0.588**	**-0.900**	**-1.052**	**-0.959**
	Standard Error	0.122	0.135	0.128	0.150	0.160	0.215	0.142
	p-value	0.031	0.000	0.000	0.000	0.000	0.000	0.000
Associate Degree	Coefficient	-0.227	**-0.377**	-0.214	**-0.522**	**-0.934**	**-0.813**	**-1.071**
	Standard Error	0.129	0.142	0.134	0.154	0.167	0.175	0.145
	p-value	0.078	0.008	0.109	0.001	0.000	0.000	0.000
College-Enrolled	Coefficient	**-0.258**	**-0.531**	**-0.527**	**-0.562**	**-1.048**	**-1.222**	**-1.637**
	Standard Error	0.121	0.134	0.126	0.142	0.152	0.164	0.140
	p-value	0.033	0.000	0.000	0.000	0.000	0.000	0.000
GED	Coefficient	-0.225	-0.193	-0.422	-0.530	-0.235	-0.414	-0.030
	Standard Error	0.236	0.245	0.233	0.285	0.274	0.280	0.235
	p-value	0.342	0.432	0.070	0.063	0.392	0.139	0.899

Variable		Medical/ Physical	Mental Health	Overweight	Drugs	Conduct	Dependents	Aptitude
HS Grad	Coefficient	-0.178	**-0.312**	-0.182	-0.246	**-0.634**	**-0.431**	**-0.734**
	Standard Error	0.124	0.136	0.129	0.145	0.150	0.158	0.133
	p-value	0.152	0.022	0.158	0.091	0.000	0.006	0.000
College Grad	Coefficient	**-0.402**	**-0.661**	**-0.574**	**-0.613**	**-1.130**	**-1.378**	**-1.691**
	Standard Error	0.134	0.150	0.142	0.166	0.194	0.214	0.185
	p-value	0.003	0.000	0.000	0.000	0.000	0.000	0.000
Race/Ethnicity (Reference group = Hispanic)								
White, Non-Hispanic	Coefficient	0.070	**0.281**	**-0.182**	-0.097	-0.044	**-0.203**	-0.031
	Standard Error	0.046	0.052	0.048	0.066	0.084	0.088	0.070
	p-value	0.129	0.000	0.000	0.142	0.599	0.021	0.659
Black, Non-Hispanic	Coefficient	0.031	**-0.179**	-0.069	0.031	0.222	**0.241**	-0.023
	Standard Error	0.073	0.089	0.075	0.102	0.122	0.121	0.109
	p-value	0.668	0.044	0.358	0.762	0.068	0.046	0.835
Asian	Coefficient	-0.048	-0.201	**-0.404**	-0.215	-0.011	-0.401	**-0.348**
	Standard Error	0.084	0.109	0.097	0.125	0.160	0.214	0.161
	p-value	0.570	0.066	0.000	0.085	0.944	0.061	0.031
Other, Non-Hispanic	Coefficient	**0.296**	**0.303**	-0.152	0.083	**0.271**	-0.075	-0.037
	Standard Error	0.082	0.090	0.086	0.113	0.126	0.160	0.122
	p-value	0.000	0.001	0.078	0.459	0.031	0.640	0.760
ZIP Code Level (ACS ZCTA) Variables								
Percentage Not White, Non-Hispanic	Coefficient	0.013	-0.165	-0.116	-0.029	0.068	-0.024	0.185
	Standard Error	0.104	0.121	0.112	0.147	0.197	0.197	0.156
	p-value	0.903	0.171	0.299	0.842	0.729	0.904	0.234
% Below Poverty Line	Coefficient	-0.454	0.294	-0.512	0.152	-0.279	0.530	0.130
	Standard Error	0.437	0.483	0.470	0.698	0.774	0.873	0.686
	p-value	0.299	0.543	0.276	0.828	0.719	0.544	0.849
Median Income	Coefficient	-0.139	-0.024	-0.165	0.099	-0.150	-0.205	0.137
	Standard Error	0.140	0.155	0.151	0.205	0.247	0.297	0.221
	p-value	0.322	0.879	0.276	0.630	0.544	0.492	0.536
% College Grad (BA or higher)	Coefficient	0.260	0.381	**-0.964**	0.132	-0.154	-0.629	-0.668
	Standard Error	0.210	0.229	0.223	0.304	0.353	0.431	0.347
	p-value	0.217	0.097	0.000	0.664	0.664	0.145	0.054
ZIP in MSA	Coefficient	0.060	0.016	0.019	0.109	-0.016	0.009	**-0.155**
	Standard Error	0.046	0.052	0.049	0.065	0.084	0.091	0.071
	p-value	0.195	0.761	0.701	0.094	0.852	0.926	0.030

Note: Bolded coefficients are statistically significant at the 0.05 level.

The results in Table 19 show that the most substantial differences obtained on disqualification rates tended to be across gender and educational lines. In particular, male and female youth differed non-trivially on all seven disqualifying factors, with male youth being more likely to be disqualified for conduct, drug use, and aptitude criteria, and female youth being more likely to be disqualified given medical/physical, dependents, overweight, and mental health criteria.

Additionally, High School-Enrolled, High School Senior, College-Enrolled, and College Graduate youth, controlling for their age, were less likely to be disqualified for all criteria compared to Non-High School Graduate youth.

Finally, there were a few slight trends toward older youth being more likely to be disqualified than younger youth—a trend most pronounced on mental health, dependents, and aptitude disqualification criteria.

Overall, ZIP code-level predictors were the least useful and provided little predictive value in predicting disqualification criteria.

Table 20 shows the estimated correlations between the disqualifying conditions in the YP data. One noteworthy trend is that aptitude disqualification had non-trivial, positive overlaps with *all* other disqualifiers in the data. Thus, being disqualified on the grounds of aptitude is associated with also being disqualified with each other disqualifier. Other noteworthy findings include the stronger associations with medical/physical and mental health disqualification as well as conduct and dependents disqualification.

Table 20. Correlations in the Seven Condition Multivariate Probit Model

	Medical/ Physical	Mental Health	Overweight	Drug Use	Conduct	Dependents	Aptitude
Medical/Physical	1.000						
Mental Health	**0.364**	1.000					
Overweight	**0.124**	**0.103**	1.000				
Drug Use	**0.088**	**0.204**	-0.017	1.000			
Conduct	0.015	**0.135**	-0.014	**0.203**	1.000		
Dependent	0.012	0.041	**0.084**	0.090	**0.240**	1.000	
Aptitude	**0.087**	**0.136**	**0.126**	**0.189**	**0.119**	**0.106**	1.000

Note: Bolded estimates are statistically significant at the 0.05 level.

Before producing the national and ZIP code-level eligibility and other disqualifier estimates, consistent with the with 2013 methodology, we estimated an additional four models using the MEPCOM applicant data to replace the coefficients for Aptitude as estimated from the YP-based on self-reported grades with those from a similar model based on respondents falling into Category V compared to all other AFQT Categories. The results from these models are reported in Appendix C (Table C-2.1). Specifically, Model 4 in Table C-2.1 was used to produce model-implied *Z*-scores for ZIP code aptitude disqualification rates.

Probability estimates for meeting the qualification standards for each of the seven conditions and the total qualified accounting for overlap in the disqualifications were applied to the population counts for each ZIP code in the Woods & Poole data. The national estimates below were obtained by summing the population counts across all ZIP codes.

Table 21. National Eligibility Estimates by Category

Category	Qualified	Disqualified
Medical/Physical	66.9%	33.1%
Overweight	64.6%	35.4%
Mental Health	75.4%	24.6%
Drugs	68.0%	32.0%
Conduct	94.2%	5.8%
Dependents	94.1%	5.9%
Aptitude	90.6%	9.4%
Total with Overlap	76.8%	23.2%

NATIONAL ESTIMATES: AFQT CATEGORY

The tables below summarize the predictions from the four AFQT models, showing AFQT distributions in the validation sample at the aggregate level, by race/ethnicity subgroup, education, and income quartile, compared to actual distribution from PAY97 data and the MEPCOM applicant data. These predictions were obtained by computing the predicted probabilities for each applicant based on the applicant's characteristics and ZIP code-level characteristics (using ACS data) and computing the weighted average of the predictions. The overall youth distribution of AFQT was obtained by weighting each applicant's AFQT by the PAY97 relevant weight. The Observed column represents the PAY97-weighted percentage of youth in each AFQT category on their first ASVAB testing and the model columns show the estimated marginal means for each model's predictions of the fraction of youth population in each AFQT category.

The results in Table 22 below shows that each of the model's estimated marginal means were able to reproduce the overall PAY97-weighted proportion of youth in each AFQT Category.

Table 22. Population Frequencies and Predicted Probabilities for All Youth

AFQT Category	Observed	Model 1	Model 2	Model 3	Model 4
I	7.86%	7.86%	7.86%	7.86%	7.86%
II	27.56%	27.56%	27.56%	27.56%	27.56%
IIIA	15.58%	15.58%	15.58%	15.58%	15.58%
IIIB	18.82%	18.82%	18.82%	18.82%	18.82%
IV	20.72%	20.72%	20.72%	20.72%	20.72%
V	9.46%	9.46%	9.46%	9.46%	9.46%

As Model 4 was ultimately selected, the above Model 4 estimates represent the final AFQT category youth population estimates.

Race/Ethnicity AFQT Estimates

Table 23 below summarizes estimated marginal means of the predictions from the four models by race/ethnicity, showing AFQT distributions in the validation sample for each race/ethnicity subgroup compared to observed distribution from PAY97 data and the MEPCOM applicant data (e.g., the PAY97-weighted percentage of each race/ethnicity subgroup in each AFQT category on their first ASVAB testing).

Overall, all the models reproduced the observed percentages of different race/ethnicity groups in each AFQT Category well with only relatively small deviations. On the whole, there was a slight decrease in alignment with observed values from Model 1 to 2 where ZIP code-level predictors were introduced; again, the differences are not substantial. Model 1 did seem to have a slight advantage in reproducing race/ethnicity AFQT Category proportions.

Table 23. Population Frequencies and Predicted Probabilities by Race/Ethnicity

Race/Ethnicity	AFQT Category	Observed	Model 1	Model 2	Model 3	Model 4
White, Non-Hispanic	I	10.28%	10.08%	9.83%	9.84%	9.86%
	II	34.58%	34.33%	33.53%	33.55%	33.60%
	IIIA	16.99%	16.99%	16.86%	16.88%	16.90%
	IIIB	18.39%	18.47%	18.60%	18.61%	18.60%
	IV	15.39%	15.70%	16.39%	16.37%	16.34%
	V	4.36%	4.43%	4.79%	4.74%	4.70%
Black, Non-Hispanic	I	1.31%	1.51%	1.74%	1.85%	1.84%
	II	10.29%	10.99%	12.61%	12.93%	12.91%
	IIIA	12.66%	13.10%	14.34%	14.27%	14.25%
	IIIB	21.71%	22.10%	23.23%	22.80%	22.75%
	IV	31.62%	30.50%	29.14%	28.92%	28.86%
	V	22.40%	21.79%	18.93%	19.23%	19.40%
Hispanic	I	1.73%	2.14%	2.48%	2.38%	2.34%
	II	10.61%	11.35%	12.63%	12.28%	11.99%
	IIIA	10.65%	10.79%	11.43%	11.30%	11.03%
	IIIB	19.15%	19.03%	19.37%	19.43%	19.29%
	IV	35.49%	34.64%	33.51%	33.66%	33.77%
	V	22.38%	22.05%	20.58%	20.94%	21.59%
Asian	I	13.66%	11.10%	10.04%	9.54%	9.63%
	II	17.01%	16.47%	16.08%	15.64%	15.87%
	IIIA	18.46%	19.24%	19.46%	19.38%	19.59%
	IIIB	15.50%	16.53%	17.20%	17.39%	17.40%
	IV	25.65%	26.67%	27.27%	27.66%	27.38%
	V	9.73%	9.98%	9.95%	10.39%	10.14%
Other, Non-Hispanic	I	2.87%	3.06%	3.14%	3.02%	3.09%
	II	27.69%	28.19%	28.74%	28.04%	28.69%
	IIIA	15.18%	15.24%	15.41%	15.27%	15.55%
	IIIB	17.39%	17.38%	17.50%	17.57%	17.56%
	IV	25.01%	24.39%	23.95%	24.34%	23.90%
	V	11.86%	11.75%	11.27%	11.76%	11.21%

Education AFQT Estimates

Table 24 summarizes estimated marginal means of the predictions from the four models by education subgroup, showing AFQT distributions in the validation sample for each education subgroup compared to observed distribution from PAY97 data and the MEPCOM applicant data for each education subgroup.

Similarly to the race/ethnicity marginal means, all the models reproduced the observed percentages of different education groups in each AFQT Category well with only relatively small deviations. In all, the alignment across observed and estimated marginal means were bigger for the education groups—most likely due to the PAY97 weights not using education as a factor to which the applicant population is weighted.

Estimates for Associate Degree holding youth, College-Enrolled, and College Graduates—most notably for Category I—were particularly discrepant across all models, most likely due to the substantial differences between weighted and unweighted percentages of different AFQT Categories for these groups. For example, the un-PAY97-weighted percentage of College Graduates in the applicant data was 27.5%—much nearer the trend in estimated marginal means among models 2, 3, and 4. Similarly, Associate Degree-holding youth have an un-PAY97-weighted percentage of Category I membership in the applicant data of 12.8%, which is much closer to the direction of the estimated marginal means' values. In all, the estimated marginal means for education tended to disagree more with the PAY97-weighted observed proportions by AFQT Category. Again, we believe this is likely due to education category not being a weighting target in the data.

On the whole, Model 1 appeared to be slightly less discrepant than the other three models, but none of the four models was clearly better than the others and all four struggled to reproduce the education categories' AFQT Category distribution.

Table 24. Population Frequencies and Predicted Probabilities by Education

Education	AFQT Category	Observed	Model 1	Model 2	Model 3	Model 4
HS-Enrolled	I	2.79%	3.16%	3.52%	3.60%	3.60%
	II	20.98%	20.12%	20.87%	21.26%	21.37%
	IIIA	14.77%	13.77%	13.81%	14.03%	14.15%
	IIIB	22.25%	20.84%	20.47%	20.54%	20.56%
	IV	25.34%	25.80%	25.27%	25.06%	24.99%
	V	13.87%	16.31%	16.06%	15.50%	15.33%
HS Senior	I	4.94%	5.76%	5.94%	5.95%	5.94%
	II	27.62%	27.34%	27.49%	27.54%	27.51%
	IIIA	17.75%	16.96%	16.92%	16.94%	16.95%
	IIIB	21.73%	20.75%	20.62%	20.61%	20.62%
	IV	19.64%	19.90%	19.79%	19.75%	19.77%
	V	8.33%	9.29%	9.25%	9.20%	9.21%
Associate Degree	I	21.49%	15.73%	15.31%	15.31%	15.26%
	II	44.08%	43.93%	43.55%	43.50%	43.38%
	IIIA	13.45%	15.52%	15.64%	15.62%	15.63%
	IIIB	10.03%	12.38%	12.64%	12.67%	12.73%
	IV	8.30%	9.53%	9.83%	9.87%	9.92%
	V	2.66%	2.91%	3.03%	3.04%	3.08%
College-Enrolled	I	18.69%	15.36%	14.49%	14.42%	14.37%
	II	40.55%	39.92%	39.46%	39.43%	39.39%
	IIIA	14.83%	15.95%	16.22%	16.21%	16.24%
	IIIB	12.42%	13.95%	14.40%	14.43%	14.45%
	IV	10.30%	11.33%	11.79%	11.84%	11.86%
	V	3.21%	3.50%	3.64%	3.67%	3.69%

Education	AFQT Category	Observed	Model 1	Model 2	Model 3	Model 4
Non-HS Grad	I	4.84%	4.60%	5.00%	4.92%	4.97%
	II	17.58%	17.27%	17.97%	17.86%	17.99%
	IIIA	11.41%	11.46%	11.59%	11.58%	11.66%
	IIIB	17.32%	17.50%	17.38%	17.47%	17.51%
	IV	31.80%	32.14%	31.48%	31.61%	31.54%
	V	17.05%	17.04%	16.58%	16.56%	16.32%
GED	I	4.86%	4.04%	4.35%	4.27%	4.31%
	II	24.74%	22.66%	23.28%	23.04%	23.17%
	IIIA	18.49%	18.35%	18.39%	18.30%	18.36%
	IIIB	22.75%	23.40%	23.12%	23.19%	23.19%
	IV	22.16%	23.81%	23.30%	23.49%	23.34%
	V	7.01%	7.74%	7.58%	7.71%	7.63%
HS Grad	I	8.39%	8.13%	8.05%	8.04%	8.04%
	II	27.25%	27.99%	27.89%	27.85%	27.85%
	IIIA	14.56%	15.01%	15.03%	15.01%	14.99%
	IIIB	17.43%	17.79%	17.87%	17.87%	17.87%
	IV	21.90%	21.43%	21.51%	21.54%	21.55%
	V	10.47%	9.64%	9.66%	9.69%	9.70%
College Grad	I	43.18%	31.03%	28.10%	28.34%	28.28%
	II	40.84%	45.55%	46.17%	46.11%	46.14%
	IIIA	7.47%	10.37%	11.14%	11.05%	11.06%
	IIIB	4.17%	6.60%	7.34%	7.28%	7.29%
	IV	3.21%	4.82%	5.41%	5.38%	5.39%
	V	1.13%	1.63%	1.83%	1.83%	1.84%

Income Quartiles AFQT Estimates

Table 25 below summarizes estimated marginal means predictions from the four models by median income, showing AFQT distributions in the validation sample for each income quartile (based on computed predicted probabilities for each applicant based on the applicant's ZIP code and income data from ACS). ZIP codes were ordered on the basis of median family income and grouped into four quartiles, such that quartile 4 represents the bottom 25% ZIP codes by median family income and the last quartile represents the lowest income ZIP codes (e.g., the top 25% of ZIP codes by median family income).

By comparison to the race/ethnicity model in particular, the discrepancy between observed and estimated marginal means tended to decrease with the introduction of more ZIP code-level predictors. There is a noteworthy increase in alignment moving from Model 1 to Model 2. Model 1 appeared to overestimate higher AFQT Category representation of lower income ZIP codes and underestimate higher AFQT Category representation in higher income ZIP codes.

As a whole, Model 4 appeared to produce the values that were least discrepant with the observed values for AFQT Categories by income quartile.

Table 25. Population Frequencies and Predicted Probabilities by Income Quartile

Income Quartile	AFQT Category	Observed	Model 1	Model 2	Model 3	Model 4
Quartile 4 (0%–25%)	I	3.83%	5.82%	4.05%	4.00%	3.98%
	II	18.10%	22.67%	18.29%	18.22%	18.21%
	IIIA	13.68%	14.59%	13.58%	13.60%	13.61%
	IIIB	20.47%	19.45%	20.34%	20.39%	20.39%
	IV	28.15%	24.42%	28.01%	28.07%	28.08%
	V	15.78%	13.04%	15.72%	15.74%	15.72%
Quartile 3 (> 25%–50%)	I	6.18%	7.62%	6.11%	6.13%	6.13%
	II	26.21%	27.85%	26.02%	26.14%	26.16%
	IIIA	16.05%	15.76%	16.12%	16.18%	16.20%
	IIIB	20.30%	19.00%	20.32%	20.33%	20.32%
	IV	21.82%	20.56%	21.95%	21.85%	21.81%
	V	9.44%	9.20%	9.48%	9.38%	9.39%
Quartile 2 (> 50%–75%)	I	8.16%	8.31%	7.95%	8.00%	8.01%
	II	30.06%	29.11%	30.03%	30.04%	30.04%
	IIIA	16.46%	15.94%	16.60%	16.54%	16.51%
	IIIB	18.84%	18.73%	18.98%	18.94%	18.95%
	IV	18.86%	19.59%	18.88%	18.88%	18.88%
	V	7.62%	8.32%	7.57%	7.60%	7.61%
Quartile 1 (> 75%)	I	13.01%	9.55%	13.09%	13.07%	13.07%
	II	35.21%	30.25%	35.25%	35.19%	35.18%
	IIIA	15.98%	15.95%	15.87%	15.85%	15.85%
	IIIB	15.76%	18.12%	15.71%	15.70%	15.69%
	IV	14.58%	18.59%	14.57%	14.62%	14.63%
	V	5.47%	7.54%	5.52%	5.57%	5.58%

When considering the results from Models 1 to 4 as well as the results of the estimated marginal means based on these models, we believe that Model 4 is likely the model best suited for the purpose for which it is intended. Because Model 4 both fit to the data best and, in addition, appears to best reproduce variation in geography-oriented differences in AFQT Categories as is observed in Table 25, we believe that Model 4 is best suited for providing ZIP code-level estimates and it was selected as the model with which to proceed to AFQT Category ZIP code-level estimates. Full results for each model can be found in Appendix C.

NATIONAL ESTIMATES BY DEMOGRAPHIC

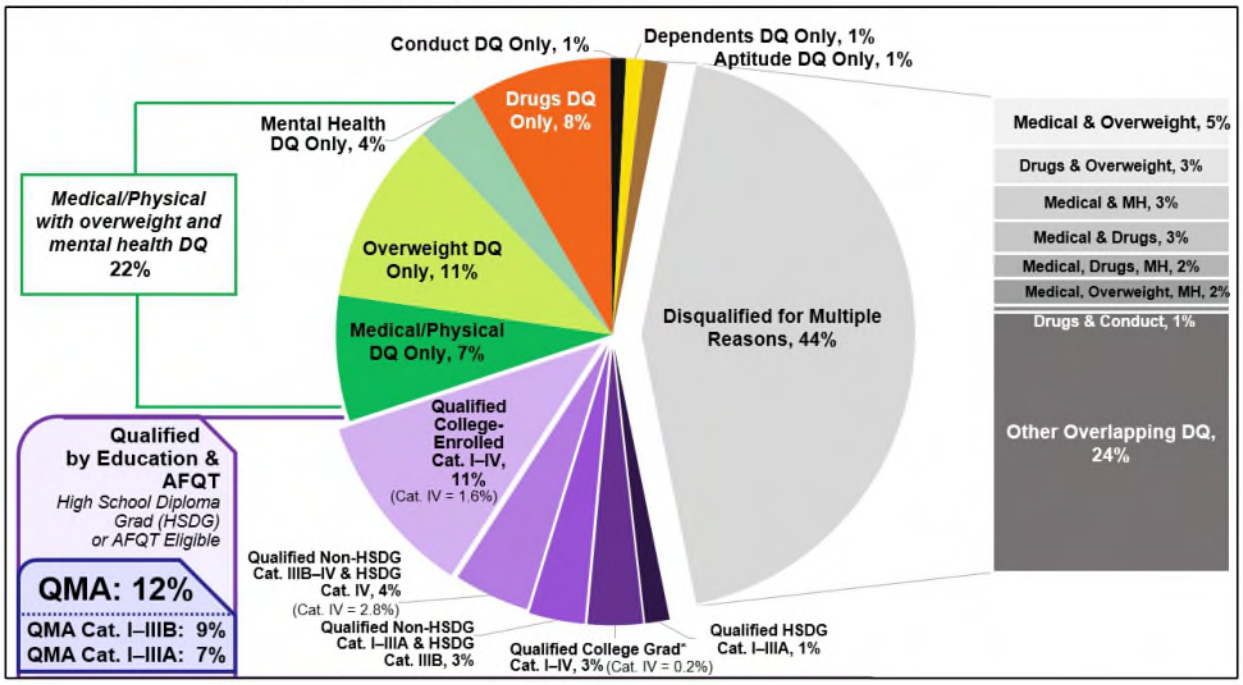
Table 26. Percentage Qualified by Gender, Race/Ethnicity, and Education

Gender	Race/Ethnicity	Education								Total
		HD	HE	HS	GG	HG	CE	AA	CG	
Total	**Total**	8.5%	28.8%	29.2%	19.0%	14.8%	28.9%	19.2%	30.6%	23.2%
Total	White, Non-Hispanic	10.1%	31.7%	30.6%	20.5%	16.2%	28.9%	19.8%	30.1%	24.7%
	Black, Non-Hispanic	7.2%	24.9%	26.2%	16.0%	12.2%	26.3%	16.9%	27.7%	19.2%
	Asian, Non-Hispanic	14.5%	40.3%	39.9%	29.1%	24.1%	38.5%	29.6%	40.7%	34.6%
	Other, Non-Hispanic	6.5%	24.6%	20.8%	13.7%	10.8%	22.9%	13.3%	25.8%	13.6%
	Hispanic	6.7%	24.2%	25.7%	16.8%	12.6%	26.5%	17.2%	27.9%	19.0%
Male	White, Non-Hispanic	9.5%	31.7%	32.0%	21.3%	16.4%	31.9%	22.3%	33.7%	25.0%
	Black, Non-Hispanic	11.6%	35.1%	33.6%	22.7%	18.0%	32.1%	23.3%	33.4%	27.1%
	Asian, Non-Hispanic	7.9%	27.0%	28.1%	17.7%	13.4%	28.3%	19.2%	30.1%	20.1%
	Other, Non-Hispanic	15.6%	42.9%	42.2%	30.4%	25.9%	41.1%	31.6%	43.2%	36.7%
	Hispanic	7.4%	26.3%	26.0%	16.3%	12.2%	24.7%	16.7%	26.2%	14.2%
	Total	7.5%	26.4%	27.9%	18.9%	13.7%	29.4%	19.7%	30.5%	20.2%
Female	White, Non-Hispanic	7.3%	25.1%	26.3%	15.9%	12.9%	26.4%	17.0%	28.1%	21.3%
	Black, Non-Hispanic	8.3%	27.3%	27.2%	17.0%	13.9%	26.0%	17.2%	27.4%	22.4%
	Asian, Non-Hispanic	6.4%	22.2%	24.0%	13.9%	10.8%	24.7%	15.6%	26.3%	18.3%
	Other, Non-Hispanic	13.4%	36.4%	37.3%	25.2%	21.8%	36.2%	27.7%	38.7%	32.6%
	Hispanic	5.0%	20.2%	20.4%	11.5%	9.6%	21.2%	12.6%	21.6%	12.9%
	Total	5.7%	21.6%	23.4%	14.7%	11.1%	24.3%	15.5%	25.8%	17.8%

NATIONAL RESULTS: PIE CHART AND TRENDS

Figure 1 includes the percentages for only one disqualifier and for multiple disqualifiers, reporting medical/physical, overweight, and mental health, as separate disqualifiers.

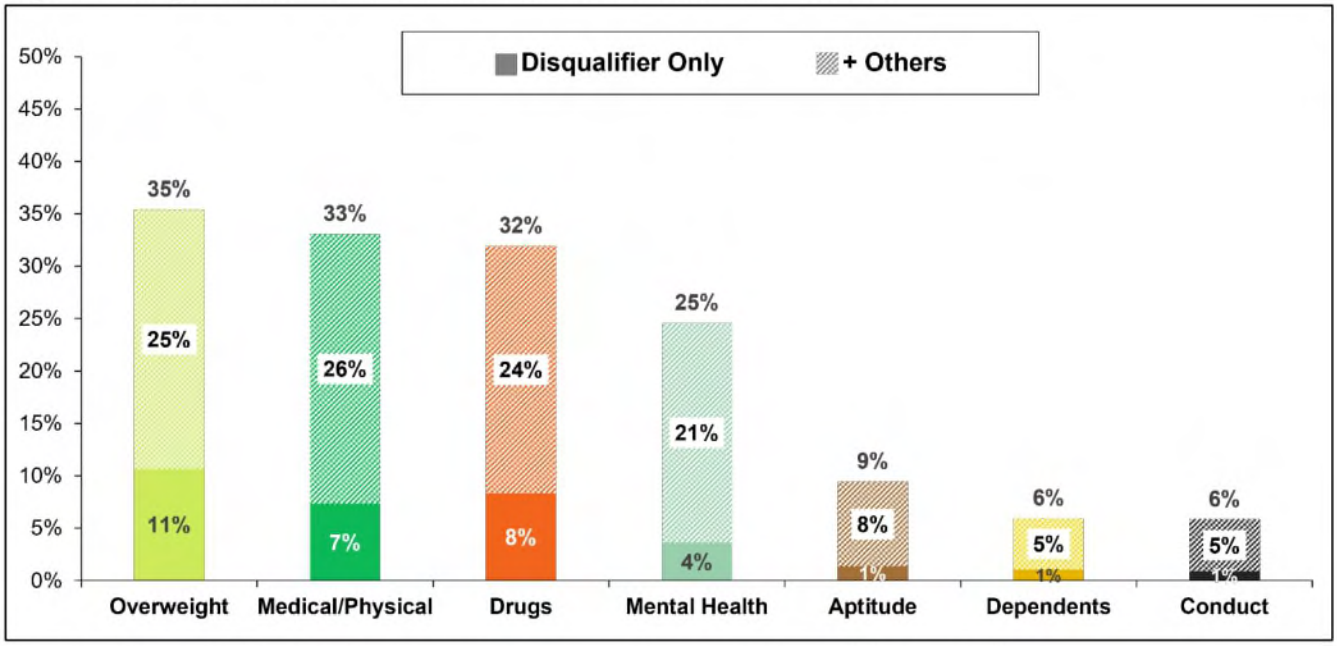
Figure 1. National Eligibility, QMA, and Disqualifier Rates



Combining overweight and mental health into the medical/physical disqualifier produces a combined estimate of 22% disqualified for medical/physical only (vs. mental health and overweight separate as single disqualifying reasons, which produces an estimate of 7% disqualified for medical/physical only). Ineligibility due to multiple reasons is the predominant disqualifier, with nearly half of all youth being ineligible due to multiple reasons; the top seven combinations of multiple disqualifying reasons and the remaining multiple disqualifiers are displayed. The most common combinations of disqualifiers are various combinations of medical/physical, overweight, drug, and mental health reasons. Figure 1 also estimates eligibility by education status and AFQT category to determine military availability (i.e., to estimate, the percentage of youth who are both eligible and available). Nearly half of eligible youth are currently enrolled in college and, as such, only 12% of the overall youth population is estimated to be qualified and available for military service (i.e., QMA). Additionally, only 9% of the youth population is estimated to be eligible, available, and score above the 30th percentile on the AFQT (i.e., Cat I–IIIB), and just 7% are High-Quality QMA (HQ QMA; i.e., eligible, available, and score above the 50th percentile on the AFQT, or Cat. I–IIIA).

Figure 2 below shows the unique and combined disqualification rates for each of the seven disqualifying reasons. Overweight and medical/physical disqualifiers were the most prevalent reasons for disqualification—more than one-third of youth are ineligible due to being overweight in total; however, only 11% of youth are only ineligible for this reason, and most overweight youth are also ineligible due to other reasons.

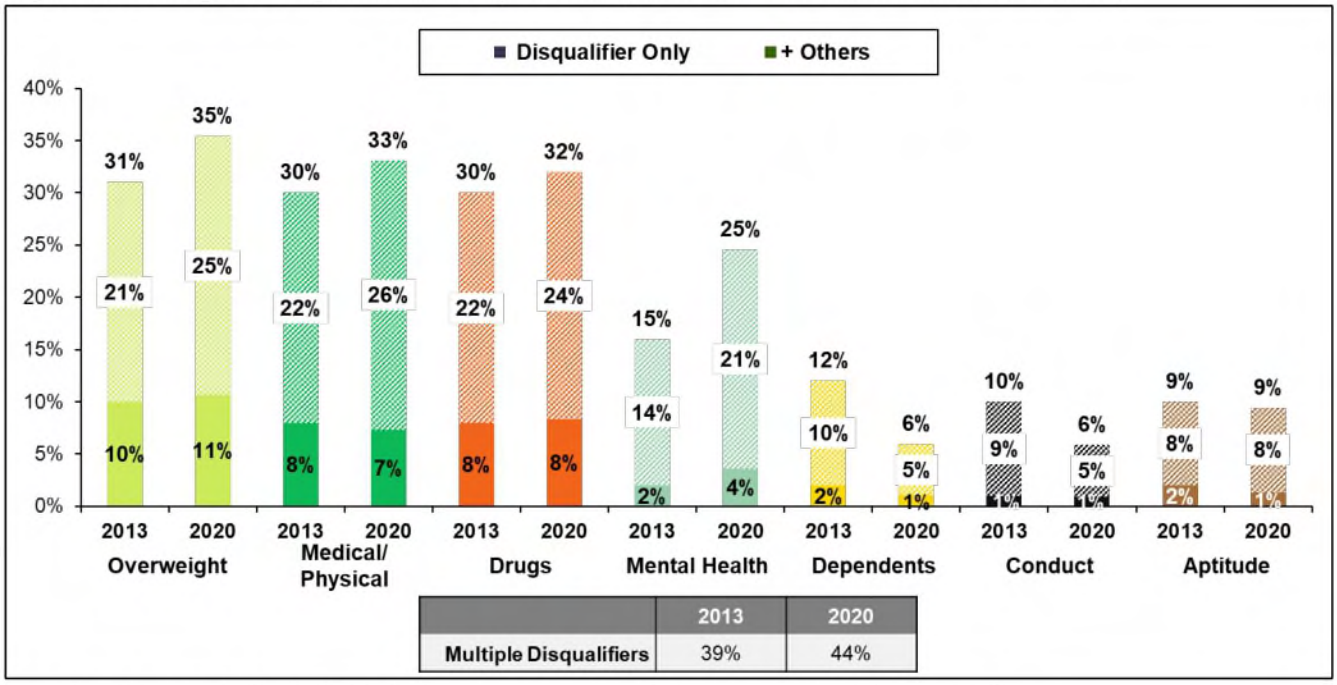
Figure 2. Single Reason Alone and in Combination with Other Reasons



Note: Youth ages 17–24. Individual category percentages may not sum to total due to rounding.

Comparing the results obtained from the 2013 model to those obtained with the 2020 model reveals an increase in the percentage of youth ineligible for multiple reasons, from 39% in 2013 to 44% in 2020. Full disqualification trends are presented below in Figure 3.

Figure 3. Change in Disqualifications by Reason (Alone and in Combination with Others)



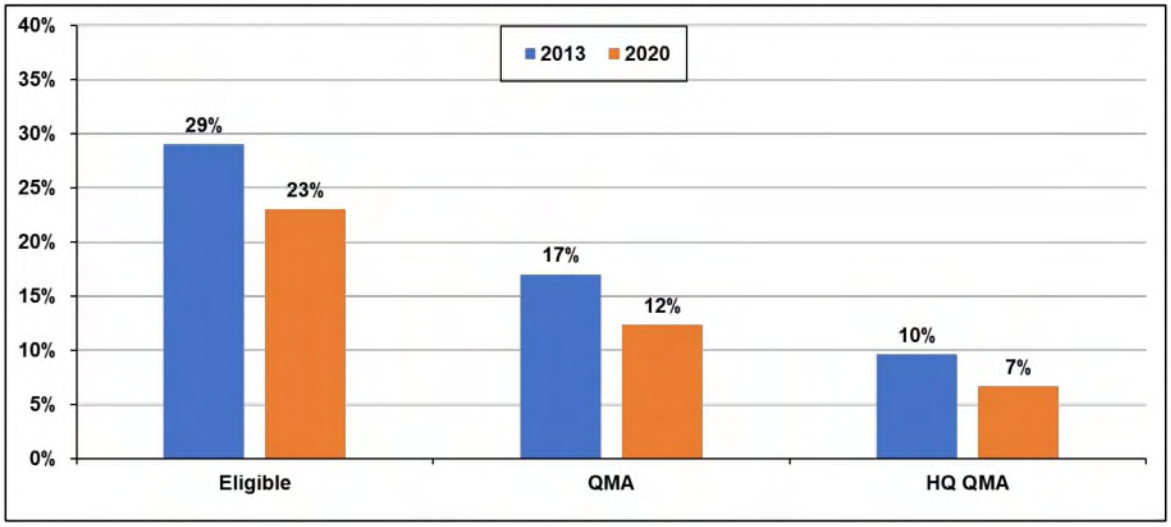
	2013	2020
Multiple Disqualifiers	39%	44%

Note: Youth ages 17–24. Individual category percentages may not sum to total due to rounding.

Trending the results also highlights several disqualifiers that increased in prevalence between the two studies when accounting for overlap between disqualifiers (e.g., the combined prevalence for overweight

disqualification includes those disqualified for other reasons in addition to being overweight). Specifically, combined overweight, medical/physical, drugs, and mental health disqualifiers all increased between 2013 and 2020. Of these disqualifiers, mental health disqualification increased the most; however, the percentage of youth disqualified for mental health alone increased but remained relatively low at 4% in 2020 (compared to 2% in 2013), which highlights the increased overlap in disqualification reasons observed in 2020 and that policy changes to a single eligibility criterion are unlikely to meaningfully impact overall eligibility rates. Together, changes in underlying disqualifier rates resulted in declines in overall youth eligibility (from 29% to 23%), QMA (from 17% to 12%) and HQ QMA (from 10% to 7%) between 2013 and 2020. These changes are depicted below in Figure 4.

Figure 4. Overall Changes in Eligibility, QMA, and HQ QMA 2013 to 2020



SUMMARY AND CONCLUSIONS

This report detailed the methodology and approach taken for the 2020 QMA model. This model was created with the objective of (1) replicating the data sources, variables, and analytic decisions made in 2013 to allow for comparable estimates to be created, (2) estimating the overlap between disqualification categories, and (3) estimating the geographic distribution of eligibility and disqualifying factors across ZIP codes. The 2020 QMA study found that 23% of youth are eligible to enlist without a waiver. Although meaningful overlap exists between disqualifiers, medical/physical and overweight factors are the most common reasons for disqualification. Given the substantial overlap in sources and methodology used in 2013 and 2020, the results obtained in 2020 can be compared to those obtained in 2013. As such, this study demonstrated that national eligibility for military service has decreased between 2013 and 2020 from 29% to 23%. This decline in overall eligibility can be attributed to increases in disqualifying rates due to being overweight, medical/physical disqualifiers, and mental health; of these factors, mental health saw the largest change between 2013 and 2020. Together, these factors provide DoD with greater insight into today's recruiting market and the factors underlying youth eligibility to enlist in the Military.

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APPENDICES

APPENDIX A. COMPARISON OF 2020 AND 2013 QMA STUDIES

The goal of the 2020 QMA study was to update QMA with the most recent data while replicating the methodology of the previous 2013 study as closely as possible so that estimates could be compared. In this section, we outline key points of note in comparing the 2013 QMA study estimates with the updated 2020 QMA study estimates as well as key decision points relevant to replication.

NHANES Data

Medical/Physical

There were changes to some of the variables used to capture medical/physical conditions in NHANES from 2013 to 2020; however, for 12 of the 17 conditions, underlying NHANES variables were unchanged and available for 2020. Five disqualifying conditions had underlying variables that changed since 2013, or variables that were no longer available in 2020. Modifications to variables were found to be minor and inconsequential to the disqualifier estimates and for variables no longer available, proxy variables were identified. These limited modifications to the set of NHANES variables were not observed as having a significant impact on disqualification such to have a meaningful impact on comparability of the 2020 estimates to those from 2013.

The table below compares the conditions used in 2013 to 2020. Data that were no longer available or had changed in the way the disqualifier was assessed are indicated by ^ next to the disqualifier.

Table A-1. Medical/Physical Disqualifier Comparison

QMA 2013: NHANES 2007–2010	QMA 2020: NHANES 2015–2018
Anemia	Anemia [DoDI 6130.03 22 (a), Interview]
Asthma^	Asthma [DoDI 6130.03 10 (e), Interview]
Cancer	Cancer [DoDI 6130.03 29, Interview]
Diabetes	Diabetes [DoDI 6130.03 24 (b), Exam & Interview]
Diseases^	Diseases [DoDI 6130.03 12 (d), 13 (m), 14 (i), 23 (b), Exam & Interview]
Emphysema and Chronic Bronchitis	Respiratory Diseases [DoDI 6130.03 10, Interview]
Hearing^	Hearing [DoDI 6130.03 6, Exam & Interview]
Heart Conditions	Heart Conditions [DoDI 6130.03 11, Interview]
Height	Height [DoDI 1308.3 E2, Exam]
Hypertension	Hypertension [DoDI 6130.03 20 (b), Exam]
Physical Limitations	Physical Limitations [DoDI 6130.03 16, 17, 18, Interview]
Oral Health	Oral Health [DoDI 6130.03 8, Exam]
Overweight*	Overweight [DoDI 1308.3 E2, Exam]*
Stroke	Stroke [DoDI 6130.03 26 (a), Interview]
Tuberculosis and Collapsed Lung^	Discontinued in NHANES
Underweight	Underweight [DoDI 1308.3 E2, Exam]
Vision^	Vision [DoDI 6130.03 4 (a) (c), Interview]

*In prior QMA studies, Overweight has been separated from other medical/physical disqualifiers due to the high percentage of the youth population estimated to be overweight by DoD Standards in DoDI 1308.3 Section 6.2. In 2020, Overweight was also be considered a standalone disqualifying condition.

Details on how these particular variables have changed since 2013 are described below:

- In 2013, the prevalence of asthma was measured using an NHANES spirometry exam variable that measures lung volume and air flow rates (SPDBRONC: Selected for Bronchodilator; Best test: first Forceful Exhalation Volume [FEV1]/Complete Forced Expiration [FVC]- a ratio below the lower limit of normal and/or less than 70% were disqualified). This exam was last captured in NHANES 2011–2012. Although this measure was no longer available in NHANES 2015–2018, several interview questions were identified as potential proxies (i.e., ever been told you have asthma, age told you have asthma, still have asthma, and prescription medication for asthma).
    - The NHANES variable MCQ035 "still have asthma" was chosen as the proxy variable for the 2020 model, as estimates of MCQ035 using 2013 data aligned most closely with the original SPDBRONC estimates, and the medical/physical disqualification estimate for 2013 using MCQ035 aligned most closely with the estimate reported in 2013.
- The Disease disqualifier is composed of three diseases (i.e., hepatitis B, C, and D; herpes simplex virus type 2; HIV). Since 2013, the NHANES variables for hepatitis C, herpes simplex virus type 2, and HIV were changed or removed and proxies were identified.
    - Hepatitis C: Since the 2013 QMA, NHANES changed the testing algorithm for the Hepatitis C antibody test, so the original variable used in 2013 (LBDHCV) was no longer available in 2020, but was replaced by LBDHCI, the Hepatitis C antibody test corresponding to the new testing procedures, which was used in the 2020 QMA. This change in measure did not significantly impact the prevalence estimate. Additional proxies were also added in 2020, disqualifying respondents who reported being told by a doctor or other medical professional that they have Hepatitis C (HEQ030=1) and been prescribed medication to treat Hepatitis C (HEQ040=1).
    - Herpes simplex virus type 2: The laboratory variable (LBXHE2) used to measure herpes simplex virus type 2 in 2013 was only available for one of the two waves of NHANES used in 2020 (2015–2016 NHANES). No proxies for herpes simplex virus type 2 were identified in the 2017–2018 NHANES. Therefore, herpes simplex virus type 2 was only measured in the 2015–2016 sample used to estimate 2020 QMA; however, this did not significantly impact prevalence rates for herpes simplex virus type 2 or the overall diseases disqualifier.
    - HIV: Since the 2013 QMA, NHANES has changed the way in which HIV is measured. NHANES 2007–2010 measured HIV using a single antibody test (LBDHI). Within NHANES 2015–2018, HIV is measured as both an initial antibody test as well as a follow-up confirmatory test (LBXHIVC and LBXHNAT). This change in measure did not significantly impact the prevalence estimate of HIV.
- Tuberculosis in the last year or history of a collapsed lung was flagged as a disqualifier in 2013, using SPQ060 and SPQ070B, which are no longer available in NHANES. No proxies were identified for collapsed lung and tuberculosis in 2020; however, rates reported in 2013 were negligible (<1%) and are a small part of the overall respiratory disqualifiers.
    - %, *N*'s, disqualified for respiratory with and without potential proxies
- The Hearing disqualifier is made up of two components (i.e., an audiometry component among youth ages 17–19, and a self-assessment of general hearing). Although both measures are available in NHANES 2015–2018, the audiometry component is only available for years 2015–2016. The limited availability of the measure is not expected to have a significant impact on prevalence estimates, as data are still available for two of the four years of data collection and it is only a minor component in overall disqualification. An interview question about general condition of hearing used in 2013, AUQ131 ("Which statement best describes {your/SP's} hearing (without hearing aid)? Would you say {your/his/her} hearing is good, that {you have/s/he has} a little trouble, a lot of trouble, or {are you/is

s/he} deaf?) with respondents indicated "moderate hearing trouble" or above were disqualified. The variable name in 2020 changed to AUQ054, but the question wording and responses are consistent with the exception of the values for "Refused" and "Don't Know" (which changed from 7 to 77 and 9 to 99, respectively).

- The vision disqualifier in 2013 used NHANES exam variables measuring visual acuity with objective refraction in each eye (VIDLOVA, VIDROVA). However, this exam measure is only available for 2007–2008. In 2020, a proxy variable, based on an interview question about blindness/serious difficulty seeing (DLQ020: "{Are you/Is SP} blind or {do you/does he/does she} have serious difficulty seeing even when wearing glasses?") was used instead. Respondents who responded "yes" were disqualified.

NSDUH Data

As in the 2013 model, mental health disqualification was represented by a combination of two variables available from the NSDUH. The first variable is a scale assessing serious psychological distress during the last year (i.e., symptoms meeting commonly accepted criterial for a mental, emotional, or behavioral disorder). Respondents were disqualified if they received a high (i.e., 13 or greater) score on this metric. A second variable was related to having received specialty mental health services related to a mental disorder.

As in the 2013 model, drug use disqualification was be represented by endorsing one or more of several questions available on the NSDUH. Respondents were disqualified if they reported using marijuana in the last 30 days, if they reported using any illicit drug in the last year, or if they reported abusing drugs (alcohol, marijuana, or other drugs). Our review has noted continuity in these measures between 2010 and 2018 survey years of the NSDUH.

Our review noted continuity in mental health and drug use measures between the 2010 and 2018 survey years of the NSDUH. Thus, the prevalence estimates of mental health disqualification in the 2020 model are comparable to the 2013 model estimates.

Youth Poll Data

Our goal in implementing the eligibility modeling was to align our approach as closely as is possible with the 2013-based approach in an effort to allow for examining trends in eligibility over time across the seven-year interval.

In order to ensure consistency with 2013, our team used three waves of Youth Poll data to obtain a sample size that was similar to that of 2013. Moreover, we used the same variables for disqualifiers that were reported on in the 2013 report.

The 2013 technical documentation did not provide enough information to completely replicate their approach and our team used our experience with the Youth Poll survey and analytic judgment to produce an approach that we believe would be a likely replication the 2013 approach. In the sections to follow we outline areas where full replication was not possible due to lack of documentation and a likely replication approach was applied.

Our team proceeded to code disqualifiers that were based on multiple questions (i.e., Medical/Physical, Conduct, Overweight) such that a disqualifying response on any question resulted in that respondent being

disqualified even if the respondent had a missing response on another question. A respondent was coded as being not disqualified only if they had a non-disqualifying response on all questions.

Our team also used a combination of two variables, EDU2_R and EDU3_Q, to classify respondents into education categories. Our team proceeded to use responses on EDU2_R, which indicated current enrollment in school, first. Hence, current enrollment was used as a superordinate classifier into educational categories. Thus, someone who was a GED graduate, but who was enrolled in college, was classified as college-enrolled as opposed to as a GED graduate. Among those who did not have a valid response on EDU2_R, we proceeded to classify respondents into educational categories based on responses to EDU3_Q, which indicated highest level of education completed.

Finally, our team proceeded to use the survey weights for all estimates obtained from the Youth Poll data.

MEPCOM Applicant Data

Our approach to replicating the coding of the MEPCOM applicant data followed a similar approach to that of the Youth Poll in that several details required to replicate the analysis fully were omitted and our team proceeded to use the most likely approach. We discuss such decision points below.

A key decision point in working with the MEPCOM applicant data is how to address repeated AFQT takers. We proceeded to retain only the first application's AFQT score for each applicant in the file.

The MEPCOM applicant data contain up to 29 different categories representing different education levels at the time of application. We proceeded to collapse the categories into the eight required for the W&P data using the approach discussed in the methodology section above. Most applicants fell into a clearly W&P-mappable category; however, a non-trivial number of applicants fell into more ambiguous W&P-mappable categories.

ACS Data

As applied to the ZIP code/ZCTA-level predictors added to the MVP and MNL models, our team used the ACS 5-year estimates at the ZCTA level from 2018, the most recent year available at the start of this project's work. For the MVP model, our team proceeded to use the U.S. Census Bureau's 2010 crosswalk linking ZCTAs to Core-Based Statistical Areas (CBSA) representing Metropolitan Statistical Areas (MSA) and Micropolitan Statistical Areas. In cases where there were multiple CBSA codes for a ZCTA, the ZCTA–CBSA code combination with the largest population proportion was used as the CBSA code for that ZCTA. For the applicant-based MNL model, which included Census Division and U.S. states, our team proceeded to use a U.S. Census Bureau's 2010 crosswalk linking ZCTAs to FIPS codes representing U.S. counties that could be linked to U.S. Census Divisions and states. In cases where there were multiple FIPS codes for a ZCTA, the ZCTA–FIPS code combination with the largest population proportion was used as the FIPS code for that ZCTA.

MVP/Eligibility Modeling

To replicate the MVP/Eligibility modeling using the Youth Poll data, our team used the same analysis software implementation as was reported in 2013. It is worth noting that we proceeded to use the survey weight from each wave of the Youth Poll as a probability weight in the analysis.

By and large the pattern of results discussed in 2013 held into 2020. Like in 2013, female youth in 2020 were more likely than male youth to be disqualified given medical/physical, dependents, overweight, and mental health criteria. By contrast, male youth were more likely than female youth to be disqualified given conduct, drug use, and aptitude criteria. Also similarly to 2013, older youth in 2020 were more likely than younger youth to be disqualified across all criteria. In 2020, this trend also appeared to subsume Medical/Physical disqualification as well by comparison to 2013. Furthermore, more educational attainment and pursuit was linked to reduced likelihood of disqualification for all disqualifiers. Finally, the pattern of racial and ethnic identification showed inconsistent findings with those identifying as non-Hispanic Asian tending to be disqualified less often than other groups.

In contrast to the 2013 study's results, the 2020 results only had two significant effects for ZIP code-level predictors, one of which reversed its direction from 2013 to 2020 (i.e., ZIP code in MSA predicting aptitude disqualification is negative in 2020, was positive in 2013). Thus, the utility of the ZIP code-level data was greatly reduced from 2013.

Another noteworthy difference from 2013 is that, generally, the effect sizes of both the model coefficients and between disqualifier correlations tended to be smaller. These smaller coefficients suggest that the disqualifiers would not "double count" as often as in 2013, which is part of the reason for the decrease in the rate of eligibility. The smaller coefficients also indicate that the ZIP code-level predictions may not be as variable overall as they were in 2013. That is, we expect there to be more homogeneity across ZIP codes in eligibility scores for 2020 than was observed in 2013.

We also used the MEPCOM applicant data to produce a more conceptually appropriate replacement for the YP-based probit equation focusing on aptitude disqualification. As in 2013, Model 4 was selected and we proceeded to use the PAY97-weighted probit model represented by Model 4 as the YP aptitude disqualifier equation replacement. Most coefficients for Model 4 were similar to those obtained in 2013 with the notable exception of the likelihood of aptitude disqualification for male youth versus female youth. The 2013 reports relatively small differences across male and female youth on aptitude disqualification. By contrast, the current analysis shows that male youth are less likely than female youth to be disqualified for aptitude criteria.

In translating the MVP/eligibility model into demographic category-by-ZIP code estimates using the W&P data, the initial population-weighted national estimates out of the model did not align with the expected disqualifier rates obtained in the data (i.e., Table 21). We then poststratified the estimates such that the model-implied *Z*-score demographic category-by-ZIP code estimate multiplied by the ratio of the known disqualifier rate translated into a *Z*-score over the current population-weighted, model-implied *Z*-score average. This adjustment ensured that the population-weighted, model-implied *Z*-score average for each disqualifier matched the expected, known values.

The adjustment to known values using the model-implied *Z*-scores produced disqualifier rates that, in some cases, strongly restricted or enhanced their variance across all demographic category-by-ZIP code observations. In order to ensure that each demographic category-by-ZIP code observation did not result in needlessly restricted or enhanced variance, the adjusted model-implied *Z*-scores were adjusted a second time to re-/de-allocate the amount of variability that was implied by the original model. Specifically, all adjusted model-implied *Z*-scores were centered (i.e., adjusted such that their mean was 0), multiplied by the ratio of their original population-weighted standard deviation prior to adjustment over the current population-weighted standard deviation, and then their mean was added back to all the scores. This adjustment ensured that the rates,

by demographic category-ZIP code observation, showed an amount of variation that was implied by the original model predictions.

The variance-adjustment described above affected the final rate estimates such that they no longer aligned with their known values. As such, a final adjustment was applied such that the demographic category-by-ZIP code estimate multiplied by the ratio of the known disqualifier rate over the current population-weighted average. This final adjustment ensured that the population-weighted average for each disqualifier matched the expected, known values.

Following the prediction of eligibility and all seven disqualifier-only probability estimates for each demographic category-by-ZIP code observation, all estimated rates were adjusted such that their population-weighted averages matched their known national totals.

MNL/AFQT Category Modeling

Like the MVP model, to replicate the MNL/AFQT category modeling using the MEPCOM applicant data, our team used the same analysis software implementation as was reported in 2013. The 2013 reports used a training/estimation and test/validation sample, which our team did as well. We split the data 50/50 stratified by AFQT category to obtain both samples.

The MNL modeling in 2020 resulted in similar findings as in the 2013 report. Like in 2013, Model 4 in 2020 was again found to fit the data best and was used for estimating AFQT Categories at the ZIP code level. Thus, adding the ZIP code-level predictors and state indicators provided a useful increment to prediction of AFQT categories. In Model 4, the effects obtained for respondent gender (with the notable exception of Cat V), age, and race/ethnicity tended to be relatively stable across 2013 to 2020. Whereas we would expect the effects for race/ethnicity to be similar across years due to the use of the PAY97 weights, the similarity across years for the other factors suggests few fundamental changes in eligibility and applicant quality among these demographic groups.

In contrast to 2013, the patterns of coefficients in Model 4 observed in 2020 did not always mirror those observed in 2013. In particular, the state-level effects were quite unstable in many cases changing sign and magnitude across years suggesting some substantial shifts in relative rank order of state-level AFQT category representation across years. Education groups' predicted category membership also shifted somewhat from 2013. For example, HS-Enrolled and HS Seniors' scores have shifted more toward Cat II compared to Cat I. One final noteworthy change is the magnitude of the male Cat V estimate for Model 4.

In translating the AFQT/MNL model into demographic category-by-ZIP code estimates using the W&P data, the initial population-weighted national estimates out of the model did not align with the expected AFQT category proportions obtained in the data (i.e., Table 19). We then poststratified the estimates such that each demographic category-by-ZIP code estimate multiplied by the ratio of the known AFQT category proportion value from the MEPCOM applicant data over the current population-weighted average. This adjustment ensured that the population-weighted average for each AFQT Category proportion matched the expected, known values.

The adjustment to known totals produced AFQT Category estimates, across all six estimated categories, that resulted in not summing to 1 within a demographic category-by-ZIP code and thus failed to be a true set of proportions. In order to ensure that each demographic category-by-ZIP code observation summed to 1, each

AFQT Category within each observation was multiplied by the inverse of the sum of the AFQT Categories for that demographic category-by-ZIP code observation. This adjustment ensured that the categories were exhaustive (i.e., covered the entire probability) by observation.

Because the sequence of adjustments did not conform with one another by way of their goals, the adjustments were repeated multiple times to produce a better balance between both. The process of adjusting to known national AFQT Category proportions, then adjusting AFQT Category proportions to sum to 1 within demographic category-by-ZIP code, was repeated a total of 10 times to optimize the adjustments and produce final AFQT Category estimates for each demographic category-by-ZIP code observation in the W&P data that both matched the expected national proportions and summed to 1 by demographic category-by-ZIP code observation.

A final adjustment applied to the AFQT Category proportions was to ensure that the Category V estimate matched that of the Aptitude Disqualification rate across all ZIP code-by-demographic categories. To do so, the Category V estimate was changed to be identical to the Aptitude Disqualification rate. Following the adjustment to the Category V rate, each of the other five AFQT Categories were adjusted to ensure that the categories summed to 1 by demographic category-by-ZIP code observation.

APPENDIX B. INELIGIBILITY ESTIMATES FOR MEDICAL/PHYSICAL, OVERWEIGHT, MENTAL HEALTH, DRUGS, CONDUCT, AND DEPENDENTS BY GENDER, RACE/ETHNICITY, AND EDUCATION

Table B-1. Percentage of Youth Ages 17–24 Disqualified from Military Service for Medical/Physical by Education

Condition	Education			Total
	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	
Anemia	3.5%	4.3%	3.4%	3.8%
Asthma	10.5%	13.1%	10.4%	11.3%
Cancer	0.0%	0.7%	1.0%	0.7%
Diabetes	3.9%	3.2%	4.5%	3.9%
Diseases	0.9%	2.1%	2.0%	1.8%
Hearing	1.9%	1.8%	1.7%	1.8%
Heart Conditions	0.0%	0.3%	0.5%	0.3%
Height	2.1%	0.4%	0.6%	0.9%
Hypertension	1.4%	1.6%	2.0%	1.7%
Physical Limitations	7.2%	5.1%	5.3%	5.7%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.5%	0.2%	0.6%	0.5%
Stroke	0.3%	0.1%	0.1%	0.1%
Underweight	9.7%	5.8%	8.0%	7.7%
Vision	3.0%	4.8%	2.1%	3.2%
Medical/Physical	34.3%	32.2%	33.0%	33.1%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-2. Percentage of White, Non-Hispanic Male Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	0.0%	0.0%	0.0%	0.0%
Asthma	3.1%	9.9%	9.2%	8.2%
Cancer	0.0%	1.8%	0.7%	1.0%
Diabetes	5.9%	1.4%	3.4%	3.1%
Diseases	0.0%	1.0%	0.0%	0.4%
Hearing	0.0%	2.0%	0.0%	0.8%
Heart Conditions	0.0%	0.0%	0.7%	0.3%
Height	0.0%	0.0%	0.0%	0.0%
Hypertension	0.0%	0.8%	2.3%	1.3%
Physical Limitations	6.0%	4.8%	8.3%	6.5%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	0.0%	0.7%	0.3%
Stroke	0.0%	0.0%	0.0%	0.0%
Underweight	8.6%	7.8%	6.0%	7.2%
Vision	1.5%	0.0%	0.7%	0.6%
Medical/Physical	20.8%	27.3%	26.5%	25.6%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-3. Percentage of Black, Non-Hispanic Male Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	0.0%	0.0%	0.0%	0.0%
Asthma	16.7%	3.5%	13.6%	11.6%
Cancer	0.0%	0.0%	0.0%	0.0%
Diabetes	3.4%	13.2%	13.5%	9.9%
Diseases	1.6%	11.1%	3.4%	5.1%
Hearing	0.0%	0.0%	3.9%	1.3%
Heart Conditions	0.0%	0.0%	1.2%	0.4%
Height	0.0%	0.0%	0.0%	0.0%
Hypertension	4.5%	2.0%	3.1%	3.3%
Physical Limitations	8.1%	5.3%	0.9%	4.7%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	0.0%	1.8%	0.6%
Stroke	0.0%	0.0%	1.2%	0.4%
Underweight	12.6%	2.9%	7.7%	8.0%
Vision	2.1%	2.9%	0.0%	1.6%
Medical/Physical	40.1%	33.6%	41.8%	38.7%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-4. Percentage of Asian, Non-Hispanic Male Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	0.0%	0.0%	1.2%	0.7%
Asthma	13.8%	22.2%	9.6%	13.5%
Cancer	0.0%	0.0%	0.0%	0.0%
Diabetes	5.1%	0.0%	5.8%	4.3%
Diseases	0.0%	0.0%	2.3%	1.3%
Hearing	0.0%	0.0%	1.9%	1.0%
Heart Conditions	0.0%	0.0%	0.0%	0.0%
Height	0.0%	0.0%	0.0%	0.0%
Hypertension	0.0%	11.5%	4.6%	5.2%
Physical Limitations	4.1%	0.0%	1.9%	2.0%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	0.0%	0.0%	0.0%
Stroke	0.0%	0.0%	0.0%	0.0%
Underweight	11.0%	3.0%	1.0%	3.8%
Vision	4.1%	0.0%	1.3%	1.7%
Medical/Physical	31.0%	33.8%	26.2%	29.1%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-5. Percentage of Other, Non-Hispanic Male Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	0.0%	0.0%	0.0%	0.0%
Asthma	1.4%	19.1%	0.0%	6.4%
Cancer	0.0%	0.0%	6.0%	1.7%
Diabetes	0.0%	0.0%	0.0%	0.0%
Diseases	0.0%	0.0%	0.0%	0.0%
Hearing	0.0%	3.0%	0.0%	0.9%
Heart Conditions	0.0%	0.0%	0.0%	0.0%
Height	0.0%	0.0%	0.0%	0.0%
Hypertension	3.2%	0.0%	16.6%	6.0%
Physical Limitations	0.0%	5.3%	0.0%	1.6%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	0.0%	0.0%	0.0%
Stroke	0.0%	0.0%	0.0%	0.0%
Underweight	31.5%	0.0%	25.3%	20.1%
Vision	0.0%	0.0%	0.0%	0.0%
Medical/Physical	36.0%	19.1%	47.9%	34.2%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-6. Percentage of Hispanic Male Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	0.0%	0.0%	0.0%	0.0%
Asthma	7.3%	2.4%	6.4%	5.2%
Cancer	0.0%	0.0%	1.4%	0.4%
Diabetes	3.1%	2.7%	3.4%	3.0%
Diseases	0.0%	0.0%	0.0%	0.0%
Hearing	5.6%	0.8%	0.9%	2.3%
Heart Conditions	0.0%	1.5%	0.0%	0.5%
Height	2.2%	0.0%	0.0%	0.7%
Hypertension	4.0%	3.4%	6.5%	4.6%
Physical Limitations	9.2%	4.1%	0.0%	4.4%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	1.5%	0.0%	0.5%
Stroke	2.5%	0.0%	0.0%	0.8%
Underweight	5.1%	2.7%	8.8%	5.4%
Vision	4.9%	5.3%	4.3%	4.9%
Medical/Physical	30.8%	20.6%	28.2%	26.1%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-7. Percentage of White, Non-Hispanic Female Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	8.3%	10.3%	4.9%	7.2%
Asthma	20.7%	20.3%	11.2%	15.9%
Cancer	0.0%	0.0%	0.7%	0.4%
Diabetes	0.9%	1.1%	2.6%	1.8%
Diseases	0.0%	1.4%	1.6%	1.2%
Hearing	4.2%	2.7%	1.9%	2.6%
Heart Conditions	0.0%	0.2%	0.7%	0.4%
Height	2.2%	0.0%	0.9%	0.9%
Hypertension	0.0%	1.0%	0.7%	0.6%
Physical Limitations	8.4%	7.0%	4.6%	6.2%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	2.2%	0.0%	0.0%	0.5%
Stroke	0.0%	0.2%	0.0%	0.1%
Underweight	14.9%	8.7%	9.9%	10.7%
Vision	1.8%	10.2%	1.1%	3.9%
Medical/Physical	46.9%	38.0%	31.6%	36.8%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-8. Percentage of Black, Non-Hispanic Female Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	11.2%	16.9%	14.4%	14.6%
Asthma	12.2%	21.4%	25.6%	21.2%
Cancer	0.0%	0.0%	0.0%	0.0%
Diabetes	8.6%	6.8%	3.6%	5.8%
Diseases	6.2%	6.1%	11.3%	8.4%
Hearing	1.5%	3.3%	4.2%	3.3%
Heart Conditions	0.0%	0.0%	0.0%	0.0%
Height	1.8%	0.0%	1.2%	0.9%
Hypertension	3.0%	1.9%	0.0%	1.3%
Physical Limitations	9.5%	4.6%	10.0%	8.0%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	0.0%	3.7%	1.6%
Stroke	0.0%	0.0%	0.0%	0.0%
Underweight	6.1%	0.0%	7.5%	4.6%
Vision	5.9%	9.7%	7.8%	8.1%
Medical/Physical	42.7%	48.1%	53.9%	49.4%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-9. Percentage of Asian, Non-Hispanic Female Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	12.6%	3.5%	4.8%	6.1%
Asthma	0.0%	20.6%	2.3%	6.7%
Cancer	0.0%	0.0%	0.0%	0.0%
Diabetes	0.0%	11.5%	7.5%	7.0%
Diseases	0.0%	8.2%	3.8%	4.2%
Hearing	0.0%	0.0%	2.9%	1.5%
Heart Conditions	0.0%	0.0%	0.0%	0.0%
Height	0.0%	0.0%	2.2%	1.1%
Hypertension	0.0%	0.0%	0.0%	0.0%
Physical Limitations	0.0%	12.7%	4.1%	5.6%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	0.0%	0.0%	0.0%
Stroke	0.0%	0.0%	0.0%	0.0%
Underweight	9.4%	14.9%	8.6%	10.4%
Vision	0.0%	0.0%	8.5%	4.4%
Medical/Physical	21.9%	51.5%	31.2%	34.6%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-10. Percentage of Other, Non-Hispanic Female Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	0.0%	16.1%	3.7%	4.3%
Asthma	9.4%	29.0%	0.0%	8.6%
Cancer	0.0%	0.0%	12.7%	5.5%
Diabetes	0.0%	10.9%	24.0%	12.3%
Diseases	0.0%	0.0%	4.4%	1.9%
Hearing	0.0%	0.0%	0.0%	0.0%
Heart Conditions	0.0%	0.0%	0.0%	0.0%
Height	0.0%	0.0%	1.2%	0.5%
Hypertension	2.9%	0.0%	0.0%	1.2%
Physical Limitations	13.4%	6.8%	4.0%	8.2%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	0.0%	0.0%	0.0%
Stroke	0.0%	0.0%	0.0%	0.0%
Underweight	0.0%	3.0%	10.4%	5.0%
Vision	10.6%	1.8%	1.8%	5.3%
Medical/Physical	28.1%	45.3%	52.8%	41.7%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-11. Percentage of Hispanic Female Youth Disqualified from Military Service for Medical/Physical by Education

Condition	Less than HS Graduate	HS Graduate (includes GED)	Greater than HS Graduate	Total
Anemia	4.9%	3.7%	6.0%	4.9%
Asthma	6.1%	13.7%	9.5%	9.8%
Cancer	0.0%	1.6%	0.0%	0.5%
Diabetes	7.7%	3.4%	3.2%	4.7%
Diseases	2.5%	2.1%	2.0%	2.2%
Hearing	0.7%	0.7%	3.9%	1.9%
Heart Conditions	0.0%	0.0%	0.0%	0.0%
Height	8.4%	3.2%	1.0%	4.0%
Hypertension	0.0%	1.1%	0.0%	0.4%
Physical Limitations	4.8%	2.2%	6.5%	4.6%
Oral Health	0.0%	0.0%	0.0%	0.0%
Respiratory Diseases	0.0%	0.0%	1.2%	0.4%
Stroke	0.0%	0.0%	0.0%	0.0%
Underweight	3.8%	3.5%	6.0%	4.5%
Vision	3.6%	7.1%	3.2%	4.6%
Medical/Physical	33.8%	33.5%	34.2%	33.8%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-12. Percentage Disqualified from Military Service for Overweight

Gender	Race/Ethnicity	Education			Total
		Less than HS Graduate	HS Graduate + GED	Greater than HS Graduate	
Male	White, Non-Hispanic	14.1%	39.5%	28.5%	29.8%
	Black, Non-Hispanic	13.8%	31.7%	35.2%	26.7%
	Asian, Non-Hispanic	10.2%	38.0%	23.9%	24.0%
	Other, Non-Hispanic	46.3%	43.5%	34.7%	42.1%
	Hispanic	47.3%	45.2%	54.2%	48.7%
Female	White, Non-Hispanic	35.1%	31.8%	31.1%	32.1%
	Asian, Non-Hispanic	39.2%	61.3%	40.9%	47.7%
	Black, Non-Hispanic	17.6%	34.4%	20.4%	23.2%
	Other, Non-Hispanic	37.3%	26.2%	50.6%	41.4%
	Hispanic	33.0%	48.3%	48.6%	43.5%

Source: NHANES 2015–2018 (for the diseases and hearing disqualifiers, few individual components were only available in NHANES 2015–2016).

Table B-13. Percentage Disqualified from Military Service for Mental Health

Gender	Race/Ethnicity	Education			Total
		Less than HS Graduate	HS Graduate + GED	Greater than HS Graduate	
Male	White, Non-Hispanic	11.5%	22.6%	23.6%	20.6%
	Black, Non-Hispanic	15.2%	15.5%	16.3%	15.7%
	Asian, Non-Hispanic	4.7%	17.6%	16.2%	15.3%
	Other, Non-Hispanic	16.4%	29.4%	22.6%	23.0%
	Hispanic	8.3%	19.6%	21.5%	16.9%
Female	White, Non-Hispanic	21.0%	35.8%	37.0%	33.6%
	Black, Non-Hispanic	17.6%	22.9%	32.3%	25.9%
	Asian, Non-Hispanic	10.1%	31.2%	30.5%	27.0%
	Other, Non-Hispanic	14.6%	28.8%	42.2%	32.1%
	Hispanic	12.1%	26.6%	32.2%	25.5%

Source: NSDUH 2019

Table B-14. Percentage Disqualified from Military Service for Drugs

Gender	Race/Ethnicity	Education			Total
		Less than HS Graduate	HS Graduate + GED	Greater than HS Graduate	
Male	White, Non-Hispanic	29.7%	34.3%	41.1%	36.6%
	Black, Non-Hispanic	29.8%	35.2%	37.0%	34.5%
	Asian, Non-Hispanic	15.1%	16.3%	22.2%	20.1%
	Other, Non-Hispanic	32.4%	32.1%	39.9%	35.2%
	Hispanic	28.0%	32.8%	35.5%	32.3%
Female	White, Non-Hispanic	27.3%	31.8%	34.2%	32.3%
	Black, Non-Hispanic	21.2%	27.5%	33.9%	29.0%
	Other, Non-Hispanic	4.2%	17.7%	22.4%	18.3%
	Asian, Non-Hispanic	34.7%	39.3%	36.6%	36.8%
	Hispanic	24.6%	25.1%	26.8%	25.8%

Source: NSDUH 2019

Table B-15. Percentage Disqualified from Military Service for Conduct

Gender	Race/Ethnicity	Education			Total
		Less than HS Graduate	HS Graduate + GED	Greater than HS Graduate	
Male	White, Non-Hispanic	9.1%	7.4%	3.1%	5.5%
	Black, Non-Hispanic	20.3%	22.3%	7.9%	15.5%
	Asian, Non-Hispanic	1.9%	21.3%	5.0%	6.0%
	Other, Non-Hispanic	13.7%	10.8%	5.6%	9.1%
	Hispanic	9.6%	8.8%	4.5%	7.1%
Female	White, Non-Hispanic	5.1%	6.8%	2.4%	3.7%
	Black, Non-Hispanic	3.2%	5.7%	4.5%	5.2%
	Asian, Non-Hispanic	1.6%	5.3%	2.2%	2.2%
	Other, Non-Hispanic	11.1%	8.7%	5.8%	7.5%
	Hispanic	7.3%	6.6%	3.1%	4.8%

Source: DoD Youth Poll (2019)

Note: Excludes individuals with missing education information (170 in YP43 Spring 2019, 166 in YP44 Summer 2019, and 153 in YP45 Fall 2019, for variable EDU33_Q and EDU5_R).

Table B-16. Percentage Disqualified from Military Service for Dependents

Gender	Race/Ethnicity	Education			Total
		Less than HS Graduate	HS Graduate + GED	Greater than HS Graduate	
Male	White, Non-Hispanic	2.5%	6.0%	1.3%	2.8%
	Black, Non-Hispanic	6.9%	14.1%	9.5%	9.8%
	Asian, Non-Hispanic	0.0%	6.1%	1.7%	2.3%
	Other, Non-Hispanic	4.1%	3.6%	4.6%	4.4%
	Hispanic	7.3%	6.3%	3.5%	5.2%
Female	White, Non-Hispanic	5.8%	20.5%	2.4%	6.0%
	Black, Non-Hispanic	11.5%	17.8%	11.8%	12.8%
	Asian, Non-Hispanic	0.4%	8.0%	0.9%	1.1%
	Other, Non-Hispanic	7.4%	32.2%	1.6%	9.1%
	Hispanic	10.5%	20.1%	5.2%	9.1%

Source: DoD Youth Poll (2019)

Note: Excludes individuals with missing education information (170 in YP43 Spring 2019, 166 in YP44 Summer 2019, and 153 in YP45 Fall 2019, for variable EDU3_Q and EDU5_R).

APPENDIX C. AFQT MODEL RESULTS

C.1. Multinomial Logit Models for AFQT Distribution

For the multinomial logit model, one level is intentionally removed from the independent variable as a method of comparison. For the purpose of comparability to the 2013 QMA study, the same AFQT category, Category II, is excluded.

Table C-1.1. Model 1 Estimates

	AFQT Cat. I		AFQT Cat. IIIA		AFQT Cat. IIIB		AFQT Cat. IV		AFQT Cat. V	
Variable	**Parm. Est.**	**Std. Err.**	**Parm. Est.**	**Std. Err.**	**Parm. Est.**	**Std. Err.**	**Parm. Est.**	**Std. Err.**	**Parm. Est.**	**Std. Err.**
Intercept	-2.442	0.076	0.487	0.042	1.454	0.040	2.764	0.048	2.376	0.083
Male	0.446	0.015	-0.291	0.007	-0.431	0.007	-0.674	0.009	-0.543	0.018
Age (Reference Age = 17–19)										
Age 20	0.292	0.016	-0.089	0.010	-0.059	0.010	0.089	0.014	0.277	0.027
Age 21	0.437	0.017	-0.158	0.012	-0.180	0.012	0.010	0.016	0.214	0.031
Age 22	0.545	0.018	-0.213	0.013	-0.247	0.013	-0.100	0.019	0.126	0.036
Age 23–24	0.513	0.017	-0.206	0.012	-0.272	0.012	-0.051	0.017	0.201	0.032
Education (Reference Education = High School Dropout)										
HS-Enrolled	-0.526	0.082	0.023	0.043	0.008	0.042	-0.400	0.051	-0.240	0.087
HS Senior	-0.215	0.074	-0.110	0.041	-0.365	0.040	-1.078	0.048	-1.285	0.082
HS Graduate	0.111	0.073	-0.258	0.041	-0.546	0.039	-1.033	0.047	-1.278	0.081
GED	-0.390	0.078	0.167	0.043	-0.039	0.041	-0.682	0.051	-1.238	0.091
Associate Degree	0.376	0.079	-0.764	0.048	-1.516	0.050	-2.553	0.069	-3.296	0.158
College-Enrolled	0.439	0.078	-0.625	0.046	-1.274	0.046	-2.240	0.062	-2.957	0.134
College Graduate	1.082	0.076	-1.279	0.047	-2.310	0.050	-3.466	0.073	-4.165	0.172
Race/Ethnicity (Reference Race/Ethnicity = Hispanic)										
White, Non-Hispanic	0.595	0.015	-0.712	0.007	-1.220	0.007	-2.000	0.010	-2.819	0.022
Black, Non-Hispanic	-0.331	0.025	0.231	0.009	0.187	0.009	-0.092	0.010	0.023	0.020
Asian, Non-Hispanic	1.403	0.024	0.160	0.015	-0.577	0.015	-0.708	0.019	-1.241	0.038
Other, Non-Hispanic	-0.466	0.029	-0.598	0.015	-1.048	0.016	-1.320	0.022	-1.602	0.051
Sample Size	1,127,726									
Pseudo R^2	0.0700									
LLF	-1,791,422									

Table C-1.2. Model 2 Estimates

Variable	AFQT Cat. I		AFQT Cat. IIIA		AFQT Cat. IIIB		AFQT Cat. IV		AFQT Cat. V	
	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.
Intercept	-4.520	0.432	2.466	0.262	4.735	0.268	7.348	0.376	10.100	0.751
Male	0.433	0.015	-0.282	0.007	-0.417	0.007	-0.651	0.009	-0.513	0.018
Age (Reference Age = 17–19)										
Age 20	0.274	0.017	-0.084	0.010	-0.054	0.010	0.091	0.014	0.276	0.027
Age 21	0.408	0.018	-0.149	0.012	-0.170	0.012	0.016	0.016	0.214	0.031
Age 22	0.507	0.018	-0.203	0.013	-0.235	0.014	-0.095	0.019	0.122	0.036
Age 23–24	0.472	0.017	-0.196	0.012	-0.260	0.012	-0.045	0.017	0.198	0.032
Education (Reference Education = High School Dropout)										
HS-Enrolled	-0.499	0.082	0.017	0.044	-0.001	0.042	-0.399	0.051	-0.228	0.087
HS Senior	-0.218	0.074	-0.098	0.041	-0.345	0.040	-1.047	0.048	-1.247	0.082
HS Graduate	0.082	0.073	-0.235	0.041	-0.508	0.040	-0.983	0.047	-1.222	0.081
GED	-0.380	0.078	0.165	0.043	-0.042	0.042	-0.685	0.051	-1.238	0.091
Associate Degree	0.360	0.079	-0.744	0.049	-1.482	0.050	-2.506	0.069	-3.242	0.159
College-Enrolled	0.389	0.078	-0.589	0.046	-1.217	0.046	-2.169	0.062	-2.882	0.134
College Graduate	0.983	0.076	-1.221	0.047	-2.218	0.050	-3.362	0.074	-4.061	0.172
Race/Ethnicity (Reference Race/Ethnicity = Hispanic)										
White, Non-Hispanic	0.582	0.016	-0.670	0.007	-1.139	0.007	-1.849	0.010	-2.607	0.023
Black, Non-Hispanic	-0.365	0.025	0.231	0.010	0.186	0.009	-0.140	0.011	-0.086	0.021
Asian, Non-Hispanic	1.295	0.025	0.234	0.015	-0.440	0.015	-0.546	0.020	-1.075	0.039
Other, Non-Hispanic	-0.490	0.029	-0.570	0.015	-0.992	0.016	-1.247	0.022	-1.523	0.051
ZIP Code Variables										
Log Med. Income	0.121	0.038	-0.152	0.023	-0.262	0.024	-0.393	0.033	-0.696	0.067
% in Poverty	1.416	0.114	-0.326	0.071	0.045	0.072	0.585	0.098	0.568	0.191
% College Graduate	1.845	0.059	-1.065	0.036	-1.593	0.037	-1.689	0.053	-1.286	0.107
% Non-White	0.023	0.030	0.095	0.016	0.113	0.017	0.331	0.022	0.561	0.041
ZIP Code in MSA	0.013	0.014	-0.015	0.008	-0.069	0.008	-0.088	0.011	-0.084	0.022
Sample Size	1,127,726									
Pseudo R^2	0.0803									
LLF	-1,771,517									

Table C-1.3. Model 3 Estimates

Variable	AFQT Cat. I		AFQT Cat. IIIA		AFQT Cat. IIIB		AFQT Cat. IV		AFQT Cat. V	
	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.
Intercept	-3.902	0.454	1.901	0.275	4.076	0.283	7.491	0.398	10.950	0.798
Male	0.437	0.015	-0.284	0.007	-0.420	0.007	-0.656	0.009	-0.521	0.018
Age (Reference Age = 17–19)										
Age 20	0.276	0.017	-0.086	0.010	-0.057	0.010	0.086	0.014	0.266	0.027
Age 21	0.410	0.018	-0.151	0.012	-0.173	0.012	0.010	0.016	0.202	0.031
Age 22	0.509	0.018	-0.205	0.013	-0.239	0.014	-0.103	0.019	0.108	0.036
Age 23–24	0.471	0.017	-0.197	0.012	-0.261	0.013	-0.051	0.017	0.183	0.033
Education (Reference Education = High School Dropout)										
HS-Enrolled	-0.483	0.082	0.006	0.044	-0.034	0.042	-0.447	0.051	-0.302	0.088
HS Senior	-0.206	0.074	-0.106	0.041	-0.364	0.040	-1.071	0.048	-1.274	0.082
HS Graduate	0.093	0.073	-0.243	0.041	-0.522	0.040	-0.998	0.048	-1.234	0.081
GED	-0.379	0.078	0.165	0.043	-0.041	0.042	-0.679	0.051	-1.221	0.092
Associate degree	0.375	0.079	-0.755	0.049	-1.501	0.050	-2.530	0.069	-3.275	0.160
College-Enrolled	0.399	0.078	-0.599	0.046	-1.234	0.047	-2.191	0.062	-2.906	0.134
College Graduate	1.009	0.076	-1.241	0.047	-2.254	0.050	-3.408	0.074	-4.118	0.172
Race/Ethnicity (Reference Race/Ethnicity = Hispanic)										
White, Non-Hispanic	0.604	0.016	-0.693	0.008	-1.183	0.008	-1.903	0.011	-2.692	0.024
Black, Non-Hispanic	-0.311	0.026	0.181	0.010	0.105	0.010	-0.212	0.012	-0.149	0.023
Asian, Non-Hispanic	1.286	0.025	0.240	0.015	-0.437	0.015	-0.543	0.020	-1.061	0.040
Other, Non-Hispanic	-0.490	0.029	-0.573	0.015	-1.000	0.016	-1.247	0.022	-1.513	0.052
ZIP Code Variables										
Log Med. Income	0.056	0.040	-0.091	0.024	-0.185	0.025	-0.371	0.035	-0.701	0.071
% in Poverty	1.319	0.116	-0.246	0.072	0.108	0.073	0.455	0.100	0.167	0.199
% College Graduate	1.906	0.060	-1.136	0.037	-1.684	0.038	-1.746	0.055	-1.393	0.111
% Non-White	-0.040	0.033	0.176	0.017	0.283	0.017	0.540	0.023	0.801	0.042
ZIP Code in MSA	0.030	0.014	-0.020	0.008	-0.072	0.008	-0.092	0.011	-0.117	0.023
Census Division (Reference Division = New England)										
Middle Atlantic	0.003	0.027	-0.021	0.017	-0.016	0.018	-0.079	0.025	-0.261	0.044
East North Central	0.039	0.026	-0.100	0.016	-0.110	0.017	-0.270	0.024	-0.567	0.044
West North Central	0.064	0.029	-0.091	0.018	-0.104	0.019	-0.228	0.027	-0.381	0.051
South Atlantic	0.025	0.026	-0.084	0.016	-0.218	0.017	-0.521	0.023	-1.018	0.042
East South Central	-0.101	0.031	0.059	0.018	0.071	0.019	-0.026	0.026	-0.234	0.046
West South Central	0.063	0.027	-0.095	0.017	-0.172	0.017	-0.348	0.024	-0.666	0.043
Mountain	0.174	0.028	-0.169	0.018	-0.309	0.019	-0.526	0.026	-0.845	0.051
Pacific	0.174	0.027	-0.201	0.017	-0.355	0.017	-0.566	0.024	-0.993	0.046
Sample Size	1,127,726									
Pseudo R^2	0.0829									
LLF	-1,766,473									

Table C-1.4. Model 4 Estimates

Variable	AFQT Cat. I		AFQT Cat. I–IIIA		AFQT Cat. IIIB		AFQT Cat. IV		AFQT Cat. V	
	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.
Intercept	-3.803	0.485	2.307	0.293	4.852	0.300	8.546	0.418	11.380	0.822
Male	0.439	0.015	-0.285	0.007	-0.421	0.007	-0.658	0.009	-0.523	0.018
Age (Reference Age = 17–19)										
Age 20	0.277	0.017	-0.086	0.010	-0.057	0.010	0.086	0.014	0.267	0.027
Age 21	0.409	0.018	-0.151	0.012	-0.173	0.012	0.010	0.016	0.202	0.031
Age 22	0.507	0.018	-0.205	0.013	-0.239	0.014	-0.103	0.019	0.106	0.036
Age 23–24	0.469	0.017	-0.197	0.012	-0.261	0.013	-0.051	0.017	0.181	0.033
Education (Reference Education = High School Dropout)										
HS-Enrolled	-0.494	0.082	0.010	0.044	-0.033	0.042	-0.445	0.051	-0.297	0.088
HS Senior	-0.210	0.074	-0.104	0.041	-0.358	0.040	-1.060	0.048	-1.252	0.083
HS Graduate	0.092	0.073	-0.243	0.041	-0.519	0.040	-0.990	0.048	-1.214	0.082
GED	-0.376	0.078	0.163	0.043	-0.043	0.042	-0.685	0.051	-1.221	0.092
Associate degree	0.374	0.079	-0.752	0.049	-1.491	0.050	-2.519	0.069	-3.247	0.161
College-Enrolled	0.395	0.078	-0.596	0.046	-1.231	0.047	-2.185	0.062	-2.887	0.135
College Graduate	1.007	0.076	-1.243	0.048	-2.255	0.050	-3.409	0.074	-4.109	0.172
Race/Ethnicity (Reference Race/Ethnicity = Hispanic)										
White, Non-Hispanic	0.605	0.016	-0.696	0.008	-1.211	0.008	-1.947	0.011	-2.777	0.025
Black, Non-Hispanic	-0.316	0.026	0.179	0.010	0.084	0.010	-0.245	0.012	-0.199	0.024
Asian, Non-Hispanic	1.282	0.025	0.232	0.016	-0.476	0.016	-0.607	0.021	-1.170	0.041
Other, Non-Hispanic	-0.485	0.030	-0.582	0.016	-1.050	0.017	-1.329	0.023	-1.657	0.052
ZIP Code Variables										
Log Med. Income	0.037	0.043	-0.122	0.026	-0.249	0.027	-0.470	0.037	-0.763	0.073
% in Poverty	1.330	0.119	-0.363	0.074	-0.049	0.075	0.237	0.102	0.025	0.200
% College Graduate	1.914	0.063	-1.101	0.038	-1.617	0.040	-1.660	0.056	-1.351	0.112
% Non-White	0.013	0.036	0.145	0.019	0.239	0.019	0.465	0.025	0.761	0.045
ZIP Code in MSA	0.014	0.015	-0.010	0.008	-0.042	0.008	-0.045	0.012	-0.080	0.024
State (Reference State = AL)										
AK	0.502	0.084	-0.289	0.051	-0.384	0.053	-0.122	0.068	0.140	0.136
AR	-0.016	0.067	-0.054	0.033	-0.016	0.033	0.024	0.043	0.153	0.075
AZ	0.289	0.050	-0.204	0.027	-0.464	0.028	-0.600	0.038	-0.790	0.077
CA	0.268	0.043	-0.224	0.022	-0.404	0.022	-0.526	0.029	-0.804	0.054
CO	0.270	0.051	-0.236	0.030	-0.259	0.030	-0.289	0.043	-0.384	0.087
CT	0.183	0.062	-0.017	0.036	-0.006	0.036	0.090	0.049	0.185	0.085
DC	0.529	0.160	-0.112	0.121	-0.030	0.120	-0.188	0.130	0.072	0.203
DE	0.084	0.103	-0.050	0.054	-0.090	0.055	-0.128	0.075	-0.083	0.136
FL	0.130	0.044	-0.179	0.023	-0.397	0.022	-0.654	0.030	-0.869	0.055
GA	0.098	0.048	-0.106	0.024	-0.269	0.024	-0.504	0.032	-0.935	0.058
HI	0.168	0.086	-0.102	0.044	0.010	0.043	0.162	0.053	0.194	0.099
IA	0.263	0.063	-0.112	0.036	-0.013	0.036	0.028	0.051	0.273	0.097
ID	0.462	0.064	-0.328	0.040	-0.500	0.042	-0.718	0.067	-0.706	0.150

Variable	AFQT Cat. I		AFQT Cat. I–IIIA		AFQT Cat. IIIB		AFQT Cat. IV		AFQT Cat. V	
	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.	Parm. Est.	Std. Err.
IL	0.120	0.048	-0.121	0.025	-0.141	0.025	-0.138	0.033	-0.275	0.061
IN	0.177	0.050	-0.184	0.027	-0.185	0.026	-0.198	0.037	-0.302	0.072
KS	0.133	0.062	-0.237	0.035	-0.252	0.036	-0.223	0.050	-0.051	0.097
KY	0.057	0.060	0.042	0.031	0.093	0.031	0.052	0.043	0.205	0.083
LA	0.004	0.061	-0.056	0.029	-0.086	0.029	-0.094	0.037	-0.141	0.063
MA	0.104	0.053	-0.057	0.030	-0.069	0.031	0.070	0.041	0.290	0.072
MD	0.239	0.054	-0.109	0.030	-0.131	0.030	-0.254	0.042	-0.368	0.076
ME	0.164	0.088	0.001	0.052	0.034	0.053	-0.020	0.082	0.376	0.164
MI	0.112	0.050	-0.136	0.026	-0.156	0.026	-0.204	0.036	-0.206	0.069
MN	0.350	0.053	-0.245	0.030	-0.276	0.031	-0.376	0.045	-0.501	0.097
MO	0.101	0.053	-0.038	0.027	-0.077	0.028	-0.086	0.038	0.046	0.069
MS	-0.164	0.072	0.002	0.033	0.018	0.032	0.090	0.041	-0.151	0.067
MT	0.358	0.084	-0.204	0.054	-0.282	0.056	-0.271	0.085	-0.159	0.194
NC	0.147	0.048	-0.146	0.025	-0.292	0.025	-0.488	0.034	-0.895	0.065
ND	0.219	0.107	-0.233	0.066	-0.418	0.072	-0.426	0.111	-0.136	0.226
NE	0.003	0.076	-0.144	0.042	-0.132	0.043	0.042	0.059	-0.149	0.133
NH	0.211	0.075	-0.196	0.046	-0.239	0.049	-0.252	0.077	-0.277	0.186
NJ	0.053	0.053	0.005	0.028	0.004	0.029	0.067	0.038	0.025	0.068
NM	0.067	0.079	-0.124	0.040	-0.138	0.040	-0.129	0.051	-0.169	0.095
NV	0.151	0.063	-0.262	0.033	-0.480	0.034	-0.752	0.049	-1.107	0.107
NY	0.111	0.047	-0.034	0.024	-0.014	0.024	0.083	0.032	0.120	0.055
OH	0.151	0.046	-0.121	0.024	-0.116	0.024	-0.174	0.033	-0.258	0.061
OK	0.051	0.059	-0.098	0.030	-0.085	0.030	-0.171	0.042	-0.241	0.083
OR	0.258	0.055	-0.280	0.032	-0.377	0.032	-0.464	0.048	-0.479	0.102
PA	0.194	0.046	-0.142	0.024	-0.138	0.024	-0.131	0.033	-0.045	0.060
RI	-0.059	0.099	0.029	0.054	0.098	0.054	0.402	0.069	0.878	0.104
SC	0.175	0.054	-0.122	0.028	-0.188	0.028	-0.229	0.036	-0.391	0.062
SD	0.138	0.097	-0.216	0.056	-0.117	0.057	-0.284	0.091	-0.281	0.215
TN	0.075	0.052	-0.007	0.027	0.000	0.027	0.054	0.035	0.218	0.062
TX	0.251	0.043	-0.186	0.022	-0.309	0.022	-0.389	0.029	-0.531	0.052
UT	0.474	0.057	-0.223	0.036	-0.319	0.037	-0.319	0.054	0.001	0.102
VA	0.199	0.048	-0.161	0.026	-0.262	0.026	-0.454	0.036	-0.861	0.070
VT	0.168	0.117	-0.033	0.077	0.067	0.078	0.291	0.112	0.490	0.240
WA	0.378	0.049	-0.330	0.027	-0.470	0.028	-0.541	0.040	-0.697	0.086
WI	0.336	0.052	-0.284	0.030	-0.265	0.030	-0.380	0.043	-0.246	0.084
WV	-0.156	0.087	0.102	0.042	0.289	0.040	0.464	0.054	0.630	0.108
WY	0.216	0.118	-0.221	0.069	-0.202	0.069	-0.352	0.111	-0.650	0.293
Sample Size	1,127,726									
Pseudo R^2	0.0848									
LLF	-1,762,924									

Table C-2.1. Probit Models for Probability of AFQT Category V

Variable		Model 1	Model 2	Model 3	Model 4
Gender					
Male	Coefficient	-0.089	-0.076	-0.078	-0.077
	Standard Error	0.009	0.009	0.009	0.009
	p-value	0.000	0.000	0.000	0.000
Race/Ethnicity (Reference Race/Ethnicity = Hispanic)					
White, Non-Hispanic	Coefficient	-0.944	-0.866	-0.890	-0.919
	Standard Error	0.011	0.012	0.012	0.013
	p-value	0.000	0.000	0.000	0.000
Black, Non-Hispanic	Coefficient	-0.007	-0.052	-0.061	-0.077
	Standard Error	0.011	0.012	0.012	0.013
	p-value	0.519	0.000	0.000	0.000
Asian	Coefficient	-0.521	-0.472	-0.461	-0.502
	Standard Error	0.020	0.020	0.021	0.021
	p-value	0.000	0.000	0.000	0.000
Other, Non-Hispanic	Coefficient	-0.419	-0.391	-0.381	-0.437
	Standard Error	0.027	0.027	0.027	0.027
	p-value	0.000	0.000	0.000	0.000
Age (Reference Age = 17–19)					
20	Coefficient	0.138	0.136	0.134	0.134
	Standard Error	0.014	0.014	0.014	0.014
	p-value	0.000	0.000	0.000	0.000
21	Coefficient	0.133	0.134	0.130	0.130
	Standard Error	0.016	0.016	0.016	0.016
	p-value	0.000	0.000	0.000	0.000
22	Coefficient	0.113	0.112	0.107	0.107
	Standard Error	0.018	0.018	0.018	0.019
	p-value	0.000	0.000	0.000	0.000
23–24	Coefficient	0.149	0.149	0.144	0.144
	Standard Error	0.017	0.017	0.017	0.017
	p-value	0.000	0.000	0.000	0.000
Education (Reference Education = High School Dropout)					
HS-Enrolled	Coefficient	-0.045	-0.038	-0.062	-0.062
	Standard Error	0.046	0.046	0.046	0.046
	p-value	0.327	0.408	0.178	0.182
HS Senior	Coefficient	-0.424	-0.409	-0.415	-0.407
	Standard Error	0.043	0.043	0.043	0.043
	p-value	0.000	0.000	0.000	0.000
Associate Degree	Coefficient	-1.088	-1.055	-1.057	-1.043
	Standard Error	0.074	0.075	0.075	0.076
	p-value	0.000	0.000	0.000	0.000
College-Enrolled	Coefficient	-0.995	-0.963	-0.963	-0.951
	Standard Error	0.064	0.065	0.065	0.065
	p-value	0.000	0.000	0.000	0.000
GED	Coefficient	-0.521	-0.518	-0.508	-0.507
	Standard Error	0.047	0.047	0.048	0.048
	p-value	0.000	0.000	0.000	0.000
HS Grad	Coefficient	-0.398	-0.379	-0.378	-0.370
	Standard Error	0.042	0.042	0.043	0.043
	p-value	0.000	0.000	0.000	0.000
College Grad	Coefficient	-1.422	-1.369	-1.381	-1.373
	Standard Error	0.074	0.074	0.074	0.074
	p-value	0.000	0.000	0.000	0.000

Variable		Model 1	Model 2	Model 3	Model 4
ZIP Code Variables					
% Not White, Non-Hispanic	Coefficient		0.200	0.261	0.264
	Standard Error		0.021	0.022	0.024
	p-value		0.000	0.000	0.000
% Under Poverty Line	Coefficient		0.069	-0.113	-0.131
	Standard Error		0.098	0.102	0.103
	p-value		0.483	0.271	0.203
Median Income	Coefficient		-0.275	-0.290	-0.296
	Standard Error		0.034	0.036	0.038
	p-value		0.000	0.000	0.000
% College Grad	Coefficient		-0.209	-0.235	-0.231
	Standard Error		0.055	0.056	0.057
	p-value		0.000	0.000	0.000
ZIP in MSA	Coefficient		-0.023	-0.038	-0.030
	Standard Error		0.011	0.012	0.012
	p-value		0.043	0.001	0.016
Census Division (Reference Division = New England)					
Middle Atlantic	Coefficient			-0.104	
	Standard Error			0.023	
	p-value			0.000	
East North Central	Coefficient			-0.213	
	Standard Error			0.023	
	p-value			0.000	
West North Central	Coefficient			-0.132	
	Standard Error			0.026	
	p-value			0.000	
South Atlantic	Coefficient			-0.390	
	Standard Error			0.022	
	p-value			0.000	
East South Central	Coefficient			-0.117	
	Standard Error			0.024	
	p-value			0.000	
West South Central	Coefficient			-0.243	
	Standard Error			0.023	
	p-value			0.000	
Mountain	Coefficient			-0.294	
	Standard Error			0.026	
	p-value			0.000	
Pacific	Coefficient			-0.350	
	Standard Error			0.024	
	p-value			0.000	
State (Reference State = AL)					
AK	Coefficient				0.148
	Standard Error				0.070
	p-value				0.034
AR	Coefficient				0.086
	Standard Error				0.039
	p-value				0.030
AZ	Coefficient				-0.235
	Standard Error				0.040
	p-value				0.000
CA	Coefficient				-0.257
	Standard Error				0.028
	p-value				0.000

Variable		Model 1	Model 2	Model 3	Model 4
CO	Coefficient				-0.105
	Standard Error				0.044
	p-value				0.017
CT	Coefficient				0.073
	Standard Error				0.045
	p-value				0.105
DC	Coefficient				0.116
	Standard Error				0.102
	p-value				0.258
DE	Coefficient				0.007
	Standard Error				0.071
	p-value				0.927
FL	Coefficient				-0.274
	Standard Error				0.029
	p-value				0.000
GA	Coefficient				-0.348
	Standard Error				0.030
	p-value				0.000
HI	Coefficient				0.091
	Standard Error				0.052
	p-value				0.078
IA	Coefficient				0.143
	Standard Error				0.049
	p-value				0.004
ID	Coefficient				-0.184
	Standard Error				0.071
	p-value				0.010
IL	Coefficient				-0.088
	Standard Error				0.032
	p-value				0.005
IN	Coefficient				-0.077
	Standard Error				0.037
	p-value				0.035
KS	Coefficient				0.055
	Standard Error				0.050
	p-value				0.267
KY	Coefficient				0.096
	Standard Error				0.042
	p-value				0.023
LA	Coefficient				-0.042
	Standard Error				0.033
	p-value				0.201
MA	Coefficient				0.142
	Standard Error				0.038
	p-value				0.000
MD	Coefficient				-0.114
	Standard Error				0.039
	p-value				0.004
ME	Coefficient				0.190
	Standard Error				0.081
	p-value				0.018
MI	Coefficient				-0.035
	Standard Error				0.035
	p-value				0.322

Variable		Model 1	Model 2	Model 3	Model 4
MN	Coefficient				-0.153
	Standard Error				0.048
	p-value				0.001
MO	Coefficient				0.056
	Standard Error				0.036
	p-value				0.118
MS	Coefficient				-0.117
	Standard Error				0.035
	p-value				0.001
MT	Coefficient				-0.004
	Standard Error				0.092
	p-value				0.967
NC	Coefficient				-0.323
	Standard Error				0.033
	p-value				0.000
ND	Coefficient				0.043
	Standard Error				0.109
	p-value				0.693
NE	Coefficient				-0.046
	Standard Error				0.066
	p-value				0.489
NH	Coefficient				-0.074
	Standard Error				0.087
	p-value				0.392
NJ	Coefficient				0.005
	Standard Error				0.036
	p-value				0.895
NM	Coefficient				-0.036
	Standard Error				0.050
	p-value				0.477
NV	Coefficient				-0.362
	Standard Error				0.054
	p-value				0.000
NY	Coefficient				0.062
	Standard Error				0.029
	p-value				0.034
OH	Coefficient				-0.074
	Standard Error				0.031
	p-value				0.019
OK	Coefficient				-0.068
	Standard Error				0.042
	p-value				0.109
OR	Coefficient				-0.113
	Standard Error				0.050
	p-value				0.024
PA	Coefficient				0.024
	Standard Error				0.031
	p-value				0.440
RI	Coefficient				0.364
	Standard Error				0.057
	p-value				0.000
SC	Coefficient				-0.139
	Standard Error				0.033
	p-value				0.000

Variable		Model 1	Model 2	Model 3	Model 4
SD	Coefficient				-0.076
	Standard Error				0.101
	p-value				0.454
TN	Coefficient				0.111
	Standard Error				0.032
	p-value				0.001
TX	Coefficient				-0.150
	Standard Error				0.027
	p-value				0.000
UT	Coefficient				0.065
	Standard Error				0.051
	p-value				0.205
VA	Coefficient				-0.315
	Standard Error				0.036
	p-value				0.000
VT	Coefficient				0.207
	Standard Error				0.118
	p-value				0.078
WA	Coefficient				-0.201
	Standard Error				0.042
	p-value				0.000
WI	Coefficient				-0.024
	Standard Error				0.042
	p-value				0.573
WV	Coefficient				0.221
	Standard Error				0.055
	p-value				0.000
WY	Coefficient				-0.239
	Standard Error				0.136
	p-value				0.080
Intercept	Coefficient	-0.333	2.658	3.112	3.043
	Standard Error	0.043	0.385	0.410	0.424
	p-value	0.000	0.000	0.000	0.000
Sample Size		**1,127,726**	**1,127,726**	**1,127,726**	**1,127,726**
Pseudo R^2		**0.114**	**0.122**	**0.128**	**0.132**
LLF		**-312,924**	**-309,224**	**-307,904**	**-306,569**

APPENDIX D. ADDITIONAL VARIABLE DETAILS

NSDUH

The conditions leading to a disqualification in the 2019 NSDUH data are reported below:

Table D-1. NSDUH Drug Use Disqualification Specifics

Code to Produce	Interpretation of Variable from NSDUH
ABPYILLALC = 1	Drug or alcohol abuse (illicit drugs including marijuana, or alcohol—past year abuse)
MJONLYMON = 1	Drug use (marijuana only—past month use)
ILLEMYR = 1	Drug (illicit drug other than marijuana—past year use)
ALCSERPB = 1	Alcohol (serious problems at home, work, or school—past year)
MRJSERPB = 1	Marijuana (serious problems at home, work, or school—past year)
COCSERPB = 1	Cocaine (serious problems at home, work, or school—past year)
HERSERPB = 1	Heroin (serious problems at home, work, or school—past year)
ALCPDANG = 1	Alcohol (in physical danger—past year)
MRJPDANG = 1	Marijuana (in physical danger—past year)
COCPDANG = 1	Cocaine (in physical danger—past year)
HERPDANG = 1	Heroin (in physical danger—past year)
ALCLAWTR = 1	Alcohol (caused repeated trouble with the law—past year)
MRJLAWTR = 1	Marijuana (caused repeated trouble with the law—past year)
COCLAWTR = 1	Cocaine (caused repeated trouble with the law—past year)
HERLAWTR = 1	Heroin (caused repeated trouble with the law—past year)
ALCFMCTD = 1	Alcohol (continued use despite causing problems with family/friends)
MRJFMCTD = 1	Marijuana (continued use despite causing problems with family/friends)
COCFMCTD = 1	Cocaine (continued use despite causing problems with family/friends)
HERFMCTD = 1	Heroin (continued use despite causing problems with family/friends)
HERMON = 1	Heroin (use—past month)
HALLUCMON = 1	Hallucinogens (use—past month)
COCMON = 1	Cocaine (use—past month)

APPENDIX E. FINAL 2020 QMA STUDY DATA SET

There are 12,135,200 records in the data set. This includes 30,338 ZIP codes, each with 400 records. Each ZIP code has the 2020 population count by Gender (two categories), Race/Ethnicity (five categories), Age (five categories), and Education (eight categories):

- ZIP Code
- Gender
  - 1 = Male
  - 2 = Female
- Race/Ethnicity
  - 1 = White Non-Hispanic
  - 2 = Black Non-Hispanic
  - 3 = Asian Non-Hispanic
  - 4 = Other Race Non-Hispanic
  - 5 = Hispanic of any race
- Education
  - 1 = High School Dropout (HD)
  - 2 = High School-Enrolled (HE)
  - 3 = High School Senior (HS)
  - 4 = GED or alternative high school equivalency (GG)
  - 5 = High School Diploma Graduate (HG)
  - 6 = College-Enrolled (CE)
  - 7 = Associate Degree (AA)
  - 8 = College Degree (CG)
- Woods & Poole (2018) estimated documented youth population projection for 2020 for that ZIP code, Gender, Race/Ethnicity, Education and Age combination.
- Percentage eligible taking into account overlap between disqualifying conditions
- Probability of being in each AFQT category
  - Category I
  - Category II
  - Category IIIA
  - Category IIIB
  - Category IV
  - Category V
- Probability of failing individual disqualifiers not accounting for overlap
  - Medical/Physical
  - Drugs
  - Conduct
  - Dependents
  - Overweight
  - Mental Health
  - Aptitude
- Probability of failing only one disqualifier accounting for overlap
  - Medical/Physical only
  - Drugs only
  - Conduct only
  - Dependents only
  - Overweight only
  - Mental Health only
  - Aptitude only