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NAWCTSD-RPT-4635-18-02

April 2018

## Enlisted Recruit Candidate Market Depth Analysis: Final Report

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## Enlisted Recruit Candidate Market Depth Analysis

### Abstract

The United States (U.S.) Navy Recruiting Command's (NRC) mission is to source and recruit the best and brightest young men and women to sustain and maintain the cadre of ready personnel necessary for the Navy's mission. Navy recruiters are placed in geographic locations where they are estimated to have the greatest success recruiting qualified candidates. All potential recruits must meet minimum Navy quality standards to be considered for enlistment. The Department of Defense estimates that 29% of the 17–24-year-old U.S. population meets these standards. However, quality standards vary by market and yield at different rates depending on a variety of factors such as population size and composition. Although NRC collects and maintains volumes of recruitment data, current quality standard estimates are derived from the general 17–24-year-old population in the U.S. and do not provide NRC with specific market depth information. Without improvements in the quality factor estimate, suboptimal assignment of the appropriate number of recruiters to a given geographic market could result in under-recruitment from the available population. This effort provides a framework, and estimates the quality standard at the finest possible geographic level to project the depth of qualified 17–24-year-old military candidates available by zip code.

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## I. Introduction

The United States Navy Recruiting Command (NRC) is responsible for Navy recruiting for the 50 States, U.S. Territories, Europe, and Asia. To meet its mission, NRC established 26 Navy Recruiting Districts (NRD), [1]. Housed within each of the NRDs are recruiting stations. The number of recruiting stations within an NRD are determined by the geographic size of the NRD and the number of qualified 17–24-year-olds residing in a geographic area. In fiscal year 2015 (FY15), NRC reported 1,459 recruiting stations manned by 2,979 active-duty enlisted recruiters with an FY15 active duty-recruiting goal of 34,990 enlisted Sailors.

To be considered as enlistment eligible for active duty, potential recruits are required to meet minimum Department of Defense (DoD) quality standards. Individuals must 1) have obtained a high school degree, 2) have an aptitude score in the 50<sup>th</sup> percentile based on the Armed Forces Qualification Test (AFQT), 3) have no record of arrest or drug use, 4) not be emotionally or mentally disabled, 5) meet body weight criteria, 6) have no dependent children if unmarried, and 7) be 18 years of age. The Navy has the discretion to excuse (i.e., grant waivers on a case-by-case basis) the minimum standard requirements, such as requiring high aptitude scores.

The DoD estimates that 29% of the 17–24-year-old population would meet all the quality standards without requiring a waiver for at least one standard, [5]. To determine the Qualified Military Available (QMA) for those individuals aged 17–24 who would not require a waiver, the DoD provides to the services estimates of QMA. The DoD QMA estimates are rates at which individuals would be ineligible for enlistment or disqualified for military service without a waiver, [5]. From the disqualification rates, the percentage of 17–24-year-olds qualified who would not require a waiver can be computed.

The QMA estimates were last updated in 2013, [5], and are currently in use by NRC to compute the number of qualified military available, also referred to as market depth, of individuals aged 17–24. The 2013 QMA estimates are not current, derived from various public and Navy data sources available prior to 2013, and therefore are not likely to capture changes in the 17–24-year-old population stemming from state educational or drug initiatives. The 2013 QMA estimates are based on national estimates. Recruiting markets yield at different rates contingent on population composition and state laws. Applying national QMA estimates to compute regional market depth may over/underestimate the true qualified military available within a recruiting station's market area.

The objective of this effort is to propose the framework for computing market depth, as accepted, update the QMA estimates using the most recent available data, at the finest feasible level, and to compute QMA available for the age group 17–24 by zip code. Following [5], the market depth for ages 17–24 by QMA factor represents the number of individuals, age 17–24, qualified for military service that would not require a waiver. The market depth counts include total QMA within a market and QMA by race and gender. For purposes of this effort, QMA estimates represent the percentage of individuals who are qualified for military service without requiring a waiver. By relaxing the minimum requirements for any of the quality standards, the depth of the market can be expanded; similarly, adding requirements for any of the quality standards would potentially decrease the market depth.

In sections II and III, QMA data sources, limitations, assumptions, and methodology are discussed. The relative depth of the market by race and age over time are illustrated in section IV. Simulation modeling is used to generate joint probabilities for two or more QMA standards. Simulation results are presented in section V. The market depth calculations controlling the individual QMA estimates for four recruiting stations are presented in section VI. Section VI includes market depth analysis by race, gender, and school district, when available. Accession data is used to gauge the quality of recruits, based on and the extent to which the market has untapped market yields or been exhausted is discussed in section VII.

## II. Quality Standards of Potential Recruits and Market Depth

The Department of Defense (DoD) sets minimum quality standards that potential recruits must meet. DoD standards for new recruits require that 90% have a high school degree and that 60% score in the top half of the Armed Forces Qualification Test (AFQT), [6]. Each service must at least meet the minimum standards but has the latitude to raise standards. The Navy standards for new recruits are 95% High School Diploma Graduates (HSDG) and at least 70% of recruits scoring in the upper half of the AFQT. Other standards, such as age, physical fitness, body fat percentage, conduct, and significant tattoos can bar an individual from qualifying for enlistment.

Table 1 below summarizes DoD’s minimum enlistment eligibility standards. Individuals who do not meet the minimum standards are, in general, not eligible for military service. The Navy’s recruitment eligibility standards for education and aptitude exceed the Table 1 minimums. However, on a per case basis, the Navy has the authority to waive minimum standards and grant enlistment eligibility to individuals.<sup>1</sup>

**Table 1: DoD Enlistment Eligibility Standards [6]**

<b>Standard</b>	<b>DoD</b>
Age	Minimum age for enlistment is 17 with a maximum age of 42.
Citizenship	U.S. Citizen or lawfully admitted to the United States for permanent residence.
Education	High School Degree. If non-high school degree must score above 31 <sup>st</sup> percentile on AFQT.
Aptitude	Persons who score in AFQT Category V (percentiles 1-9) are ineligible for military service. Total Armed Services accession cohort cannot exceed 20% of persons categorized as AFQT Category IV; those persons scoring in percentiles 10-30.
Physical Fitness	DODI 1308.3 sets gender-specific height and weight maximums.
Dependency Status	Individuals with two or more dependents under the age of 18 or who are unmarried with custody of any dependents under the age of 18 are ineligible for military service.
Character/Conduct	Individuals are ineligible for military service if: 1. Serving probation, under a bond, imprisoned, or on parole 2. Significant criminal record 3. Federal Conviction 4. Previously separated from the military under conditions other than honorable 5. Exhibits anti-social behavior 6. Fails National Agency Check with Law and Credit (NACLC)
Drugs and Alcohol	Ineligible for military service if an individual has a current or history of alcohol and or drug dependence.
Medical	DODI 6130.03 medical conditions that deem an individual ineligible for military service.

Potential recruits must meet Table 1 eligibility standards; therefore, some portion of the youth population aged 17–24 would not be qualified for military service. The potential recruiting pool is resident youth who meet all

<sup>1</sup> Listing of eligible waiver categories is given in [6].

the standards. The “2013 Qualified Military Available (QMA)” technical report, [5], provides single and combined disqualification estimates for this population.

Disqualifying estimates are provided for seven categories: medical/physical, overweight, mental health, drugs, conduct, dependents, and aptitude. Estimates of unique and combined disqualifying factors are applied to U.S. Census counts for the 17–24-year-old population to derive the percentage of the 17–24-year-olds that are qualified for military service (referred to as qualified military available (QMA)).

Table 2 summarizes the estimated percentage of the target population who would be disqualified and qualified by standard.

**Table 2: DoD QMA Study 2013 – Summary [5] & [8]**

<b>Standard/Category (Disqualified = DQ)</b>	<b>Percentage Disqualified</b>
Dependents DQ only	2%
Aptitude DQ only	2%
Conduct DQ Only	1%
Drugs DQ only	8%
Medical DQ only (includes mental health and overweight)	28%
Multiple Reasons DQ (overlapping DQs)	31%
Total DQs	72%*
<b>Education/Aptitude Qualified</b>	<b>Percentage Qualified</b>
Non-HSDG IIIB-IV & HSDG IV	6% (IV = 3.4%)
Non-HSDG CAT I-III A & HSDG CAT IIIB	5%
HSDG CAT I-III A	2%
Qualified College Graduate CAT I-IV	4%
College Enrolled CAT I-IV	12% (of 12% of college enrolled, 2% are CAT IV)
<b>Total Qualified Military Available</b>	<b>29%</b>
Qualified Military Available (Not College Enrolled)	17%
Qualified Military Available CAT I-III B	13%

\*As noted in [5], total does not add up to 100% due to rounding error.

Approximately 29% of the 17–24-year-old population met the eligibility standards and are qualified for military service, without requiring a waiver [8].<sup>2</sup> To the extent that waivers increase the percentage of qualified applicants, depend on DoD instructions and at the discretion of the reviewing service. Projections, through 2030, show that the qualified military market remains constant at 29%. Likely, because of declining U.S. birth rates, the number of eligible youth will only increase by 1.31M between 2016 and 2030, albeit the percentage of the market, 29%, remains constant over this period [8].

The percentage estimates by standard in Table 2 are based on two data sources: national surveys and DoD institutional data from 2007–2013. Estimates for four of the standards (medical/physical, overweight, mental health, and drugs) are based on 2010 data. Since 2010, changes in state laws and educational initiatives, and other cohort attributes, may affect the QMA estimates.

<sup>2</sup> With a waiver, applicants aged 17 may enter the Navy’s Delayed Entry Program (DEP); however, 17-year-old applicants cannot enlist prior to their 18<sup>th</sup> birthday. See [6].

The number of youth qualified based on aptitude is obtained from Military Entrance Processing Command (MEPCOM) data. MEPCOM data is likely to bias aptitude estimates, as the estimate is not representative of the total U.S 17–24-year-old population, but of those that chose military service. QMA estimates are overlaid at the zip code level to obtain 17–24-year-old market depth for a given zip code. However, QMA estimates are national estimates and do not account for likely differences in standards by state, region, or county. The DoD QMA estimates used by Navy Recruiting Command to determine the market depth within an NRD or recruiting station’s area of responsibility may under/overstate market depth.

## **II.1 QMA Data Sources and Assumptions**

The methodology used in this effort is designed to allow ease of updating 17–24-year-old market depth for each standard as new data becomes available. To this extent, estimates of the QMA by standard are based on publicly available data. Of the eligibility standards addressed when computing QMA, high school graduation rates, aptitude, obesity, and disability are updated annually. In general, publicly available data for these four categories are available at the state, county, or zip code level, allowing for a more precise computation of the QMA for the target age category.

NRC sets the overall fiscal year recruiting goal. The respective NRDs allocate their portion of the Navy’s goal to recruiting stations within the district. Each station is responsible for a specific geographic area, comprised of an aggregation of bordering zip codes. The size of the stations’ assigned geographic area is, in part, based on the resident youth population and the estimated number of QMA. The resident youth population within a recruiting station’s assigned geographic area is available from the U.S. Census.<sup>3</sup> The proportion of the recruiting station’s resident youth population aged 17–24 qualified for military service by category is estimated using the most current available data and at the finest possible level. Data descriptions and assumptions for each QMA category are discussed below.

### **II.1.a Disability**

The American Community Survey (ACS) annually surveys 3.5 million households to identify individuals with disabilities. Households from the noninstitutionalized working-age population self-report any of six disabilities: hearing, visual, ambulatory, self-care, independent living, and cognitive.

In contrast to [5], the ACS disability categories are broader and less refined. Specifically, ACS reports individuals cognitively disabled if physical, mental, or emotional conditions impede concentration, recall, or decision-making, [16]. The DoD QMA study’s, [5], equivalent cognitive disability classification uses data from Substance Abuse and Mental Health Services Administration (SAMHSA) and National Survey on Drug Use and Health (NSDUH) to ascertain mental health, where mental health disability includes obsessive-compulsive disorder and suicidal behavior.

From the 2015 ACS, the percentage of disabled individuals is filtered by state, high school degree or equivalent, 16–20-year-old age group, gender, and race. The percentage-disabled estimate is applied to the 17–24-year-old population counts to compute 17–24-year-old market depth, that percentage of the population not disabled. Using the ACS reported margin of error, 90% confidence intervals are also computed for each state and demographic group.<sup>4</sup>

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<sup>3</sup> See ‘Methodological’ section for discussion on U.S Census Data and 17-24 Market Depth

<sup>4</sup> Passing a physical examination is one of the Navy’s basic enlistment requirements and therefore anyone with a known assignment limitation is prohibited from enlisting. This especially includes any condition that would likely form the basis for physical retirement benefits, [14].

### **II.1.b Dependents**

The ACS and Current Population Survey (CPS) report households with children by age; however, those estimates rely on household counts and do not take into consideration non-household 18–24-year-olds with dependents living with a parent or householder. Absent a waiver, an unmarried individual with custody of dependents is disqualified from military service.<sup>5</sup> The ACS/CPS provides no data on 17–24-year-old populations with a dependent living in a parent household. As a default value, the 2013 estimate of 2% reported in [5] is used to compute the 17–24-year-old market depth with no dependents.

### **II.1.c Obesity**

Survey data from the Youth Risk Behavioral Surveillance System (YRBSS) is used to estimate high school obesity rates by state based on body mass index (BMI). The survey is conducted annually with 2015 results based on a sample size of 400,000. Reported adult obesity rates are two times that of the high school population. Based on the YRBSS, the 17–24-year-old population captures high school and adult populations. To minimize overestimating the proportion of the 17–24-year-old market disqualified for obesity, the state's high school obesity rate is applied to the 17–24-year-old population to compute market depth.<sup>6</sup>

### **II.1.d Drug**

The most recent publicly available data on drug use is from the National Surveys on Drug Use and Health (NSDUH) 2012–2014. The percentage of individuals age 12 or older who report using drugs within the previous 30 days is reported by state and sub-state region. NSDUH defines illicit drugs to include hash, marijuana, cocaine, and the use of non-medically prescribed prescription drugs. As the NSDUH does not report drug use by single age group, the state's and sub state's regions illicit drug use percentages are used to compute the percentage of the 17–24-year-old population disqualified for drug use. This computation assumes no variation in drug use across single age groups and as a result may overestimate drug use for younger cohorts and underestimate adult drug use. To be eligible for enlistment in the Navy, an applicant cannot be a substance abuser, [14].

### **II.1.e Conduct**

National statistics from the Federal Bureau of Investigation (FBI) on the arrests of juveniles age 10–17, regardless of classification of offense, were used to determine the percentage of the individuals age 17–24 that would be ineligible for military service due to conduct. The mean arrest rate for 2001–2012, 7.99%, is computed as the total number of juveniles arrested relative to the total 10–17-year-old population. Arrest statistics are available by single age within a police district; however, police districts cover multiple zip codes that do not map to zip codes as classified for recruiting districts. FBI statistics only demarcate arrests for juveniles (ages 10–17) and adults (ages 18 and older). Adult arrest rates are significantly higher than for juveniles. The 7.99% arrest rate is larger than that reported in [5]. Differences in source data and arrest by type of offense (violate, property, misdemeanor) may explain the variation in the estimate. The mean juvenile arrest rate is based on national data, is assumed constant regardless of geographic region, and is applied equally to the 17–24 single age group.<sup>7</sup>

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<sup>5</sup> See [6] for dependent waiver eligibility.

<sup>6</sup> The Navy follows a BMI calculator and has different height and weight standards for males and females. Applicants below 17.5 BMI are temporarily disqualified, [14].

<sup>7</sup> The Navy's basic enlistment character requirements request that applicants maintain a satisfactory pattern of conduct. This includes applicants not being under civil restraints, not having a pattern of minor convictions, or major misconduct convictions, [14].

### II.1.f High School Graduation Rates

As part of its governing function, each state has a Department of Education. State education departments are responsible for oversight of the elementary and secondary curriculum, instruction, and testing. High school graduation rates and assessment statistics by school district and individual schools are accessible through the state's department of education websites. Data is updated annually; however, the detail of the data varies by state. Colorado Department of Education reports high school graduation rates by district and school, race and gender, whereas, Mississippi only reports overall student graduation rates. High School graduation rates, 2015, by school district or high schools, controlling for race and gender, where data are available, were used to compute the number of high school diploma graduates (HSDG) in each market. High school diploma graduates or adult alternative diploma programs are basic enlistment eligibility requirements for the Navy, [14].

### II.1.g Aptitude/Upper Mental Group

All potential recruits are assessed for aptitude and are administered the Armed Services Vocational Aptitude Battery (ASVAB). Four components of the ASVAB, work knowledge, arithmetic reasoning, paragraph comprehension, and mathematics knowledge testing, are used to compute the Armed Forces Qualification Test (AFQT) raw score, which is then converted into a percentile score range and category (see Table 3). Based on aptitude alone, all potential recruits with an AFQT score in the 50 or above percentile range are qualified for military service and do not require an aptitude waiver.<sup>8</sup> Table 3, AFQT Category and Percentile Score Range, is grouped into categories ranging from I–V. The Navy's preferred market is individuals scoring in Category IIIA (commonly referred to as CAT IIIA) or higher. The market depth analysis focuses on the percentage of 17–24-year-olds who would be classified as CAT IIIA or higher; CAT V are ineligible, [6].

**Table 3: AFQT Category and Percentile Score Range**

<b>AFQT Category</b>	<b>Percentile Score Range</b>
I	93-99
II	65-92
IIIA	50-64
IIIB	31-49
IV	10-30
V	1-9

#### II.1.g.1 ACT and AFQT

In response to the need for statewide educational assessments of high school students, as of 2015–2016, 20 states have adopted the ACT as a statewide assessment instrument, administered to all high school students.<sup>9</sup> These 20 states report ACT scores by school district and or high school. States in 2015–2016 requiring an exam to graduate are provided in an interactive breakdown by Testing Plans from Education Newsweek, [18].

Using the mapping in Table 4, individuals with an ACT composite score of 18 or higher would have an equivalent AFQT raw score of 50 and categorized as CAT IIIA. Caution should be observed when using linkages suggested by Table 4, unless assessments are highly correlated, since accuracy over time will wear due to differing motivations, content, and purposes [20]. The composite ACT mean and standard deviation for each school district within a recruiting station market area were used to estimate the probability that an individual

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<sup>8</sup> See [6] for overall aptitude requirements for enlistment.

<sup>9</sup> <http://blog.prepscholar.com/which-states-require-the-act-full-list-and-advice> mentioned in reference [19]

would fall into the CAT IIIA or higher upper mental group. The school district standard deviation and mean high school ACT composite score are used to calculate the likelihood that an individual from a given high school would have an aptitude of CAT IIIA or higher. The probability value is applied to the 17–24-year-old market depth to estimate the number of youth who are likely to be classified as CAT IIIA or higher.

**Table 4: AFQT-ACT-SAT Mapping<sup>10</sup>**

<b>AFQT</b>	<b>ACT</b>	<b>SAT—Math</b>	<b>SAT—Verbal</b>
10-30	10-12	326-375	300-349
31-49	13-17	376-449	350-399
50-64	18-20	450-499	400-475
65-92	21-25	500-649	476-599
93-99	26-33	650-800	600-750

### **II.1.g.2 Alternative Assessments for Aptitude**

States that do not use ACT as a high school assessment exam use a variety of test instruments to assess student performance. Information regarding the type, scoring, and content of state-specific test instruments is available through each state’s department of education. A conversion mapping, such as that given in Table 4, of state-specific high school assessments to AFQT categories (Table 3), is not available. Given that an AFQT conversion table is not available and that these states use a variety of assessment instruments, estimating aptitude will require an understanding of each state’s specific assessment scoring scales.

As a proof of concept, the Scholastic Achievement Test (SAT) and Massachusetts Comprehensive Assessment System (MCAS) are considered as proxies to estimate market depth based on aptitude. MCAS is administered to all high school students, typically in the 10<sup>th</sup> grade, and is a requirement for conferring of a high school diploma. In contrast, the SAT is not required for conferring of a high school diploma, and test takers are likely to be college-bound students. Aptitude estimates using only the SAT is likely to overstate the number of CAT IIIA 17–24-year-olds.

To determine the feasibility of using SAT and MCAS, this proof of concept focuses on Worcester County, Massachusetts. The Worcester recruiting area is largely confined to Worcester County. The zip code area assignments do not overlap into neighboring states, and of the 53 zip codes that comprise the Worcester county recruiting area, 47 are within the Worcester county school district.

### **II.1.g.3 SAT and Aptitude**

Massachusetts Department of Education reports, for 2015, that the SAT was administered to approximately 50.1 thousand students. Statewide, for 2015, the MCAS was administered to 71 thousand high school students, with Worcester County school district reporting 3,435 SAT test takers.<sup>11</sup> Given the relatively high proportion of SAT to MCAS test takers, it is assumed that the SAT is a feasible proxy for aptitude.

The SAT is comprised of three components, math, reading, and writing, with a maximum possible score for each section of 800. Worcester County school district reports mean SAT high school test scores for each component. For 2015, this includes the average high school SAT test scores for all three components.

<sup>10</sup> In reference [9], conversion of AFQT-ACT-SAT is available at [http://www.usd115.org/pages/uploaded\\_files/ASVAB%20Attachment.pdf](http://www.usd115.org/pages/uploaded_files/ASVAB%20Attachment.pdf). Actual citation source unknown.

<sup>11</sup> Worcester County School District does not report enrollment numbers for 10<sup>th</sup>, 11<sup>th</sup>, or 12<sup>th</sup> grade.

However, in 2016, the reading and writing components of the SAT were combined into a single composite test, reading.<sup>12</sup> To estimate the number of CAT IIIA eligible, two approaches using SAT are considered: the combined sum of the SAT math and reading score and strictly SAT math score.

Of the 38 high schools in Worcester County, 27 schools report SAT scores.<sup>13</sup> From the reporting high schools, the mean and standard deviation for the combined SAT math and verbal are used to compute the probability that an individual would be categorized in the upper mental group. Worcester County SAT summary statistics are provided in Table 5. Table 4 provides the mapping of AFQT scores to the SAT math and reading or equivalently verbal scores. The AFQT score of 50, the minimum score for CAT IIIA, differs for SAT Math, with a minimum of 450, and for SAT Verbal, with a minimum of 400. Individuals with a combined SAT math and verbal score of 850 are categorized as CAT IIIA. The probability value is applied to the 17–24-year-old market depth to obtain the QMA based on aptitude. Similarly, the SAT Math score mean and standard deviation are used to compute the QMA based on aptitude.

**Table 5: Worcester County SAT Summary Statistics**

<b>Massachusetts Department of Education Reporting High Schools, N= 339</b>		
	<b>SAT Math</b>	<b>SAT Reading</b>
Mean	505.34	495.041
Standard Deviation	61.3662	63.916
<b>Worcester County School District, N = 27</b>		
	<b>SAT Math</b>	<b>SAT Math &amp; Reading Combined Score</b>
Mean	497.88	1047.5185
Standard Deviation	57.2829	111.1742
<b>Correlation</b>		
Reading and Math	0.956*	
*Correlation is significant at 0.01 level, N = 339.		

### II.1.g.4 MCAS and Aptitude

MCAS is the statewide standards-based assessment program. Students must achieve a minimum scaled score achievement level of “Proficient” in English Language Arts, Mathematics, and Science and Technology portions of the Grade 10 test to meet the Massachusetts Department of Education competency determination. The Massachusetts Department of Education does not report MCAS scaled scores, only reporting the percentage and number of students by high school in each achievement level. The MCAS Raw scores are scaled to achievement levels (see Table 6). Students who achieve a scaled score of 240 or higher are deemed Proficient in that subject area.

<sup>12</sup> Reading score is the prior 2005 verbal score.

[http://www.collegeboard.com/prod\\_downloads/counselors/hs/sat/resources/handbook/4\\_InterpretingScores.pdf](http://www.collegeboard.com/prod_downloads/counselors/hs/sat/resources/handbook/4_InterpretingScores.pdf)

<sup>13</sup> National Center for Educational Statistics, 2015-2016, <https://nces.ed.gov/ccd/schoolsearch/>

**Table 6: MCAS Scaled Score Range Achievement Level<sup>14</sup>**

<b>Achievement Level</b>	<b>Range</b>
260-280	Advanced
240-258	Proficient
220-238	Needs Improvement
200-218	Warning/Failing

The percentage and number of students in each achievement level are reported for each test. For some Worcester County high schools, the percentage of students in achievement levels Proficient and Advanced relative to Needs Improvement or below does not vary across tests. For other schools, there is a significant difference in percentage of students who tested Proficient and Advanced across the three tests. To meet the competency determination, students must be Proficient in all three subject areas. For Worcester County school district, 78.44% of students, on average, tested as Proficient or Advanced on at least one test. Similarly, the mean percent of 75.22%, is the percentage of students who achieved Proficient or Advanced on the MCAS math assessment (see Table 7).

**Table 7: Worcester County School District MCAS Achievement Levels Proficient and Advanced**

	<b>Percentage of Students in Achievement Levels Proficient and Advanced</b>
English Language Arts, Math, and Science	78.44%
Math Only	75.22%
N= 31 High Schools	

Given the construct and limitations of the MCAS data, two approaches for capturing aptitude are considered. First, using the combined percentage for Proficiency and Advanced across all three tests, the average percentage of students who would have achieved a score of Proficient or higher on at least one test subject was calculated. The mean combined percentage is used to compute the 17–24-year-old aptitude market depth. A second approach for estimating aptitude only considers the mean percentage of students Proficient and Advanced based on MCAS math. Both the combined and MCAS math mean percentage proxies should be interpreted as the percentage of the market depth that scored Proficient/Advanced on at least one MCAS assessment.

From the data sources, QMA estimates are computed for each quality standard and are applied to zip code, 17–24-year-old 2015 census counts for the following recruiting districts: Mississippi Ridgeland, Colorado Lakewood, Colorado Littleton, and Massachusetts Worcester.

<sup>14</sup> See Massachusetts Department of Education raw score to scale conversion, <http://www.doe.mass.edu/mcas/>.

### III. Methodology

The methodological approach in estimating zip code level market depth of 17–24-year-olds qualified for military service entails a two-step approach. In the first step, zip code level population counts are extracted from the American Community Survey (ACS). In step two, the mean percentage for a given attribute is applied to the 17–24-year-old population to determine their market depth; that is, the number of 17–24-year-olds that would be qualified to serve in the military based on a given attribute.

The ACS is updated annually with population counts available at the zip code level and various demographic characteristics of the population such as age, gender, and race. However, the ACS population counts are grouped by age ranges; therefore, individual age counts for the 17–24-year-old populations are not directly available. The ACS age groupings vary across demographic characteristics. For the aggregate population, regardless of age, race, or gender, the age groupings by zip code are grouped by 15–19 and 20–24-year-olds. With regard to the age groupings by race, the age ranges are 15–17, 18–19, and 20–24, and by gender, the age ranges are 15–17, 18–19, 20, 21, and 22–24.<sup>15</sup> As described below, the proportion of the population age 15 and 16 was extracted from the ACS age groupings in order to derive the 17–24-year-old population.

Population projections by state, region, and individual age are available from the U.S. Census.<sup>16</sup> Using the 2015 State population projections for single year age, i.e., 15-year-old, the proportion of 15 through 19-year-olds are calculated. Proportions are the ratio of single year divided by the summation of the relevant age range. Single year proportions are applied to the ACS age groupings to estimate the population count for a specific age. To illustrate, the 2015 State of Mississippi resident count for 17-year-old is 40,345, with the total 15–19 resident population of 202,157. The value of 0.1995 is the proportion of the 2015 Mississippi 17-year-old resident population calculated (see Table 8).

The estimated proportion is applied to the ACS 5-Year Estimate age groupings to extract out the 17-year-old population count. Similarly, the single year proportion estimates are applied to ACS age groupings for 15-19. After applying the proportion estimates for single year age counts, the 17–19-year-old counts are then added to the 20–24 age group ACS counts to obtain the total 17–24-year-old resident population by zip code.

**Table 8: Mississippi Proportion Projections of Population by Single Year<sup>17</sup>**

2015	Proportions
Proportion of 15-year-old	0.2076
Proportion of 16-year-old	0.2030
Proportion of 17-year-old	0.1995
Proportion of 18-year-old	0.1946
Proportion of 19-year-old	0.1951

Note: proportion values were truncated at the 4<sup>th</sup> digit right of the decimal.

As recruiting stations’ markets are comprised of multiple zip codes and counties, QMA values are estimated at the finest possible geographic level. Contingent on the State, the percentage of HSDG can be calculated at the zip code or county level. In other cases, such as drug use, the state-/region-specific value is used. The computation level for the seven QMA factors is given in Table 9.

<sup>15</sup> Margins of error (MOE) by age group are available for American Community Survey 5-Year Estimates. Population counts for 17–24-year-old population use the ACS 5-Year Estimate.

<sup>16</sup> Population projections for 2014–2060 are based on 2013 population estimates. In some cases, such as Tennessee, population projections are provided by the State and show resident population counts at the county level.

<sup>17</sup> State-specific proportion estimates based on single year resident population were done for Colorado and Massachusetts. Not shown.

**Table 9: QMA Factors Computational Level**

QMA	Geographic Level
HSDG	County/School District/High School/race/gender
Aptitude/Upper Mental Group (UMG) <sup>18</sup>	County/School District/High School/race/gender
Obesity	State-reported High School obesity rates
Conduct	National, 10–17-year-old arrest violations
Drug	State by sub-region, illicit drug use 12 years or older
Dependents	National
Disability	State/16–20-year-old/HS Diploma/gender/race

The number of qualified military youth is calculated for each of the seven QMA factors at the zip code level. Applying each QMA factor to the total 17–24-year-old resident population yields the 17–24-year-old net market depth; that is, the number of youth who would not be disqualified. For obesity, conduct, drug, dependents, and disability, the computed market depth is the number of individuals not disqualified by these factors. For HSDG and UMG, the computed market depth is the number of individuals who meet the standard and are qualified.

Table 10 illustrates the 17–24-year-old market depth for the Colorado Lakewood recruiting station. The total 17–24-year-old population is shown for each zip code, with a total zip code area resident population of 39,044.99. The 2015 four-year graduation rate for Denver and Jefferson Counties is 67.2% and 82.8%, respectively. Multiplying the zip-code market depth by county specific graduation rates gives the mean number of HSDG qualified for specific counties; summing the qualified HSDG gives the total market depth for specific RSIDs. This approach is also used for computing aptitude..

To find the number of resident youth in the upper mental group, UMG is computed using school district mean aptitude scores. Mean 2015 ACT scores for Denver and Jefferson Counties are 17.09 and 20.53, respectively. Assuming a normal distribution, with CAT IIIA equivalent ACT minimum score of 18, the probability of an individual in Denver County categorized in the upper mental group (UMG) is 0.3745 and 0.7852 for Jefferson County. Therefore, the number of UMG resident youth in zip code 80202 is 630.55 or 37.45% of 17–24-year-old market depth.

Table 10 illustrates the number of qualified youth for only two QMAs. A similar approach is used for all QMA attributes and is evaluated at the mean. Confidence intervals are provided for all QMA computations with the exception of dependents and conduct.<sup>19</sup> The 17–24-year-old market depth for each QMA is the number of qualified military assuming no waivers required.

<sup>18</sup> Upper Mental Group (UMG) and aptitude are used interchangeably throughout.

<sup>19</sup> See section II.1 for data limitations on Dependents and Conduct.

**Table 10: Colorado Lakewood High School Degree and UMG - Qualified Military Available**

<b>Zip Code</b>	<b>County</b>	<b>ZCTA*</b>	<b>17–24-Year-Old Population</b>	<b>HSDG</b>	<b>Aptitude/UMG</b>
80202	Denver, CO	80202	1683.71	1131.45	630.55
80203	Denver, CO	80203	2445.49	1643.37	915.84
80204	Denver, CO	80204	3986.89	2679.19	1493.09
80211	Denver, CO	80211	2348.91	1578.47	879.67
80212	Denver, CO	80212	1302.59	875.34	487.82
80214	Jefferson, CO	80214	2591.01	2145.36	2034.46
80215	Jefferson, CO	80215	1730.73	1433.04	1358.97
80218	Denver, CO	80218	1651.43	1109.76	618.46
80219	Denver, CO	80219	7312.10	4913.73	2738.38
80226	Jefferson, CO	80226	3877.48	3210.55	3044.60
80227	Jefferson, CO	80227	3360.02	2782.10	2638.29
80228	Jefferson, CO	80228	3692.32	3057.24	2899.21
80232	Jefferson, CO	80232	2137.54	1769.88	1678.40
80235	Jefferson, CO	80235	924.77	765.71	726.13
		<b>Totals</b>	<b>39044.99</b>	<b>29095.20</b>	<b>22143.86</b>

\* ZCTAs were created by the U.S. Census Bureau in 2000 as a unit of aggregation for tabulating summary statistics and are similar to zip codes; however, U.S. Postal Service Zip Codes can cross state and county boundaries [<http://www.zipboundary.com/zcta.html>].

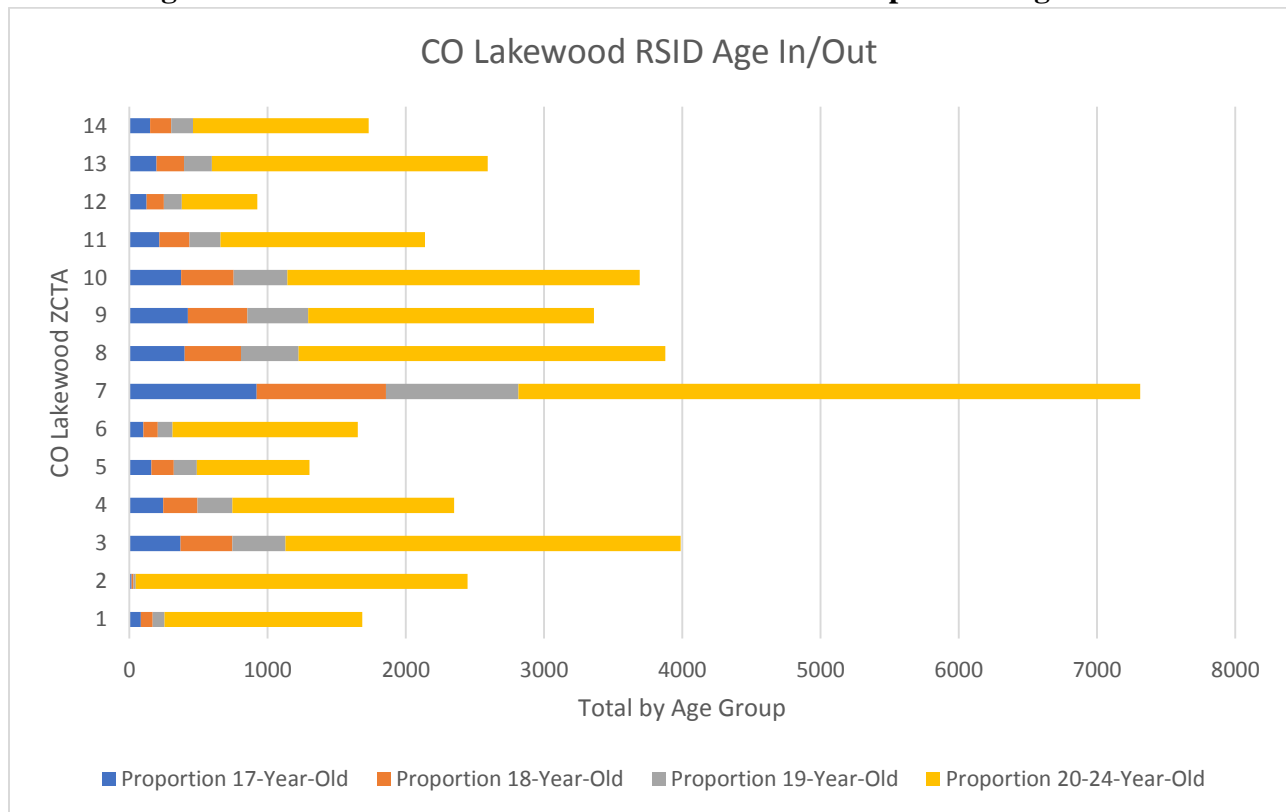
## IV. 17–24-Year-Old Market Depth: Visual Tools

### IV.1 Aging-In and Out of the 17–24-Year-Old Population

Navy Recruiting Command, in part, sets its recruiting goals based on estimated RSID population counts, changes in regional net migration, and birth rates, all of which have an impact on the number of 17–24-year-olds residing within an RSID. The U.S. Census provides annual forecast updates of age and regional population counts. Alternatively, using the market depth estimates discussed above, a less involved and time-consuming proxy for the projected size and movement over time of age groupings can be constructed. Simple visual tools for observing population movements over time can be used to modify recruiting goals or allocate resources as needed.

Based on 2015 ACS data, Figure 1 provides a visual of the market depth by age group for each zip code (vertical axis) for the Colorado Lakewood recruiting station. Comparing the 17, 18, and 19-year-old age groups to the 20–24-year-old resident population, the latter is significantly larger. Over time, the 20–24-year-old age group ages out, where the combined 17–19-year-old age group ages into the 20–24-year-old group, but the width differential for the combined 17–19-year-old age group is relatively smaller. The information displayed in Figure 1 offers an approximation of the depth of the 17–24-year-old resident population. While not provided herein, extended proxy forecasts for aging in/out can be readily constructed by adding in ACS population counts for the 10–14-year-old age groups.

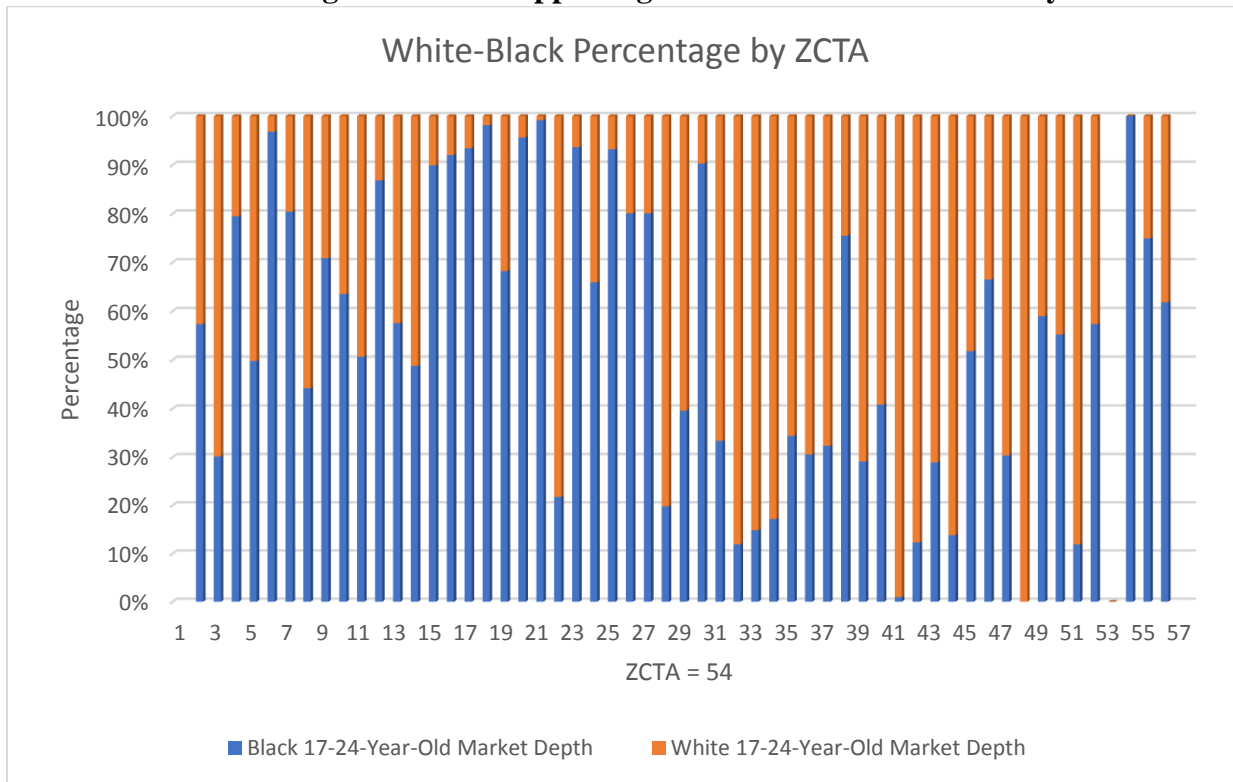
**Figure 1: 2015 Colorado Lakewood 17–24-Year-Old Population Age In/Out**



## IV.2 Race Distributions

Navy Recruiting Command is committed to ensuring race, ethnicity, and gender diversity within the military ranks as these distributions are reflective of the population at large. To meet diversity objectives, recruiters need information as to which markets, (i.e., regions, zip codes, counties) have the greatest diversity recruitment potential. The White-Black race distribution by zip code for the Mississippi Ridgeland station is illustrated in Figure 2. The vertical axis provides 54 zip codes in Mississippi while the horizontal axis gives the percentage of the population in either black or white race groups. Zip codes 1 through 27 show relatively large populations of blacks, whereas zip codes 28 through 51 are comprised largely of whites. Although recruiters are typically assigned to markets based on its size, consideration for race as compared to the overall market is an additional factor. This visual tool is easily constructed from the ACS data and can be useful in allocating recruiter efforts to meet diversity objectives. On a broader scale, the distribution can be expanded to Navy Recruiting District (NRD) levels.

**Figure 2: Mississippi Ridgeland Race Concentrations by ZCTA**



## V. Joint Probability Simulation

The QMA estimates in [5], which are used by the various services in estimating the number of U.S. youth that would either be disqualified or ineligible for military service, could have overlapping outcomes. To capture overlapping outcomes or the probability that an individual may be disqualified on two or more outcomes [5] applies a Multi-Variate Probit Model to estimate the probabilities for the seven disqualifying factors. Simulation modeling provides an alternative approach to estimating QMA probabilities. The advantage of a simulation is that it allows the data to be updated as it becomes available and its ease of use. The simulation analysis conducted for this effort uses Excel probability functions and VBA (Visual Basic Applications).

The simulation model estimates the joint probabilities based on four traits: high school degree graduate (HSDG), upper mental group (UMG) where UMG is defined as CAT IIIA or higher, obesity, and conduct.<sup>20</sup> Note: UMG and “aptitude” are used interchangeably throughout this report. For each trait, the user sets the preferred distribution, the total number of trials or draws, and samples per trial. Depending on the probability model selected, success value, mean, and standard deviation are set.

Four probability distributions are coded into the simulation: Normal, Uniform, Bernoulli, and Poisson.

1. For the Normal distribution, input mean and standard deviation must be specified. The input mean and standard deviation are obtained from the source data. An additional input parameter, “success,” must be specified by the user. For the normal distribution, “success” is the minimum desired value and for all simulations was set at the equivalent CAT IIIA minimum cut score (see Table 4). For any given trial, the “success” parameter sets the value to determine (count) the number of observations that exceed the parameter, where trials greater than or equal to the parameter are counted as a “success.”
2. For the Bernoulli distributions, the user sets the probability of success. The probability of success is determined if an observation (individual) is observed to exceed the input parameter “probability of success.” The probability of success is the value if the trait is not observed (e.g., the trait of obesity is not observed).
3. The Uniform distribution is a discrete probability distribution, where the probability remains constant or uniform throughout the sample. The input variable “success” sets the probability of not observing a given trait (e.g., no conduct issues observed).
4. The Poisson distribution is a discrete probability distribution, used typically for probability distributions over time, space, and distance. The user sets the input variable and the mean.

The simulation model “creates” the number of samples per trial with each trial or individual observed with the four traits, HSDG, UMG, obesity, and conduct. For each trial, the model “creates” a number of individuals based on the value set in “samples per trial.” For each of the traits, the individual is either “qualified” or “unqualified”. If the individual is qualified, the model increments the cell for that trait and that trial by one.

The number of qualified individuals for each trait is divided by the total sample size for a given trait to get the percentage qualified. The overall mean and standard deviation for each trait are obtained using the entire simulated sample for each trait. Joint probabilities are calculated in the same manner and are the likelihood that an individual is qualified for military service based on two or more traits.

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<sup>20</sup> With simple modifications to the Excel VBA code, additional traits can be added to the simulation.

The simulated probabilities shown in Tables 11–14 are the likelihood that an individual is qualified for military service, based on 10,000 trials.<sup>21</sup> (Note: The number of simulation trials is set by the user.) In our analysis, 10,000 trials were used, and it was verified that additional trials have little to no effect on the calculated probability. The simulation run times are between 30 seconds to a few minutes, depending on parameters. The results from Tables 11–14 assumed a normal distribution for UMG, since it has a ratio scale where the mean, mode, and median are nearly equal, and a Bernoulli distribution for HSDG, obesity, and conduct, since those outcomes are typically a discrete choice of two outcomes (i.e., “yes” has an HSDG or “no” does not have an HSDG). The input parameters, mean, standard deviation, or probability of success, were calculated from the finest possible source: school district, county, region, or state.

Mississippi Ridgeland is comprised of eight counties. Simulated probabilities shown in Table 11 are the likelihood that an individual in Copiah County and Yazoo County are qualified for military service by trait(s). The required input parameters for conduct and obesity are only available at the state level; therefore, both Copiah and Yazoo Counties use the identical input parameter value. For HSDG and UMG, the input values were calculated at the school district level, yielding the differences in output probabilities for Copiah and Yazoo Counties.

For Copiah County, the probability that an individual is qualified based on an aptitude of CAT IIIA or higher and a high school degree (i.e., UMG & HSDG) is 0.4582. The Yazoo County result for UMG & HSDG is 0.0509. This probability reflects high school graduation rates and ACT scores well below the state average. Similarly, the probability an individual has a high school degree and no conduct record (i.e., HSDG & Conduct) is 0.7386 for Copiah County and 0.65 for Yazoo County.

**Table 11: Simulated Probabilities: Mississippi Ridgeland**

Trait	Copiah, MS		Yazoo, MS	
	Average	Std Dev	Average	Std Dev
HSDG	0.8030	0.0391	0.7066	0.0452
UMG	0.5706	0.0494	0.0722	0.0258
Obese	0.8105	0.0394	0.8111	0.0392
Conduct	0.9199	0.0269	0.9199	0.0274
UMG & HSDG	0.4582	0.0495	0.0509	0.0219
HSDG & Obese	0.6511	0.0475	0.5733	0.0490
HSDG & Conduct	0.7386	0.0432	0.6500	0.0474
UMG & Obese	0.4625	0.0501	0.0584	0.0232
UMG & Conduct	0.5249	0.0498	0.0663	0.0247
Obese & Conduct	0.7456	0.0437	0.7461	0.0440
UMG & HSDG & Obese	0.3716	0.0482	0.0412	0.0196
UMG & HSDG & Conduct	0.4214	0.0489	0.0468	0.0209
UMG & Obese & Conduct	0.4255	0.0495	0.0537	0.0224
HSDG & Obese & Conduct	0.5989	0.0488	0.5273	0.0497
UMG & HSDG & Obese & Conduct	0.3418	0.0472	0.0378	0.0188

Mississippi Department of Education reports graduation rates and ACT scores by school and school district but does not report graduation rates or ACT scores by race or gender. However, the Colorado Department of

<sup>21</sup> The user sets the number of trials. Incrementing the number of trials beyond 10,000 showed no substantial change in simulated probabilities.

Education reports graduation rates and ACT scores by race and gender, allowing for further refinement of the simulated probabilities.

Colorado Lakewood is comprised of two counties, Denver and Jefferson. Obesity and conduct are state level statistics and are therefore equivalent between the two counties. Colorado Lakewood has a total of 71 high schools with 42 high schools within the Denver County school district and 29 in Jefferson County. The input parameters, the mean and standard deviation, for high school graduation rates and ACT were calculated from the total number of high schools within the respective counties. Simulated probabilities for Denver and Jefferson Counties are given in Table 12. Input parameters for high school graduation rates and ACT are based on total students and do not control for race or gender. Within the same recruiting station market, the simulation shows that for UMG & HSDG there is a 40-percentage-point difference between the two counties. As with Mississippi Ridgeland, the variation is attributed to substantial differences in graduation rates and aptitude across the two counties

**Table 12: Simulated Probabilities: Colorado Lakewood**

Trait	Denver County		Jefferson County	
	Average	Std Dev	Average	Std Dev
HSDG	0.6717	0.0467	0.8277	0.0375
UMG	0.3743	0.0479	0.7856	0.0411
Obese	0.8876	0.0313	0.8881	0.0315
Conduct	0.9199	0.0269	0.9201	0.0265
UMG & HSDG	0.2518	0.0433	0.6502	0.0479
HSDG & Obese	0.5962	0.0489	0.7353	0.0441
HSDG & Conduct	0.6179	0.0485	0.7616	0.0418
UMG & Obese	0.3320	0.0468	0.6977	0.0460
UMG & Conduct	0.3443	0.0468	0.7227	0.0446
Obese & Conduct	0.8165	0.0384	0.8171	0.0383
UMG & HSDG & Obese	0.2234	0.0415	0.5776	0.0495
UMG & HSDG & Conduct	0.2315	0.0419	0.5982	0.0489
UMG & Obese & Conduct	0.3053	0.0456	0.6419	0.0479
HSDG & Obese & Conduct	0.5485	0.0497	0.6766	0.0462
UMG & HSDG & Obese & Conduct	0.2055	0.0401	0.5314	0.0497

Listed in Table 13 are the simulated UMG & HSDG probabilities by race, controlling or race-specific graduation rates and ACT scores. Similarly, Table 14 provides the UMG & HSDG probabilities by gender, allowing for gender-specific graduation rates and ACT scores. There is a distinct difference in the probability for males and females for Jefferson County compared to Denver County, where there is virtually no difference (see Table 14). Consequently, it would be prudent to assign female recruiters to Jefferson County.

**Table 13: Colorado Lakewood Mean Simulation Probabilities by Race**

<b>Denver County</b>	<b>Black</b>	<b>Asian</b>	<b>American Indian</b>	<b>White</b>	<b>Hispanic</b>
UMG & HSDG	0.2382	0.31	0.1776	0.6088	0.2356
Standard Deviation	0.0429	0.0463	0.0377	0.049	0.0427
<b>Jefferson County</b>	<b>Black</b>	<b>Asian</b>	<b>American Indian</b>	<b>White</b>	<b>Hispanic</b>
UMG & HSDG	0.2978	0.3447	0.2450	0.67	0.5917
Standard Deviation	0.0453	0.0477	0.0427	0.047	0.0486

**Table 14: Colorado Lakewood Simulation Probabilities by Gender**

	<b>Denver County</b>		<b>Jefferson County</b>	
<b>Males</b>	<b>Average</b>	<b>Std Dev</b>	<b>Average</b>	<b>Std Dev</b>
UMG & HSDG	0.2321	0.0419	0.29395	0.0457
<b>Females</b>				
UMG & HSDG	0.2707	0.0438	0.6841	0.046

Based on UMG and HSDG, there is a marked difference in quality between Jefferson County males and females (see Table 14), and Hispanics and whites in Denver County (see Table 13). These differences in geographic area, race, and gender extend to all four recruiting areas. As an indicator of market quality, the simulated probabilities can be used to inform recruiter resource allocation decisions and market depth within a recruiting area.

Given the four traits, fifteen possible probability combinations can be estimated. For all recruiting stations discussed in this report, a full set of probabilities were estimated. The probabilities in [5] rely on sophisticated modeling techniques and sample data obtained from multiple sources. As an alternative, the simulation probabilities provide a good approximation, can be readily updated as data becomes available for key qualifiers, such as HSDG and UMG, can be estimated at the school district level and applied to specific zip codes.

## **VI. Market Depth and Qualified Military Available**

The market depth for age group 17–24 controlling for QMA estimate was calculated for four recruiting stations: Mississippi Ridgeland, Colorado Lakewood, Colorado Littleton, and Massachusetts Worcester. Recruiting stations were chosen based on geographic location, ACT as a high school assessment, and likely regional differences across quality standards. In comparison to national averages, relatively lower high school completion rates and aptitude test scores coupled with high obesity rates were the basis for choosing Mississippi Ridgeland. Given the likelihood of high rates of disqualifications, the proportion of the resident youth population ages 17–24 that are likely to be qualified for enlistment makes Ridgeland a difficult recruiting market.

Colorado Lakewood and Littleton are neighboring recruiting markets. While these stations do have unique zip code market areas of responsibility, there is overlap in the markets at the county level; both station’s recruiting areas include Jefferson and Denver Counties. Comparing QMA estimates based on school district HSDG and aptitude, the partial overlap in market areas allows for a comparison of depth and quality of the market. Conduct, disability, and dependents are relatively constant across geographic areas. This is a result of the limitations of the data discussed in Section II.

### **VI.1 QMA Estimates and Market Depth: Mississippi Ridgeland, Colorado Lakewood, and Colorado Littleton**

The military available by qualifying standards for Ridgeland, Lakewood, and Littleton are provided in Tables 15–20. There are significant differences in the QMA estimates across and within recruiting markets. The mean high school obesity rate in Mississippi is 18.9%, thus, only 81.1% of high school aged students meet DoD weight standards for enlistment. Statewide, the high school obesity rate in Colorado is 11.2%, significantly lower. In contrast, illicit drug use in Colorado is 7.96 percentage points higher than reported illicit drug use in Mississippi. Considering obesity alone, as a percentage of the resident youth population, the qualified military available would be smaller in Mississippi, 81.1%, as compared to Colorado, 88.8%. However, this result is reversed based on illicit drug use, with 91.2% of Mississippi youth and only 83.25% of Colorado youth meeting the drug quality standard (see Tables 15–17).

While there are marked differences in HSDG and aptitude across recruiting areas, these differences are also observed within a recruiting market. There is a 23-percentage-point difference in high school completion between Mississippi Madison and Warren County school districts (see Table 15). Differences in high school graduation rates are also observed for Colorado Lakewood and Littleton (see Tables 16 and 17).

For 2015, the Denver County school district reports 67.2% high school completion as compared to Douglas County of 90.1% (see Table 17). Differences in aptitude are also observed across county school districts. Based on composite ACT scores, the percentage of upper mental group high school students is substantially lower in Denver County, 37.45%, as compared to Arapahoe County, 92.36% (see Table 17).

Quality differences and therefore qualified military available are further magnified when computing the probability that an individual has a high school diploma and is in the upper mental group. To illustrate the joint probability of high school diploma graduate (HSDG) and upper mental group (UMG), Denver County has 0.2518 as compared to 0.6502 in Jefferson County. For recruiters assigned to Colorado Lakewood, these probabilities are an indicator of market productivity and where best to focus recruiting efforts. Simulated probabilities are discussed further in section V.

**Table 15: Mississippi Ridgeland QMA Estimates**

*Percentages used to determine the number of qualified military available aged 17–24*

School District	HSDG – 4 Year	
Copiah	80.3%	
Hinds	80.6%	
Madison	88.9%	
Rankin	85.4%	
Scott	81.3%	
Simpson	71.2%	
Warren	65.9%	
Yazoo	70.7%	
Aptitude/UMG CAT IIIA or higher	50%	
		MOE
Obesity	81.1%	1.9%*
Conduct	92.01%	
Drug	91.21%	-1.98%, +2.5%*
Dependents	98%	
Disability	93.2%	.61%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table 16: Colorado Lakewood QMA Estimates**

*Percentages used to determine the number of qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County
	67.2%	82.8%
Aptitude/UMG CAT IIIA or higher	37.45%	78.52%
		MOE
Obesity	88.8%	1.1%*
Conduct	92.01%	
Drug	83.25%	-2.26%, +2.54%*
Dependents	98%	
Disability	95%	1.77%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table 17: Colorado Littleton QMA Estimates**

*Percentages used to determine the number of qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County	Arapahoe County	Douglas County
	67.2%	82.8%	88.1%	90.1%
Aptitude/UMG CAT IIIA or higher	37.45%	79.1%	92.36%	88.1%
		MOE		
Obesity	87.7%	1.1%*		
Conduct	92.01%			
Drug	83.25%	-2.26%, +2.54*		
Dependents	98%			
Disability	95%	1.77%**		

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

Tables 18–20 represent the calculated market depth for the age group 17–24 by quality standard. The “QMA Market Depth” provided in each table are non-overlapping market depth counts. The QMA estimates are applied to the 17–24-year-old zip code population and then summed up to compute the qualified military available by quality standard. To illustrate, after accounting for the single year proportions, the Mississippi Ridgeland total population aged 17–24 is 78,233.89 (Table 18). The qualified military available accounting for HSDG only is estimated at 62,977.21. The QMA diminishes substantially when considering only aptitude, with approximately 39,111.94 of the market in the UMG. Tables 18–20 provide the summed QMA Market Depth for Ridgeland, Lakewood, and Littleton.

**Table 18: Mississippi Ridgeland Market Depth by Individual QMA Estimate**

<b>Total 17–24-Year-Old</b>	78223.87
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	62977.21
Aptitude	39111.94
Obesity	63439.57
Conduct	71973.8
Drug	71348.01
Dependents	76659.41
Disability	72904.66

**Table 19: Colorado Lakewood Market Depth by Individual QMA Estimate**

<b>Total 17–24-Year-Old</b>	39044.99
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	29095.19
Aptitude	22143.85
Obesity	34671.95
Conduct	35925.29
Drug	32504.95
Dependents	38264.08
Disability	37092.73

**Table 20: Colorado Littleton Market Depth by Individual QMA Estimate**

<b>Total 17–24-Year-Old</b>	37503.51
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	31602.41
Aptitude	28594.44
Obesity	33303.11
Conduct	33303.11
Drug	31221.66
Dependents	36753.43
Disability	35628.32

## VI.2 QMA Estimates and Market Depth: Massachusetts Worcester

There are 30 states that use a state test instrument other than ACT as a high school assessment. To estimate the UMG market depth, an alternative metric for aptitude had to be identified contingent on state available assessment data. Massachusetts Worcester recruiting market is an ideal test case as its geographic market is limited largely to one county, Worcester, does not overlap into neighboring states, and is a composite of urban, suburban, and rural populations.

Table 21 summarizes the Massachusetts Worcester qualified military available for two standards, high school graduate and aptitude. Table 21 displays the four alternative aptitude metrics considered in determining the number of resident youth who are likely to be categorized in the upper mental group. The SAT Math estimate of 79.71% is the percentage of high school students scoring higher than 450 on the SAT Math section. Similarly, the SAT Math and Reading percentage, 96.21%, is the percentage of high school students with a combined SAT math and reading score of 850.

The minimum requirement for graduation is a score of Proficient on all three sections of the MCAS. For the Worcester County school district 78.44% of 10<sup>th</sup> graders achieved a score of Proficient or Advanced. Likewise, 75.22% of 10<sup>th</sup> graders tested Proficient or Advanced on the MCAS Math assessment. While all four-aptitude metrics are used to compute market depth, the MCAS composite score, which is designed to measure student proficiency, is likely the best representative metric as it is not prone to the sample bias associated with the use of SAT scores and the assessment tests as part of the Armed Services Vocational Aptitude Battery (ASVAB) test components, [16].

**Table 21: Massachusetts Worcester QMA Estimates**

*Percentages used to determine the number of qualified military available aged 17–24*

<b>QMA</b>	
HSDG	87.54%
Aptitude SAT Math	79.71%
Aptitude SAT Math + Reading	96.21%
MCAS ELA/Math/SCI	78.44%
MCAS Math	75.22%

For Massachusetts Worcester, the qualified military available is reported based on HSDG and aptitude/UMG. See Table 22.

**Table 22: Massachusetts Worcester  
Market Depth for HSDG and Aptitude/UMG QMA Estimate**

<b>Total 17–24-Year-Old</b>	70946.94
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	62106.95
Aptitude SAT Math	56551.81
Aptitude SAT Math + Reading	68258.05
MCAS ELA/Math/SCI	55650.78
MCAS Math	53366.29

Detailed zip code market depth available for age group 17–24 by qualifying factor is provided in Appendix A for Mississippi Ridgeland. For Lakewood and Littleton, Colorado, market depth for the 17–24 population is provided in Appendix B and Appendix C and includes QMA market depth counts and estimates by race and gender. Appendix D includes total Worcester market depth counts and market depth by HSDG and UMG.

## VII. Accessions

Setting aside DoN policy regarding the physical presence of recruiting stations, placing recruiters in high yielding markets maximizes recruiter productivity and provides cost-effective allocation of resources. The number and quality of accessions are suggestive of the depth of the market; whether a market is exhausted or has untapped capacity. From the FY15 NRC Accession data, the number of accessions, conduct and non-conduct waivers, mean accession AFQT, and recruit age for each recruiting station are given in Tables 23–26.

As an indicator of market yield, the number of accessions per county for Colorado and Massachusetts recruiting stations are provided in Tables 24–26. Matching the home of record zip code field captured in the accession data to the identical high school zip code, Mississippi Ridgeland accessions are reported at the high school level (see Table 23). The differences in accessions, most notably the area of Jefferson County assigned to Lakewood and that portion assigned to Littleton, suggest that market yields within counties can vary. This variability is likely attributed to high school quality.<sup>22</sup>

In terms of the 17–24-year-old resident population, Massachusetts and Mississippi have comparable population sizes, 70,946.62 and 78,223.89, respectively. However, Mississippi yields at over twice the rate of Massachusetts with 68 FY15 accessions as compared to 35 FY15 accessions for Massachusetts. Both recruiting stations on average accessed individuals in the CAT II UMG; however, accessions for Worcester are younger (see Table 26). The mean age for Warren Central and Madison Central High Schools in Ridgeland, e.g., 22 and 27-years-old, is an indicator that the higher yielding sub-market is the college age population and not current or recent high school graduates. This is also suggestive that high schools may have untapped capacity. The reverse conclusion can be made for Worcester with a mean age of 20-years-old.

The population sizes are likewise similar for Colorado Lakewood and Littleton; however, Littleton’s FY15 accessions are twice that of Lakewood. Significantly lower graduation rates and aptitude scores, see Appendices B and C, are likely key driving factors in recruiting qualified individuals from Denver County (Lakewood recruiting station). Comparing the mean AFQT scores, Lakewood and Littleton accessed, on average, individuals in CAT II upper mental group. The aptitude quality of accessions suggests that the market is not exhausted, and the accession goal could be expanded and met by actively recruiting CAT IIIA.

While the qualified military available computed do not consider the impact of waivers on market depth, the number and type of waivers are an indicator of market quality and the investment of time recruiters must make accessing from these markets as they assist in obtaining waivers. For simplicity, waivers are grouped into conduct and non-conduct categories and are reported in Tables 23–26.<sup>23</sup> Non-conduct are waivers given based on circumstances related to the Future Sailor, but not a direct result of bad behavior or mistakes by the Future Sailor, such as two dependents the Future Sailor is financially responsible for. Conduct waivers pertain to behaviors committed by Future Sailors, but have been satisfactorily handled, such as a minor traffic offense. Approximately 20.5% of Lakewood accessions required a (non)-conduct waiver as compared to 13.79% for Littleton. Taken together, relatively lower high school graduation rates and aptitude scores and the high percentage of required waivers are an indicator of the difficulty in recruiting in the Lakewood market.

Combining the 17–24-year-old population counts, QMA estimates, and accession data, it is possible to identify zip codes that exhibit characteristics that are informative for recruiting goals and market depth. For example, approximately 5,689 residents aged 17–24-years-old reside in Yazoo County, Mississippi, with graduation rates of 70.7% and ACT mean score of 17, which is significantly below regional averages. For FY15, no accessions

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<sup>22</sup> [http://www.jeffcopublicschools.org/about/district\\_profile](http://www.jeffcopublicschools.org/about/district_profile) There are 17 high schools in Jefferson County.

<sup>23</sup> DoD conduct standards are discussed in section II and [17].

are reported for Yazoo County. As the likelihood of a qualified accession from this sub-market is low, Yazoo County is a candidate for virtual recruiting.<sup>24</sup>

**Table 23: Mississippi Ridgeland FY15 Accessions**

<b>High School (Based on Home of Record Zip Code)</b>	<b>FY15 Accessed</b>	<b>Mean AFQT</b>	<b>Mean Age</b>	<b>Conduct Waivers</b>	<b>Non- Conduct Waivers</b>
Madison Central HS	1	81	27	0	0
Warren Central HS	4	78	22	0	1
Yazoo City HS	0	-	-	-	-
<b>FY15 Total Accessions</b>	<b>68</b>				

**Table 24: Colorado Lakewood FY15 Accessions**

<b>Home of Record</b>	<b>FY15 Accessed</b>	<b>Mean AFQT</b>	<b>Mean Age</b>	<b>Conduct Waivers</b>	<b>Non- Conduct Waivers</b>
Denver County or other	30	69	21	0	5
Jefferson County	4	73	24	0	2
<b>FY15 Total Accessions</b>	<b>34</b>				<b>7</b>

**Table 25: Colorado Littleton FY15 Accessions**

<b>Home of Record</b>	<b>FY15 Accessed</b>	<b>Mean AFQT</b>	<b>Mean Age</b>	<b>Conduct Waivers</b>	<b>Non- Conduct Waivers</b>
Denver County	6	74	18	0	1
Jefferson County	13	76	20	1	3
Arapahoe County	15	73	20	0	2
Douglas County	12	74	20	0	1
<b>FY15 Total Accessions*</b>	<b>46*</b>			<b>1</b>	<b>7</b>
*Reported FY15 Accessions were 58. Only 46 accessions show home of record within one of the four counties. The remaining 12 accessions have home of record outside of RSID.					

<sup>24</sup>The probability of UMG and HSDG for Yazoo County is 5%. See simulation results in section V.

**Table 26: Massachusetts Worcester FY15 Accessions**

<b>Home of Record</b>	<b>FY15 Accessed</b>	<b>Mean AFQT</b>	<b>Mean Age</b>	<b>Conduct Waivers</b>	<b>Non-Conduct Waivers</b>
Worcester County	33	74.72	20.24	2	2
FY15 Total Accessions*	33			2	2
*Worcester recruiting area includes Hampden and Middlesex Counties. There are no FY15 accessions reported from these counties.					

## VIII. Conclusion

The 2013 DoD QMA Study, [5], estimated the percentage of the population aged 17–24 that would be qualified for military service. The percentage estimates are reported by individual and overlapping quality standards. DoD, [5], concluded that “*only 29% of today’s youth are eligible to serve*” without a waiver. The 2013 DoD QMA estimates continue to be used in 2017 to set recruiting goals and policies and to implement programs. The 2013 estimates, however, are based on 2013 or earlier national level data. As a result, for any given geographic area, applying these outdated national estimates to zip code populations may over or understate the market depth. Further, the estimates are not informative as to the depth of a market, that is, whether a market is depleted, but also to the specific characteristics of sub-markets (i.e., community college, specific high school, etc.) with relatively high yield potential that are not being identified.

The methodological approach discussed herein improves upon the current QMA estimates by employing the most recent available data, at the finest possible geographic level to compute QMA by zip code. Within and across markets, notable QMA differences are observed. The data used to estimate QMA are available from publicly available sources and are updated annually, allowing for timely updating and essential for informing recruiting goal allocations and allocating recruiter time and effort resources to the most productive markets.

Extensions of this effort would include validating the simulation probabilities discussed in section V, refining the conduct and dependent estimates using geographic-specific data, and incorporating cohort demographic variables.

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## Data Sources

<b>Data Sources</b>
<b>Population</b>
Zip Code Tabulation Areas (ZCTA) and Zip Code Crosswalk <a href="https://www.census.gov/geo/reference/zctas.html">https://www.census.gov/geo/reference/zctas.html</a>
2015 American Community Survey, population by zip codes, <a href="https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml">https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml</a>
U.S. Census Population Projections, <a href="https://www.census.gov/programs-surveys/popproj.html">https://www.census.gov/programs-surveys/popproj.html</a>
<b>High School Degree Graduates (HSDG)</b>
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NSDUH Substate ShapeFile2012 <a href="https://www.samhsa.gov/data/population-data-nsduh/reports?tab=34">https://www.samhsa.gov/data/population-data-nsduh/reports?tab=34</a>
<b>Conduct</b>
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Cornell University, Institute of Employment and Disability, <a href="http://disabilitystatistics.org/">http://disabilitystatistics.org/</a>
<b>Dependents</b>
Qualified Military Available briefing, OUSD (P&R)/Military Personnel Policy, DoD QMA Study 2013, [5]
<b>Accessions FY15</b>
Navy Recruiting Command, Millington, TN, FY15 Accessions, PRIDE MOD II

**Evaluation Metric**

<b>QMA</b>	<b>Statistic Used for Estimating Market Depth</b>
HSDG	Evaluated at 4-year graduation rate mean by county/district/HS/gender/race, 95% confidence intervals, all RSIDs
Aptitude/UMG	Evaluated at mean ACT or proxies by mean SAT/State HS assessment exam, 95% confidence intervals were applicable
Obesity	Evaluated at mean, 95% confidence interval, all RSIDs
Conduct	Evaluated at mean of 7.99% - applied to all RSIDs
Drug	Evaluated at NSDUH-reported State/region mean, 95% confidence interval, all RSIDs
Dependents	DoD QMA estimate of 2%, [5], all RSIDs
Disability	Evaluated at mean, 90% confidence interval, all RSIDs

**Evaluation Metric Geographic Level**

<b>QMA</b>	<b>Geographic Level</b>
HSDG	County/School District/High School/race/gender
Aptitude/UMG	County/School District/High School/race/gender
Obesity	State-reported High School obesity rates
Conduct	National, 10–17-year-old arrest violations
Drug	State by sub-region, illicit drug use 12 years or older
Dependents	National
Disability	State/16-20-year-old/HS Diploma/gender/race

## Appendix A

### Mississippi Ridgeland 2015

**Table A-1**  
**Total 17–24-Year-Old Population**

County	Zip Code	17–24-year-old Population
Copiah, MS	39077	905.87
Copiah, MS	39059	1276.87
Copiah, MS	39078	82.40
Copiah, MS	39083	1080.42
Copiah, MS	39191	905.87
Hinds, MS	39174	485.84
Hinds, MS	39041	442.64
Hinds, MS	39056	3338.97
Hinds, MS	39066	456.15
Hinds, MS	39154	2681.94
Hinds, MS	39170	1104.09
Hinds, MS	39175	576.69
Hinds, MS	39201	88.45
Hinds, MS	39202	1870.37
Hinds, MS	39203	1808.65
Hinds, MS	39204	2542.68
Hinds, MS	39206	2890.13
Hinds, MS	39209	3702.44
Hinds, MS	39211	2820.72
Hinds, MS	39212	3937.03
Hinds, MS	39213	2364.38
Hinds, MS	39216	239.83
Hinds, MS	39217	926.79
Hinds, MS	39272	1734.38
Madison, MS	39045	83.14
Madison, MS	39046	3283.17
Madison, MS	39071	454.36
Madison, MS	39110	3094.60
Madison, MS	39157	2681.94
Rankin, MS	39193	69.16
Rankin, MS	39042	3013.39
Rankin, MS	39047	2894.58
Rankin, MS	39073	1705.44
Rankin, MS	39145	354.42
Rankin, MS	39208	4324.61

Rankin, MS	39218	782.21
Rankin, MS	39232	808.92
Scott, MS	39074	1454.62
Scott, MS	39092	467.83
Scott, MS	39117	937.44
Scott, MS	39152	167.66
Simpson, MS	39062	34.09
Simpson, MS	39044	368.99
Simpson, MS	39082	122.25
Simpson, MS	39111	1077.51
Simpson, MS	39114	1021.35
Simpson, MS	39149	171.76
Warren, MS	39156	30.61
Warren, MS	39180	3587.34
Warren, MS	39183	1279.29
Yazoo, MS	39039	42.27
Yazoo, MS	39040	3013.39
Yazoo, MS	39162	0.00
Yazoo, MS	39179	196.76
Yazoo, MS	39194	2437.17
	<b>Totals</b>	<b>78223.87</b>

**Table A-2**  
**HSDG: 17–24-Year-Old Market Depth**

*Estimated resident youth population likely to be high school graduates*

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>	<b>HSDG by District</b>
Copiah, MS	39077	905.87	727.42
Copiah, MS	39059	1276.87	1025.33
Copiah, MS	39078	82.40	66.16
Copiah, MS	39083	1080.42	867.58
Copiah, MS	39191	905.87	727.42
Hinds, MS	39174	485.84	391.59
Hinds, MS	39041	442.64	356.77
Hinds, MS	39056	3338.97	2691.21
Hinds, MS	39066	456.15	367.66
Hinds, MS	39154	2681.94	2161.65
Hinds, MS	39170	1104.09	889.90
Hinds, MS	39175	576.69	464.81
Hinds, MS	39201	88.45	71.29
Hinds, MS	39202	1870.37	1507.52
Hinds, MS	39203	1808.65	1457.78
Hinds, MS	39204	2542.68	2049.40
Hinds, MS	39206	2890.13	2329.45
Hinds, MS	39209	3702.44	2984.17
Hinds, MS	39211	2820.72	2273.50
Hinds, MS	39212	3937.03	3173.25
Hinds, MS	39213	2364.38	1905.69
Hinds, MS	39216	239.83	193.30
Hinds, MS	39217	926.79	746.99
Hinds, MS	39272	1734.38	1397.91
Madison, MS	39045	83.14	73.92
Madison, MS	39046	3283.17	2918.74
Madison, MS	39071	454.36	403.93
Madison, MS	39110	3094.60	2751.10
Madison, MS	39157	2681.94	2384.25
Rankin, MS	39193	69.16	59.07
Rankin, MS	39042	3013.39	2573.43
Rankin, MS	39047	2894.58	2471.97
Rankin, MS	39073	1705.44	1456.45
Rankin, MS	39145	354.42	302.68
Rankin, MS	39208	4324.61	3693.22
Rankin, MS	39218	782.21	668.00
Rankin, MS	39232	808.92	690.82
Scott, MS	39074	1454.62	1182.60
Scott, MS	39092	467.83	380.35
Scott, MS	39117	937.44	762.14

Scott, MS	39152	167.66	136.30
Simpson, MS	39062	34.09	24.27
Simpson, MS	39044	368.99	262.72
Simpson, MS	39082	122.25	87.04
Simpson, MS	39111	1077.51	767.19
Simpson, MS	39114	1021.35	727.20
Simpson, MS	39149	171.76	122.30
Warren, MS	39156	30.61	20.17
Warren, MS	39180	3587.34	2364.06
Warren, MS	39183	1279.29	843.05
Yazoo, MS	39039	42.27	29.89
Yazoo, MS	39040	3013.39	2130.47
Yazoo, MS	39162	0.00	0.00
Yazoo, MS	39179	196.76	139.11
Yazoo, MS	39194	2437.17	1723.08
	<b>Totals</b>	<b>78223.87</b>	<b>62977.27</b>

**Table A-3**  
**Aptitude/UMG: 17–24-Year-Old Market Depth**

*Estimated resident youth population likely to be in UMG – CAT IIIA or higher*

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>	<b>Aptitude Evaluated at All School mean, 18.289</b>
Copiah, MS	39077	905.87	452.94
Copiah, MS	39059	1276.87	638.44
Copiah, MS	39078	82.40	41.20
Copiah, MS	39083	1080.42	540.21
Copiah, MS	39191	905.87	452.94
Hinds, MS	39174	485.84	242.92
Hinds, MS	39041	442.64	221.32
Hinds, MS	39056	3338.97	1669.48
Hinds, MS	39066	456.15	228.07
Hinds, MS	39154	2681.94	1340.97
Hinds, MS	39170	1104.09	552.05
Hinds, MS	39175	576.69	288.34
Hinds, MS	39201	88.45	44.22
Hinds, MS	39202	1870.37	935.19
Hinds, MS	39203	1808.65	904.33
Hinds, MS	39204	2542.68	1271.34
Hinds, MS	39206	2890.13	1445.07
Hinds, MS	39209	3702.44	1851.22
Hinds, MS	39211	2820.72	1410.36
Hinds, MS	39212	3937.03	1968.51
Hinds, MS	39213	2364.38	1182.19
Hinds, MS	39216	239.83	119.92
Hinds, MS	39217	926.79	463.40
Hinds, MS	39272	1734.38	867.19
Madison, MS	39045	83.14	41.57
Madison, MS	39046	3283.17	1641.59
Madison, MS	39071	454.36	227.18
Madison, MS	39110	3094.60	1547.30
Madison, MS	39157	2681.94	1340.97
Rankin, MS	39193	69.16	34.58
Rankin, MS	39042	3013.39	1506.69
Rankin, MS	39047	2894.58	1447.29
Rankin, MS	39073	1705.44	852.72
Rankin, MS	39145	354.42	177.21
Rankin, MS	39208	4324.61	2162.31
Rankin, MS	39218	782.21	391.10
Rankin, MS	39232	808.92	404.46

Scott, MS	39074	1454.62	727.31
Scott, MS	39092	467.83	233.91
Scott, MS	39117	937.44	468.72
Scott, MS	39152	167.66	83.83
Simpson, MS	39062	34.09	17.05
Simpson, MS	39044	368.99	184.50
Simpson, MS	39082	122.25	61.12
Simpson, MS	39111	1077.51	538.75
Simpson, MS	39114	1021.35	510.68
Simpson, MS	39149	171.76	85.88
Warren, MS	39156	30.61	15.30
Warren, MS	39180	3587.34	1793.67
Warren, MS	39183	1279.29	639.65
Yazoo, MS	39039	42.27	21.14
Yazoo, MS	39040	3013.39	1506.69
Yazoo, MS	39162	0.00	0.00
Yazoo, MS	39179	196.76	98.38
Yazoo, MS	39194	2437.17	1218.58
	<b>Totals</b>	<b>78223.87</b>	<b>39111.95</b>

**Table A-4**  
**Drug: 17–24-Year-Old Market Depth**

*Estimated resident youth population not likely to be disqualified for illicit drug use*

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>	<b>NSDUH Avg 2012–2014 Illicit Drug Use 12 years or older, evaluated at mean, 8.79%, MS Region 4</b>	<b>NSDUH Avg 2012–2014 Illicit Drug Use 12 years or older, lower 95%, 6.81%</b>	<b>NSDUH Avg 2012–2014 Illicit Drug Use 12 years or older, upper 95%, 11.29%</b>
Copiah, MS	39077	905.87	826.25	844.18	803.60
Copiah, MS	39059	1276.87	1164.63	1189.92	1132.71
Copiah, MS	39078	82.40	75.15	76.78	73.09
Copiah, MS	39083	1080.42	985.45	1006.84	958.44
Copiah, MS	39191	905.87	826.25	844.18	803.60
Hinds, MS	39174	485.84	443.14	452.76	430.99
Hinds, MS	39041	442.64	403.73	412.50	392.67
Hinds, MS	39056	3338.97	3045.47	3111.59	2962.00
Hinds, MS	39066	456.15	416.05	425.09	404.65
Hinds, MS	39154	2681.94	2446.20	2499.30	2379.15
Hinds, MS	39170	1104.09	1007.04	1028.91	979.44
Hinds, MS	39175	576.69	525.99	537.41	511.58
Hinds, MS	39201	88.45	80.67	82.43	78.46
Hinds, MS	39202	1870.37	1705.97	1743.00	1659.21
Hinds, MS	39203	1808.65	1649.67	1685.49	1604.46
Hinds, MS	39204	2542.68	2319.17	2369.52	2255.61
Hinds, MS	39206	2890.13	2636.09	2693.32	2563.84
Hinds, MS	39209	3702.44	3377.00	3450.31	3284.44
Hinds, MS	39211	2820.72	2572.78	2628.63	2502.26
Hinds, MS	39212	3937.03	3590.96	3668.92	3492.54
Hinds, MS	39213	2364.38	2156.55	2203.37	2097.44
Hinds, MS	39216	239.83	218.75	223.50	212.75
Hinds, MS	39217	926.79	845.33	863.68	822.16
Hinds, MS	39272	1734.38	1581.93	1616.27	1538.57
Madison, MS	39045	83.14	75.84	77.48	73.76
Madison, MS	39046	3283.17	2994.58	3059.59	2912.50
Madison, MS	39071	454.36	414.42	423.42	403.06
Madison, MS	39110	3094.60	2822.58	2883.86	2745.22
Madison, MS	39157	2681.94	2446.20	2499.30	2379.15
Rankin, MS	39193	69.16	63.08	64.45	61.36

Rankin, MS	39042	3013.39	2748.51	2808.18	2673.18
Rankin, MS	39047	2894.58	2640.14	2697.46	2567.78
Rankin, MS	39073	1705.44	1555.53	1589.30	1512.90
Rankin, MS	39145	354.42	323.27	330.29	314.41
Rankin, MS	39208	4324.61	3944.48	4030.11	3836.36
Rankin, MS	39218	782.21	713.45	728.94	693.89
Rankin, MS	39232	808.92	737.81	753.83	717.59
Scott, MS	39074	1454.62	1326.75	1355.56	1290.39
Scott, MS	39092	467.83	426.71	435.97	415.01
Scott, MS	39117	937.44	855.04	873.60	831.60
Scott, MS	39152	167.66	152.92	156.24	148.73
Simpson, MS	39062	34.09	31.10	31.77	30.24
Simpson, MS	39044	368.99	336.56	343.87	327.34
Simpson, MS	39082	122.25	111.50	113.92	108.44
Simpson, MS	39111	1077.51	982.80	1004.13	955.86
Simpson, MS	39114	1021.35	931.57	951.80	906.04
Simpson, MS	39149	171.76	156.66	160.07	152.37
Warren, MS	39156	30.61	27.92	28.52	27.15
Warren, MS	39180	3587.34	3272.01	3343.04	3182.33
Warren, MS	39183	1279.29	1166.84	1192.17	1134.86
Yazoo, MS	39039	42.27	38.55	39.39	37.50
Yazoo, MS	39040	3013.39	2748.51	2808.18	2673.18
Yazoo, MS	39162	0.00	0.00	0.00	0.00
Yazoo, MS	39179	196.76	179.46	183.36	174.54
Yazoo, MS	39194	2437.17	2222.94	2271.20	2162.01
	<b>Totals</b>	<b>78223.87</b>	<b>71347.95</b>	<b>72896.90</b>	<b>69392.41</b>

**Table A-5**  
**Conduct: 17–24-Year-Old Market Depth**

*Estimated resident youth population not likely to be disqualified for conduct*

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>	<b>FBI 10–17 year old only, evaluated at the 2001–2012 mean, 7.99%</b>
Copiah, MS	39077	905.87	833.49
Copiah, MS	39059	1276.87	1174.85
Copiah, MS	39078	82.40	75.81
Copiah, MS	39083	1080.42	994.09
Copiah, MS	39191	905.87	833.49
Hinds, MS	39174	485.84	447.03
Hinds, MS	39041	442.64	407.27
Hinds, MS	39056	3338.97	3072.19
Hinds, MS	39066	456.15	419.70
Hinds, MS	39154	2681.94	2467.65
Hinds, MS	39170	1104.09	1015.88
Hinds, MS	39175	576.69	530.61
Hinds, MS	39201	88.45	81.38
Hinds, MS	39202	1870.37	1720.93
Hinds, MS	39203	1808.65	1664.14
Hinds, MS	39204	2542.68	2339.52
Hinds, MS	39206	2890.13	2659.21
Hinds, MS	39209	3702.44	3406.62
Hinds, MS	39211	2820.72	2595.34
Hinds, MS	39212	3937.03	3622.46
Hinds, MS	39213	2364.38	2175.47
Hinds, MS	39216	239.83	220.67
Hinds, MS	39217	926.79	852.74
Hinds, MS	39272	1734.38	1595.81
Madison, MS	39045	83.14	76.50
Madison, MS	39046	3283.17	3020.85
Madison, MS	39071	454.36	418.06
Madison, MS	39110	3094.60	2847.34
Madison, MS	39157	2681.94	2467.65
Rankin, MS	39193	69.16	63.64
Rankin, MS	39042	3013.39	2772.62
Rankin, MS	39047	2894.58	2663.30
Rankin, MS	39073	1705.44	1569.18
Rankin, MS	39145	354.42	326.11
Rankin, MS	39208	4324.61	3979.07
Rankin, MS	39218	782.21	719.71
Rankin, MS	39232	808.92	744.28

Scott, MS	39074	1454.62	1338.39
Scott, MS	39092	467.83	430.45
Scott, MS	39117	937.44	862.54
Scott, MS	39152	167.66	154.26
Simpson, MS	39062	34.09	31.37
Simpson, MS	39044	368.99	339.51
Simpson, MS	39082	122.25	112.48
Simpson, MS	39111	1077.51	991.42
Simpson, MS	39114	1021.35	939.74
Simpson, MS	39149	171.76	158.04
Warren, MS	39156	30.61	28.16
Warren, MS	39180	3587.34	3300.71
Warren, MS	39183	1279.29	1177.08
Yazoo, MS	39039	42.27	38.89
Yazoo, MS	39040	3013.39	2772.62
Yazoo, MS	39162	0.00	0.00
Yazoo, MS	39179	196.76	181.04
Yazoo, MS	39194	2437.17	2242.44
	<b>Totals</b>	<b>78223.87</b>	<b>71973.80</b>

**Table A-6**  
**Dependents: 17–24-Year-Old Market Depth**  
*Estimated resident youth population with no dependents*

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>	<b>Market Depth Net Dependents</b>
Copiah, MS	39077	905.87	887.75
Copiah, MS	39059	1276.87	1251.33
Copiah, MS	39078	82.40	80.75
Copiah, MS	39083	1080.42	1058.81
Copiah, MS	39191	905.87	887.75
Hinds, MS	39174	485.84	476.13
Hinds, MS	39041	442.64	433.79
Hinds, MS	39056	3338.97	3272.19
Hinds, MS	39066	456.15	447.03
Hinds, MS	39154	2681.94	2628.30
Hinds, MS	39170	1104.09	1082.01
Hinds, MS	39175	576.69	565.15
Hinds, MS	39201	88.45	86.68
Hinds, MS	39202	1870.37	1832.97
Hinds, MS	39203	1808.65	1772.48
Hinds, MS	39204	2542.68	2491.82
Hinds, MS	39206	2890.13	2832.33
Hinds, MS	39209	3702.44	3628.39
Hinds, MS	39211	2820.72	2764.31
Hinds, MS	39212	3937.03	3858.29
Hinds, MS	39213	2364.38	2317.09
Hinds, MS	39216	239.83	235.03
Hinds, MS	39217	926.79	908.25
Hinds, MS	39272	1734.38	1699.70
Madison, MS	39045	83.14	81.48
Madison, MS	39046	3283.17	3217.51
Madison, MS	39071	454.36	445.27
Madison, MS	39110	3094.60	3032.71
Madison, MS	39157	2681.94	2628.30
Rankin, MS	39193	69.16	67.78
Rankin, MS	39042	3013.39	2953.12
Rankin, MS	39047	2894.58	2836.69
Rankin, MS	39073	1705.44	1671.33
Rankin, MS	39145	354.42	347.34
Rankin, MS	39208	4324.61	4238.12
Rankin, MS	39218	782.21	766.56
Rankin, MS	39232	808.92	792.74
Scott, MS	39074	1454.62	1425.52
Scott, MS	39092	467.83	458.47
Scott, MS	39117	937.44	918.69

Scott, MS	39152	167.66	164.30
Simpson, MS	39062	34.09	33.41
Simpson, MS	39044	368.99	361.61
Simpson, MS	39082	122.25	119.80
Simpson, MS	39111	1077.51	1055.96
Simpson, MS	39114	1021.35	1000.92
Simpson, MS	39149	171.76	168.33
Warren, MS	39156	30.61	30.00
Warren, MS	39180	3587.34	3515.59
Warren, MS	39183	1279.29	1253.71
Yazoo, MS	39039	42.27	41.43
Yazoo, MS	39040	3013.39	2953.12
Yazoo, MS	39162	0.00	0.00
Yazoo, MS	39179	196.76	192.82
Yazoo, MS	39194	2437.17	2388.43
	<b>Totals</b>	<b>78223.87</b>	<b>76659.39</b>

**Table A-7**  
**Obesity: 17–24-Year-Old Market Depth**

*Estimated resident youth population not likely to be disqualified for obesity*

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>	<b>Obesity Net evaluated at mean, 18.9%</b>	<b>95% CI lower, MOE* 1.9%</b>	<b>95% CI upper, MOE 1.9%</b>
Copiah, MS	39077	905.87	734.66	717.45	751.87
Copiah, MS	39059	1276.87	1035.54	1011.28	1059.80
Copiah, MS	39078	82.40	66.82	65.26	68.39
Copiah, MS	39083	1080.42	876.22	855.69	896.75
Copiah, MS	39191	905.87	734.66	717.45	751.87
Hinds, MS	39174	485.84	394.02	384.79	403.25
Hinds, MS	39041	442.64	358.98	350.57	367.39
Hinds, MS	39056	3338.97	2707.90	2644.46	2771.35
Hinds, MS	39066	456.15	369.94	361.27	378.60
Hinds, MS	39154	2681.94	2175.05	2124.10	2226.01
Hinds, MS	39170	1104.09	895.42	874.44	916.40
Hinds, MS	39175	576.69	467.69	456.73	478.65
Hinds, MS	39201	88.45	71.73	70.05	73.41
Hinds, MS	39202	1870.37	1516.87	1481.34	1552.41
Hinds, MS	39203	1808.65	1466.82	1432.45	1501.18
Hinds, MS	39204	2542.68	2062.11	2013.80	2110.42
Hinds, MS	39206	2890.13	2343.90	2288.99	2398.81
Hinds, MS	39209	3702.44	3002.68	2932.33	3073.03
Hinds, MS	39211	2820.72	2287.60	2234.01	2341.20
Hinds, MS	39212	3937.03	3192.93	3118.13	3267.73
Hinds, MS	39213	2364.38	1917.51	1872.59	1962.44
Hinds, MS	39216	239.83	194.50	189.95	199.06
Hinds, MS	39217	926.79	751.63	734.02	769.24
Hinds, MS	39272	1734.38	1406.58	1373.63	1439.54
Madison, MS	39045	83.14	67.43	65.85	69.01
Madison, MS	39046	3283.17	2662.65	2600.27	2725.03
Madison, MS	39071	454.36	368.49	359.85	377.12
Madison, MS	39110	3094.60	2509.72	2450.92	2568.52
Madison, MS	39157	2681.94	2175.05	2124.10	2226.01
Rankin, MS	39193	69.16	56.09	54.78	57.41
Rankin, MS	39042	3013.39	2443.86	2386.60	2501.11
Rankin, MS	39047	2894.58	2347.50	2292.51	2402.50
Rankin, MS	39073	1705.44	1383.11	1350.71	1415.51
Rankin, MS	39145	354.42	287.44	280.70	294.17

Rankin, MS	39208	4324.61	3507.26	3425.09	3589.43
Rankin, MS	39218	782.21	634.37	619.51	649.23
Rankin, MS	39232	808.92	656.03	640.66	671.40
Scott, MS	39074	1454.62	1179.69	1152.06	1207.33
Scott, MS	39092	467.83	379.41	370.52	388.30
Scott, MS	39117	937.44	760.26	742.45	778.07
Scott, MS	39152	167.66	135.97	132.78	139.15
Simpson, MS	39062	34.09	27.65	27.00	28.30
Simpson, MS	39044	368.99	299.25	292.24	306.27
Simpson, MS	39082	122.25	99.14	96.82	101.46
Simpson, MS	39111	1077.51	873.86	853.39	894.33
Simpson, MS	39114	1021.35	828.31	808.91	847.72
Simpson, MS	39149	171.76	139.30	136.04	142.56
Warren, MS	39156	30.61	24.82	24.24	25.41
Warren, MS	39180	3587.34	2909.33	2841.17	2977.49
Warren, MS	39183	1279.29	1037.51	1013.20	1061.81
Yazoo, MS	39039	42.27	34.28	33.48	35.08
Yazoo, MS	39040	3013.39	2443.86	2386.60	2501.11
Yazoo, MS	39162	0.00	0.00	0.00	0.00
Yazoo, MS	39179	196.76	159.57	155.83	163.31
Yazoo, MS	39194	2437.17	1976.54	1930.24	2022.85
	<b>Totals</b>	<b>78223.87</b>	<b>63439.51</b>	<b>61953.30</b>	<b>64925.80</b>

\*Margin of Error

**Table A-8  
Disability: 17–24-Year-Old Market Depth**

*Estimated resident youth population not likely to be disqualified for disability*

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>	<b>Disability ACS 2015 16–20 year old filtered at HS degree or equivalent, evaluated at the Mean = 6.8%</b>	<b>Disability ACS 2015 16–20 year old filtered at HS degree or equivalent, lower 90%, MOE -2.7% or 4.1%</b>	<b>Disability ACS 2015 16–20 year old filtered at HS degree or equivalent, upper 90%, MOE +2.7% or 9.5%</b>
Copiah, MS	39077	905.87	844.27	868.73	819.81
Copiah, MS	39059	1276.87	1190.04	1224.52	1155.57
Copiah, MS	39078	82.40	76.79	79.02	74.57
Copiah, MS	39083	1080.42	1006.95	1036.12	977.78
Copiah, MS	39191	905.87	844.27	868.73	819.81
Hinds, MS	39174	485.84	452.81	465.92	439.69
Hinds, MS	39041	442.64	412.54	424.49	400.59
Hinds, MS	39056	3338.97	3111.92	3202.07	3021.77
Hinds, MS	39066	456.15	425.13	437.45	412.81
Hinds, MS	39154	2681.94	2499.57	2571.98	2427.16
Hinds, MS	39170	1104.09	1029.02	1058.83	999.21
Hinds, MS	39175	576.69	537.47	553.04	521.90
Hinds, MS	39201	88.45	82.43	84.82	80.05
Hinds, MS	39202	1870.37	1743.19	1793.69	1692.69
Hinds, MS	39203	1808.65	1685.67	1734.50	1636.83
Hinds, MS	39204	2542.68	2369.77	2438.43	2301.12
Hinds, MS	39206	2890.13	2693.61	2771.64	2615.57
Hinds, MS	39209	3702.44	3450.68	3550.64	3350.71
Hinds, MS	39211	2820.72	2628.91	2705.07	2552.75
Hinds, MS	39212	3937.03	3669.31	3775.61	3563.01
Hinds, MS	39213	2364.38	2203.60	2267.44	2139.77
Hinds, MS	39216	239.83	223.52	230.00	217.05
Hinds, MS	39217	926.79	863.77	888.79	838.75
Hinds, MS	39272	1734.38	1616.45	1663.27	1569.62
Madison, MS	39045	83.14	77.49	79.74	75.25
Madison, MS	39046	3283.17	3059.92	3148.56	2971.27
Madison, MS	39071	454.36	423.46	435.73	411.20
Madison, MS	39110	3094.60	2884.17	2967.72	2800.61
Madison, MS	39157	2681.94	2499.57	2571.98	2427.16

Rankin, MS	39193	69.16	64.46	66.33	62.59
Rankin, MS	39042	3013.39	2808.48	2889.84	2727.12
Rankin, MS	39047	2894.58	2697.75	2775.90	2619.59
Rankin, MS	39073	1705.44	1589.47	1635.52	1543.42
Rankin, MS	39145	354.42	330.32	339.89	320.75
Rankin, MS	39208	4324.61	4030.54	4147.30	3913.77
Rankin, MS	39218	782.21	729.02	750.14	707.90
Rankin, MS	39232	808.92	753.91	775.75	732.07
Scott, MS	39074	1454.62	1355.70	1394.98	1316.43
Scott, MS	39092	467.83	436.02	448.65	423.39
Scott, MS	39117	937.44	873.69	899.00	848.38
Scott, MS	39152	167.66	156.26	160.78	151.73
Simpson, MS	39062	34.09	31.77	32.69	30.85
Simpson, MS	39044	368.99	343.90	353.87	333.94
Simpson, MS	39082	122.25	113.93	117.23	110.63
Simpson, MS	39111	1077.51	1004.24	1033.33	975.15
Simpson, MS	39114	1021.35	951.90	979.47	924.32
Simpson, MS	39149	171.76	160.08	164.72	155.45
Warren, MS	39156	30.61	28.53	29.35	27.70
Warren, MS	39180	3587.34	3343.40	3440.26	3246.54
Warren, MS	39183	1279.29	1192.30	1226.84	1157.76
Yazoo, MS	39039	42.27	39.40	40.54	38.25
Yazoo, MS	39040	3013.39	2808.48	2889.84	2727.12
Yazoo, MS	39162	0.00	0.00	0.00	0.00
Yazoo, MS	39179	196.76	183.38	188.69	178.07
Yazoo, MS	39194	2437.17	2271.44	2337.25	2205.64
	<b>Totals</b>	<b>78223.87</b>	<b>72904.67</b>	<b>75016.69</b>	<b>70792.64</b>

**Table A-9**  
**Female Market Depth Aged 17–24 by Individual QMA Estimate**

<b>Female 17-24 Year Olds</b>	34546.83108
<b>HSDG Qualified</b>	27984.23562
<b>Aptitude CAT IIIA or Higher Qualified</b>	17273.41554
<b>Aptitude CAT II or Higher Qualified</b>	1710.068139
<b>Obesity Qualified</b>	28017.48001
<b>Conduct Qualified</b>	31786.53928
<b>Drug Qualified</b>	31510.16463
<b>Dependents Qualified</b>	33855.89446
<b>Disability Qualified</b>	32612.20854

**Table A-10**  
**QMA Estimates – Female**

*Percentages used to determine the number of females qualified military available aged 17–24*

<b>HSDG – 4 Year</b>		
	Hinds County	80.6%
	Madison County	88.9%
	Rankin County	85.4%
	Scott County	81.3%
	Simpson County	71.2%
	Warren County	65.9%
	Yazoo County	70.7%
Aptitude/UMG CAT IIIA or higher	50%	
		MOE
Obesity	81.1%	1%
Conduct	92.01%	
Drug	91.21%	-1.98%, +2.5%*
Dependents	98%	
Disability	94.4%	3.34%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table A-11**  
**Male Market Depth Aged 17–24 by Individual QMA Estimate**

<b>Male 17-24 Year Olds</b>	34738.90755
<b>HSDG Qualified</b>	29032.9042
<b>Aptitude CAT IIIA or Higher Qualified</b>	17369.45377
<b>Aptitude CAT II or Higher Qualified</b>	1719.575924
<b>Obesity Qualified</b>	28173.25402
<b>Conduct Qualified</b>	31963.26883
<b>Drug Qualified</b>	31685.35757
<b>Dependents Qualified</b>	34044.1294
<b>Disability Qualified</b>	31855.57822

**Table A-12**  
**QMA Estimates – Male**

*Percentages used to determine the number of males qualified military available aged 17–24*

<b>HSDG – 4 Year</b>		
	Hinds County	80.6%
	Madison County	88.9%
	Rankin County	85.4%
	Scott County	81.3%
	Simpson County	71.2%
	Warren County	65.9%
	Yazoo County	70.7%
Aptitude/UMG CAT IIIA or higher	50%	
		MOE
Obesity	81.1%	1%
Conduct	92.01%	
Drug	91.21%	-1.98%, +2.5%*
Dependents	98%	
Disability	93.57%	4.38%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table A-13**  
**Black Market Depth Aged 17–24 by Individual QMA Estimate**

<b>Black 17–24 year old</b>	41226.21
<b>HSDG</b>	33040.66
<b>Aptitude CAT IIIA or Higher</b>	20613.11
<b>Obesity</b>	33434.46
<b>Conduct</b>	37932.24
<b>Drug</b>	37602.43
<b>Dependents</b>	40401.69
<b>Disability</b>	38340.38

**Table A-14**  
**QMA Estimates – Black**

*Percentages used to determine the number of Blacks qualified military available aged 17–24*

<b>HSDG – 4 Year</b>		
	Hinds County	80.6%
	Madison County	88.9%
	Rankin County	85.4%
	Scott County	81.3%
	Simpson County	71.2%
	Warren County	65.9%
	Yazoo County	70.7%
Aptitude/UMG CAT IIIA or higher	50%	
		MOE
Obesity	81.1%	1%
Conduct	92.01%	
Drug	91.21%	-1.98%, +2.5%*
Dependents	98%	
Disability	93%	4.06%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table A-15**  
**White Market Depth Aged 17–24 by Individual QMA Estimate**

<b>White 17–24 year old</b>	25457.77
<b>HSDG</b>	20826.18
<b>Aptitude CAT IIIA or Higher</b>	12728.88
<b>Obesity</b>	20646.25
<b>Conduct</b>	23423.69
<b>Drug</b>	23220.03
<b>Dependents</b>	24948.61
<b>Disability</b>	23803.01

**Table A-16**  
**QMA Estimates – White**

*Percentages used to determine the number of Whites qualified military available aged 17–24*

<b>HSDG – 4 Year</b>		
	Hinds County	80.6%
	Madison County	88.9%
	Rankin County	85.4%
	Scott County	81.3%
	Simpson County	71.2%
	Warren County	65.9%
	Yazoo County	70.7%
Aptitude/UMG CAT IIIA or higher	50%	
		MOE
Obesity	81.1%	1%
Conduct	92.01%	
Drug	91.21%	-1.98%, +2.5%*
Dependents	98%	
Disability	93.5%	3.61%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

## Appendix B Colorado Lakewood 2015

**Table B-1  
Total 17–24-Year-Old Population**

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>
Denver, CO	80202	1683.71
Denver, CO	80203	2445.49
Denver, CO	80204	3986.89
Denver, CO	80211	2348.91
Denver, CO	80212	1302.59
Jefferson, CO	80214	2591.01
Jefferson, CO	80215	1730.73
Denver, CO	80218	1651.43
Denver, CO	80219	7312.10
Jefferson, CO	80226	3877.48
Jefferson, CO	80227	3360.02
Jefferson, CO	80228	3692.32
Jefferson, CO	80232	2137.54
Jefferson, CO	80235	924.77
		<b>39044.99</b>

**Table B-2  
17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total 17–24 year old</b>	39044.99
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	29095.19
Aptitude	22143.85
Obesity	34671.95
Conduct	35925.29
Drug	32504.95
Dependents	38264.08
Disability	37092.73

**Table B-3**  
**QMA Estimates**

*Percentages used to determine the number of qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County
	67.2%	82.8%
Aptitude/UMG CAT IIIA or higher	37.45%	78.52%
		MOE
Obesity	88.8%	1.1%*
Conduct	92.01%	
Drug	83.25%	-2.26%, +2.54%
Dependents	98%	
Disability	95%	1.77%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table B-4**  
**Female 17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total Female 17–24 Year Old</b>	18684.27
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	14729.80
Aptitude	10363.00
Obesity	16591.63
Conduct	17191.40
Drug	15554.66
Dependents	18310.59
Disability	17750.06

**Table B-5**  
**QMA Estimates – Female**

*Percentages used to determine the number of females qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County
	72.3%	87.2%
Aptitude/UMG CAT IIIA or higher	37.45%	78.52%
		MOE
Obesity	88.8%	1.1%*
Conduct	92.01%	
Drug	83.25%	-2.26%, +2.54%*
Dependents	98%	
Disability	95%	2.68%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table B-6**

**Male 17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total Male 17–24 Year Old</b>	18772.27
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	13144.10
Aptitude	10732.16
Obesity	16669.78
Conduct	17272.37
Drug	15627.92
Dependents	18396.83
Disability	17852.43

**Table B-7**  
**QMA Estimates – Male**

*Percentages used to determine the number of males qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County
	62%	78.7%
Aptitude/UMG CAT IIIA or higher	37.45%	78.52%
		MOE
Obesity	88.8%	1.1%*
Conduct	92.01%	
Drug	83.25%	-2.26%, +2.54%*
Dependents	98%	
Disability	95.1%	2.36%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table B-8**  
**Hispanic 17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total Hispanic 17–24 Year Old</b>	15102.54
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	10164.94
Aptitude	7726.61
Obesity	13411.06
Conduct	13895.85
Drug	12572.87
Dependents	14800.49
Disability	14498.44

**Table B-9**  
**QMA Estimates – Hispanic**

*Percentages used to determine the number of Hispanics qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County
	63.3%	75.3%
Aptitude/UMG CAT IIIA or higher	37.45%	78.52%
		MOE
Obesity	88.8%	1.1%*
Conduct	92.01%	
Drug	83.25%	-2.26%, +2.54%*
Dependents	98%	
Disability	96%	2.87%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table B-10**  
**White 17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total White 17–24 Year Old</b>	21911.69
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	17812.02
Aptitude	12578.62
Obesity	19457.59
Conduct	20160.95
Drug	18241.49
Dependents	21473.46
Disability	20706.55

**Table B-11**  
**QMA Estimates – White**

*Percentages used to determine the number of Whites qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County
	77.5%	85.3%
Aptitude/UMG CAT IIIA or higher	37.45%	78.52%
		MOE
Obesity	88.8%	1.1%*
Conduct	92.01%	
Drug	83.25%	-2.26%, +2.54%*
Dependents	98%	
Disability	94.5%	2.07%**

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table B-12**

**17–24-Year-Old Market Depth by Individual QMA Estimate: Black, Asian, and American Indian**

	Black	Asian	American Indian
17–24 Market Depth	1250.85	1288.59	639.75
HSDG	856.33	1113.86	364.74
Aptitude/UMG CAT IIIA or higher	616.26	681.91	377.69

**Table B-13**

**QMA Estimates – Black, Asian, and American Indian**

*Percentages used to determine the number of qualified military available aged 17–24 by HSDG and Aptitude/UMG*

	Black	Asian	American Indian
HSDG – 4 Year			
Denver County	64%	82.9%	47.5%
Jefferson County	79.5%	92.3%	65.6%
Aptitude/UMG			
Denver County	37.45%	37.45%	37.45%
Jefferson County	78.52%	78.52%	78.52%

## Appendix C Colorado Littleton 2015

**Table C-1  
Total 17–24-Year-Old Population**

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>
Arapahoe, CO	80110	2525.72
Arapahoe, CO	80113	1886.44
Arapahoe, CO	80120	3052.46
Arapahoe, CO	80121	1478.92
Arapahoe, CO	80122	2281.91
Denver, CO	80123	3781.38
Douglas, CO	80124	2235.83
Douglas, CO	80125	739.31
Douglas, CO	80126	3718.34
Jefferson, CO	80127	4099.18
Jefferson, CO	80128	3170.40
Douglas, CO	80129	2649.52
Douglas, CO	80130	2033.52
Denver, CO	80236	1833.49
Jefferson, CO	80433	622.33
Jefferson, CO	80454	110.47
Jefferson, CO	80465	1284.29
	<b>Total</b>	<b>37503.51</b>

**Table C-2  
17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total 17–24 Year Old</b>	37503.51
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	31602.41
Aptitude	28594.44
Obesity	33303.11
Conduct	33303.11
Drug	31221.66
Dependents	36753.43
Disability	35628.32

**Table C-3**  
**QMA Estimates**

*Percentages used to determine the number of qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County	Arapahoe County	Douglas County
	67.2%	82.8%	88.1%	90.1%
Aptitude/UMG CAT IIIA or higher	37.45%	79.1%	92.36%	88.1%
		MOE		
Obesity	87.7%	1.1%*		
Conduct	92.01%			
Drug	83.25%	-2.26%, +2.54*		
Dependents	98%			
Disability	95%	1.77%**		

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table C-4**  
**Male 17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total Male 17–24 Year Old</b>	17143.85
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	13798.66
Aptitude	13571.36
Obesity	15223.74
Conduct	15774.06
Drug	14272.26
Dependents	16800.98
Disability	16303.81

**Table C-5**  
**QMA Estimates – Male**

*Percentages used to determine the number of males qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County	Arapahoe County	Douglas County
	62%	82.8%	84.8%	87.5%
Aptitude/UMG CAT IIIA or higher	37.45%	78.7%	92.36%	88.1%
		MOE		
Obesity	87.7%	1.1%*		
Conduct	92.01%			
Drug	83.25%	-2.26%, +2.54*		
Dependents	98%			
Disability	95.1%	2.36%**		

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table C-6**  
**Female 17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total Female 17–24 year old</b>	16322.39
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	14354.14
Aptitude	13005.08
Obesity	14494.29
Conduct	15018.24
Drug	13588.39
Dependents	15995.95
Disability	15506.28

**Table C-7**  
**QMA Estimates – Female**

*Percentages used to determine the number of females qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County	Arapahoe County	Douglas County
	72.3%	87.2%	91.4%	92.9%
Aptitude/UMG CAT IIIA or higher	37.45%	78.7%	92.36%	88.1%
		MOE		
Obesity	87.7%	1.1%*		
Conduct	92.01%			
Drug	83.25%	-2.26%, +2.54*		
Dependents	98%			
Disability	95.%	2.68%**		

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table C-8**  
**White 17–24-Year-Old Market Depth by Individual QMA Estimate**

<b>Total White 17–24 year old</b>	26271.44
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	23089.39
Aptitude	21338.91
Obesity	23329.05
Conduct	24172.36
Drug	21870.98
Dependents	25746.02
Disability	24826.52

**Table C-9**  
**QMA Estimates – White**

*Percentages used to determine the number of Whites qualified military available aged 17–24*

HSDG – 4 Year	Denver County	Jefferson County	Arapahoe County	Douglas County
	77.5%	85.3%	90%	91.8%
Aptitude/UMG CAT IIIA or higher	37.45%	78.7%	92.36%	88.1%
		MOE		
Obesity	87.7%	1.1%*		
Conduct	92.01%			
Drug	83.25%	-2.26%, +2.54*		
Dependents	98%			
Disability	94.5%	2.07%**		

\*Level of significance of 0.05. MOE are provided where available in the source data or computed if the source data has sufficient observations.

\*\*Level of significance of 0.10.

**Table C-10**

**17–24-Year-Old Market Depth by Individual QMA Estimate: Black, Asian, and American Indian**

	Black	Asian	American Indian
17–24 Market Depth	472.65	5754.40	1089.11
HSDG	371.99	4314.83	984.00
Aptitude/UMG CAT IIIA or higher	352.14	4143.05	839.22

**Table C-11**

**QMA Estimates – Black, Hispanic, Asian, and American Indian**

*Percentages used to determine the number of qualified military available aged 17–24 by HSDG and Aptitude/UMG*

	Black	Hispanic	Asian	American Indian
HSDG – 4 Year				
Denver County	64%	63.3%	82.9%	47.5%
Jefferson County	79.5%	75.3%	92.3%	65.6%
Arapahoe County	84.5%	82.9%	94.1%	83.3%
Douglas County	88.1%	80.9%	91.3%	81.5%
Aptitude/UMG				
Denver County	37.45%	37.45%	37.45%	37.45%
Jefferson County	78.52%	78.52%	78.52%	78.52%
Arapahoe County	92.36%	92.36%	92.36%	92.36%
Douglas County	88.1%	88.1%	88.1%	88.1%

## Appendix D Massachusetts Worcester 2015

**Table D-1  
Total 17–24-Year-Old Population**

<b>County</b>	<b>Zip Code</b>	<b>17–24-year-old Population</b>
Hampden, MA	1081	119.57
Worcester, MA	1516	1707.16
Worcester, MA	1515	222.72
Worcester, MA	1501	1588.16
Worcester, MA	1092	98.09
Worcester, MA	1507	1266.89
Worcester, MA	1506	190.63
Worcester, MA	1504	1107.46
Worcester, MA	1529	263.95
Worcester, MA	1605	3781.64
Worcester, MA	1524	856.33
Worcester, MA	1568	601.76
Worcester, MA	1569	1650.29
Worcester, MA	1570	1741.27
Worcester, MA	1571	1774.42
Worcester, MA	1581	1302.11
Worcester, MA	1585	493.19
Worcester, MA	1588	998.01
Hampden, MA	1010	321.84
Worcester, MA	1590	885.04
Worcester, MA	1602	3725.54
Worcester, MA	1562	1078.59
Worcester, MA	1604	3814.68
Worcester, MA	1560	315.78
Worcester, MA	1606	1774.43
Worcester, MA	1607	934.01
Worcester, MA	1608	470.37
Worcester, MA	1609	7035.98
Worcester, MA	1772	837.55
Worcester, MA	1756	611.83
Middlesex, MA	1752	3533.49
Middlesex, MA	1749	1581.89
Middlesex, MA	1748	1073.02
Worcester, MA	1612	879.82
Worcester, MA	1611	241.84
Worcester, MA	1603	2441.37
Hampden, MA	1521	264.78

Worcester, MA	1083	306.93
Worcester, MA	1518	125.83
Worcester, MA	1566	393.30
Worcester, MA	1520	1229.89
Worcester, MA	1527	1301.37
Worcester, MA	1610	5485.35
Worcester, MA	1532	1410.96
Worcester, MA	1534	610.00
Worcester, MA	1535	544.63
Worcester, MA	1536	966.49
Worcester, MA	1537	147.04
Worcester, MA	1540	780.46
Worcester, MA	1542	160.61
Worcester, MA	1545	3535.51
Worcester, MA	1550	1936.89
Worcester, MA	1519	426.18
<b>Total</b>		70946.94

**Table D-2**

**17–24-Year-Old Market Depth for HSDG and Aptitude/UMG QMA Estimate**

<b>Total 17–24 year old</b>	70946.94
<b>QMA</b>	<b>QMA Market Depth</b>
HSDG	62106.95
Aptitude SAT Math	56551.81
Aptitude SAT Math + Reading	68258.05
MCAS ELA/Math/SCI	55650.78
MCAS Math	53366.29

**Table D-3**  
**QMA Estimates**

*Percentages used to determine the number of qualified military available aged 17–24*

<b>QMA</b>	
HSDG	87.54%
Aptitude SAT Math	79.71%
Aptitude SAT Math + Reading	96.21%
MCAS ELA/Math/SCI	78.44%
MCAS Math	75.22%