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# **2006 Workplace and Gender Relations Survey of Active Duty Members**

## **Statistical Methodology Report**

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**2006 WORKPLACE AND GENDER RELATIONS**  
**SURVEY OF ACTIVE DUTY MEMBERS**

**Defense Manpower Data Center**  
**Human Resources Strategic Assessment Program**  
**1600 Wilson Boulevard, Suite 400, Arlington, VA 22209-2593**

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# 2006 WORKPLACE AND GENDER RELATIONS SURVEY OF ACTIVE DUTY MEMBERS

## Executive Summary

This report describes sample design, sample selection, weighting, and variance estimation for the *2006 Workplace and Gender Relations Survey of Active Duty Members (2006 WGRA)*. The first section of this report presents sample design and sample selection procedures. The second and third sections describe the frame and sample file preparation followed by the weighting statistical methodology. The fourth section describes two general variance estimation procedures.

The *2006 WGRA* was administered by the Department of Defense (DoD) Defense Manpower Data Center (DMDC) and targeted Active Duty members with at least 6 months of service by the time of data collection. The survey web site opened June 26, 2006 and closed September 5, 2006. The *2006 WGRA* continued research in the area of workforce and gender relations that started with the *1995 Sexual Harassment Survey*, continued with the *2002 Workplace and Gender Relations Survey*, and was extended with the *2004 Workplace and Gender Relations Survey of Reserve Component Members*.

The sample for the *2006 WGRA* consisted of a stratified random sample of 86,213 military members, of whom 83,405 were ultimately determined to be eligible; stratum definitions were based on Service branch, tempo, paygroup, race/ethnicity, and sex. The sample size was determined by developing equations to describe sample variance estimates and variable survey costs, and simultaneously solving them subject to precision requirements for key reporting domains. The sample was selected with equal probabilities within strata but with unequal selection probability overall since stratum allocations were not proportional to stratum sizes.

The *2006 WGRA* sample weights were created in four steps. First, sampled members were classified as eligible respondents, eligible nonrespondents, ineligible members, or unknown eligibility. Second, a base weight, the inverse of the probability of selection, was assigned to each sample member. Third, base weights were adjusted for nonresponse by adjusting for members with unknown eligibility at the end of data collection and then adjusting weights for eligible members who returned incomplete or unusable questionnaires. Fourth, the weights were raked to control totals to reduce bias not accounted for previously.

Since the *2006 WGRA* sample design was complex (not a simple random sample), specialized methods were required to account for sample design during statistical testing and variance estimation. This issue was discussed in the third section of this report where variance estimation for complex surveys was described with reference to linearization and replication strategies.

Response rates are generally used to measure the success and quality of survey administration. Response rates were reported in the final section of this report along with location and completion rates. Guidelines recommended by the Council of American Survey Research Organizations (CASRO) were followed for these calculations. The weighted location, completion, and response rates for the *2006 WGRA* were 86%, 35%, and 30%, respectively.



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# 2006 WORKPLACE AND GENDER RELATIONS SURVEY OF ACTIVE DUTY MEMBERS

## Introduction

This report describes the sample design, sample selection, weighting, and variance estimation procedures for the *2006 Workplace and Gender Relations Survey of Active Duty Members (2006 WGRA)*. The first section of this report presents the sample design and sample selection procedures. The second and third sections provide information regarding the processing of sample and frame files and the statistical methodology used for survey sample weighting.

Response rates for the *2006 WGRA* have also been computed in accordance with the standards defined by the Council of American Survey Research Organizations (CASRO, 1982). The response rates for the full sample and for subgroups and how they are computed are described in the last section of this report.

## 2006 WGRA Sampling

The *2006 Workplace and Gender Relations Survey of Active Duty Members (2006 WGRA)* targeted active duty members of the Army, Navy, Marine Corps, Air Force, and Coast Guard, up to and including paygrade O-6, with at least six months service by the time the internet site opened. A single-stage, stratified random sampling design was used and members were sampled with equal conditional probabilities and without replacement within strata. Strata sample sizes were determined by variance constraints imposed on prevalence estimates for key reporting domains. The sample size for *2006 WGRA* was 86,213 members.

## *Inferential Requirements*

Inferential requirements for the *2006 WGRA* are described in terms of:

- An operational definition of the population of interest (i.e., the target population);
- The parameters used in sample design and sample allocation;
- Estimates of the proportion of active duty members belonging to key domains who report having various attitudes, opinions, and experiences;
- Key reporting domains, defined in terms of characteristics of the entire population and characteristics of subpopulations of special interest;
- Precision requirements, stated as functions of the maximum values of variances to be associated with the sample estimates;
- Data collection and processing costs;
- Nonresponse and ineligibility within key reporting domains, estimated from similar recent surveys.

### ***Population Definition***

The population definition identifies all individuals about whom inferences are to be made based on the survey data. The target population for the *2006 WGRA* consists of active duty members of the Army, Navy, Marine Corps, Air Force, and Coast Guard, up to and including paygrade O-6, with at least six months service at the time the survey fielding period was scheduled to begin. Fielding of the survey began on June 26, 2006 and ended September 5, 2006.

### ***Key Reporting Domains***

The factors used to define the key reporting domains are listed in Table 1. This set of domains is consistent with our usual survey weighting protocol and is consistent across active duty surveys.

**Table 1.**  
***Stratifying Variables and Key Reporting Domains***

| <b>Factor</b>                     | <b>Levels</b>   |
|-----------------------------------|---|
| Service <sup>†</sup>              | Army<br>Navy<br>Marine Corps<br>Air Force<br>Coast Guard            |
| Tempo <sup>†</sup>                | Low<br>High<br>Unknown  |
| Race/Ethnicity <sup>†</sup>       | Non-minority<br>Minority<br>Unknown                                 |
| Pay Group <sup>†</sup>            | E1-E3<br>E4<br>E5-E6<br>E7-E9<br>W1-W5<br>O1-O3<br>O4-O6<br>Unknown |
| Sex <sup>†</sup>                  | Male<br>Female<br>Unknown   |
| Any Sexual Harassment Incident(s) | Yes<br>No/Unknown   |
| Any Sexual Assault Incident(s)    | Yes<br>No/Unknown   |

<sup>†</sup> Denotes stratifying variable.

### ***Precision Requirements***

In general, precision requirements are specified for DMDC surveys as a function of the maximum value of the sampling variance associated with prevalence estimates for key domains. For the current survey, precision requirements are defined in terms of maximum *confidence interval half-widths* to be associated with *a priori* estimates of 50-percent prevalence rates.

Precision requirements interact with other design parameters to determine the sample size. The target sample size for the 2006 WGRA was limited by overall cost. Given this limit, the final sample size and allocation were determined by the anticipated domain sizes, prevalence estimates, per-unit costs, nonresponse and eligibility rates, and the precision requirements. The desired precision for an estimate of 0.5 was a 95% confidence interval half-width of 0.05; expected precision for each of the 210 reporting domains is given in Table A-1 of Appendix A. Note that domain labels are abbreviated: 'DoD' means all services except Coast Guard, 'AnyHar' means Any Sexual Harassment Incident(s) and 'AnyAslt' means Any Sexual Assault Incident(s).

## ***Sampling Frame Construction and Stratification***

### ***The Sampling Frame***

The sampling frame consisted of 1,332,791 records drawn from administrative files that were compiled six months prior to the scheduled beginning of the field period. These files include the September 2005 Active Duty Master Edit File (ADMF), September 2005 Active Duty Pay File, September 2005 Family Database File, and September 2005 Basic Allowance for Housing File (BAH). In addition, the eligible population was determined through comparison with the February 2006 Defense Eligibility Enrollment System File (DEERS). The DEERS file contains information on eligibility for health care. Personnel who appear in the September 2005 administrative datasets may have separated or retired from active duty service between September, 2005 and January 31, 2006 and therefore would not be found in the February, 2006 DEERS file. Individuals who separate or retire between February 1, 2006 and the beginning of the field period may be identified by self-reported ineligibility.

### ***Stratification***

For sampling, a distinction was made between *dimensions of stratification* and *levels of stratification*. The dimensions are the variables used to stratify the sample/population whereas the levels are the values within a dimension. Generally, the strata and their levels are chosen because they are important reporting categories.

The following set of stratification dimensions and levels were used to define strata for the sample:

- Service: Army, Navy, Marine Corps, Air Force, or Coast Guard.
- Pay group: E1-E3, E4, E5-E6, E7-E9, W1 to W5, O1 to O3, or O4 to O6.
- Race/Ethnicity: Non-minority, Minority, or Unknown.
- Sex: Male, Female, or Unknown.
- Tempo: Low, High, or Unknown.

As a starting point, a candidate set of strata was constructed by referring to the 249 levels of stratification variables previously utilized in the *2002 Status of the Armed Forces Survey – Workplace and Gender Relations (WGRA 2002)*.

These strata were further collapsed, based on size (fewer than 25) and on consideration of the relative importance of specific candidate stratification dimensions to the survey. Four strata were collapsed to produce a final set of 245 strata for the *2006 WGRA*. Essentially, warrant officers and junior officers (O1 to O3) were combined for Coast Guard males and Coast Guard females. This was necessary since the Coast Guard is the smallest service branch and warrant officers are the smallest category of pay group.

The final strata definitions are listed in Appendix A, Table A-2. A total of 244 strata were constructed. The “unknown” stratum (stratum 245 in Table A-2) contains active duty personnel where one or more of the stratum dimensions was missing in the sampling frame.

### ***Sample Size Allocation***

The DMDC Sampling Tool (Dever and Mason, 2003) was used to allocate the sample so that the precision requirements were met for the different reporting domains. This software is designed to produce optimal sample designs for stratified samples with equal probability of selection for elements within the same stratum for a specified cost model. The cost model used is described by Mason, Kavee, Wheelless, George, Riemer, and Elig (1996).

Given the sampling design, prevalence estimates, stratum and domain definitions, per-unit costs, and nonresponse and eligibility rates, the Tool determined the minimum cost allocation of the sample that satisfied the imposed precision requirements. Precision requirements were set for selected domains to allow in-depth analysis for the overall active duty population and some depth of analysis for other domains. Special attention was given to allow for Service-level analyses.



## ***Assigning Disposition Codes for the 2006 Workplace and Gender Relations Survey***

Each person in the survey was assigned a disposition code indicating whether a completed survey was returned and whether the sampled person was an eligible respondent, an eligible nonrespondent, or an ineligible person. These codes were a key input in weighting and in the computation of response rates discussed in the last section of this report. The assignment of disposition codes draws upon information obtained from a number of sources. Disposition code assignment is a sequential process that used the following variables created during the processes of data collection and weighting: MAILELIG, FLAG\_FIN, SCSINEL, SR\_ELIG, REFUSE, BLKREAS, and COMPFLAG. Each of these variables is described in the following discussion.

The creation and/or description of these variables are described in this section. The process for assigning disposition codes is also described below. In general, for each sampled member, we determined whether the member was eligible or ineligible. For eligible members we determined whether the questionnaire was complete or incomplete. As a convenience, we will refer below to the names of variables found in different SAS files.

### ***Frame Eligibility***

DMDC provided a variable, MAILELIG, in the sample file to indicate the frame eligibility status of the sample members as of April 30, 2006. MAILELIG is defined by a match against the DEERS file, and it identifies members who were eligible at the time the sample was selected. After the time of the DEERS match and before the beginning of the survey field period, a few more people separate, retire, die, or otherwise become ineligible. These cases were identified by either SCS variables or survey items.

### ***Survey Control System Disposition Variables***

One of the Survey Control System (SCS) variables is FLAG\_FIN. During data collection, returned surveys were assigned a FLAG\_FIN code based on whether they were returned blank, returned non-blank, not returned, refused, or postal non-deliverable (Table 2).

**Table 2.****Description of the Survey Control System Disposition Codes (FLAG\_FIN) Used in the 2006 WGRA**

| <b>FLAG_FIN</b>           | <b>Description</b>   | <b>Sample Cases</b> | <b>Percent</b> | <b>Sum of Base Weights</b> | <b>Percent of Sum of Base Weights</b> |
|---------------------------|--|---------------------|----------------|----------------------------|---------------------------------------|
| Returned non-blank survey | No additional information                                      | 29,788              | 34.55          | 431,407                    | 32.37                                 |
|                           | Separated/retired  | 15                  | 0.02           | 204                        | 0.02                                  |
|                           | Deployed   | 21                  | 0.02           | 375                        | 0.03                                  |
|                           | Other: not deceased, incarcerated, separated/retired, deployed | 156                 | 0.18           | 2,208                      | 0.17                                  |
| Returned blank survey     | Separated/retired  | 11                  | 0.01           | 144                        | 0.01                                  |
|                           | Refused to take part in the survey                             | 7                   | 0.01           | 151                        | 0.01                                  |
|                           | Deployed   | 5                   | 0.01           | 64                         | 0                                     |
|                           | No reason given  | 642                 | 0.74           | 10,141                     | 0.76                                  |
| No survey returned        | Deceased   | 39                  | 0.05           | 474                        | 0.04                                  |
|                           | Separated/retired  | 251                 | 0.29           | 3,376                      | 0.25                                  |
|                           | Refused to take part in the survey                             | 597                 | 0.69           | 8,457                      | 0.63                                  |
|                           | Deployed: not reached at unit due to deployment                | 187                 | 0.22           | 3,241                      | 0.24                                  |
|                           | Other: not deceased, incarcerated, separated/retired, deployed | 4                   | 0              | 38                         | 0                                     |
|                           | No reason given  | 42,123              | 48.86          | 678,076                    | 50.88                                 |
| Postal non-deliverable    | All addresses were attempted                                   | 2,814               | 3.26           | 46,206                     | 3.47                                  |
|                           | Address remaining at the close of field                        | 9,547               | 11.07          | 148,153                    | 11.12                                 |
|                           | No address at start of mailing                                 | 6                   | 0.01           | 78                         | 0.01                                  |
| Total                     |  | 86,213              | 100            | 1,332,791                  | 100                                   |

**Reason Reported for Ineligibility**

A second Survey Control System (SCS) variable was SCSINEL; it identified members who were considered ineligible. This variable refers to member ineligibility from the point of view of field operations and does not necessarily match the member ineligibility used in weighting. Members with values of SCSINEL that indicate that they are incarcerated, no longer in the military, or retired can already be identified using the variable FLAG\_FIN as ineligible, no special code was created for these situations.

**Self-Reported Eligibility**

The service member's response to the first question in the questionnaire, "In what Service were you on active duty on June 26, 2006?" determined self-reported eligibility. As in previous DMDC surveys, members who returned the survey were considered eligible unless they explicitly responded that they were not on active duty as of June 26, 2006.

**Refused Survey**

The variable REFUSE is produced by the Survey Control System and describes the reason the survey was refused. Because inconsistencies occur among SCS variables, REFUSE is useful in combination with other survey disposition variables for defining eligibility. In the

absence of other information, reasons for refusal may identify ineligible individuals who have separated from the military or who are ill, for example. Otherwise, refusals are generally defined as eligible.

### ***Survey Returned Blank***

The variable BLKREAS is produced by the Survey Control System and describes the reason the survey was returned blank. In the absence of other information, BLKREAS can define eligibility. In combination with other disposition variables, BLKREAS can be useful for resolving inconsistencies among other disposition variables.

### ***Completed Questionnaire***

The sixth variable used when assigning disposition codes indicates whether or not a questionnaire was completed (COMPFLAG). This variable is created by DMDC based on the definition of a completed questionnaire (i.e., answers to key questions and/or response to at least 50% of items in the questionnaire). Counts of sample cases are reported in Table 3.

**Table 3.**  
***Disposition Codes for Completion***

| <b>COMPFLAG</b>             | <b>Sample Cases</b> | <b>Percentage of Sample Cases</b> | <b>Sum of Base Weights</b> | <b>Percentage of Sum of Base Weights</b> |
|-----------------------------|---------------------|-----------------------------------|----------------------------|--|
| Blank or No Survey Returned | 55,568              | 64.45                             | 888,099                    | 66.63                                    |
| Incomplete                  | 3,724               | 4.32                              | 58,178                     | 4.37                                     |
| Complete                    | 26,921              | 31.23                             | 386,514                    | 29.00                                    |
| Total                       | 86,213              | 100.00                            | 1,332,791                  | 100.00                                   |

### ***Final Disposition Codes***

The method of assigning final disposition codes is a sequential process that utilized the variables described in the previous sections. After code assignment, each combination was checked for inconsistencies. Table 4 lists the outcome of various combinations of the variables MAILELIG, FLAG\_FIN, and COMPFLAG that occurred in the 2006 WGRA survey. Based on these three variables, a new variable for eligibility status denoted ELIG was created with the five categories listed in the table.

The first category was eligible respondents; it consisted of all eligible members who participated in the survey and provided substantially complete and usable survey data. The second category was eligible nonrespondents; this group consisted of all sampled members who were known to be eligible for the survey, but did not provide substantially complete and usable survey data. The third category was frame ineligible members or out-of-scope as determined by

the DEERS match (April 2006). This group consists of all sampled persons determined to be ineligible because they were not part of either the April DEERS file or the February frame.

The fourth category was ineligible members as determined by the combination of FLAG\_FIN (2, 3, 6, 9, 10, 13, 18, 19, and, 22), SCSINEL (H), and SR\_ELIG (2). These were members who either reported themselves, or their proxies reported, that they were not on active duty or that they were ineligible for another reason based on information provided at the time of data collection. The last category was unknown eligibility. This group consisted of all the members whose eligibility could not be determined (for example, postal non-deliverables, other non-locatables, and members who did not return the questionnaire). Table 4 provides frequencies of cases and sums of base weights for each combination of the variables used for determining eligibility.

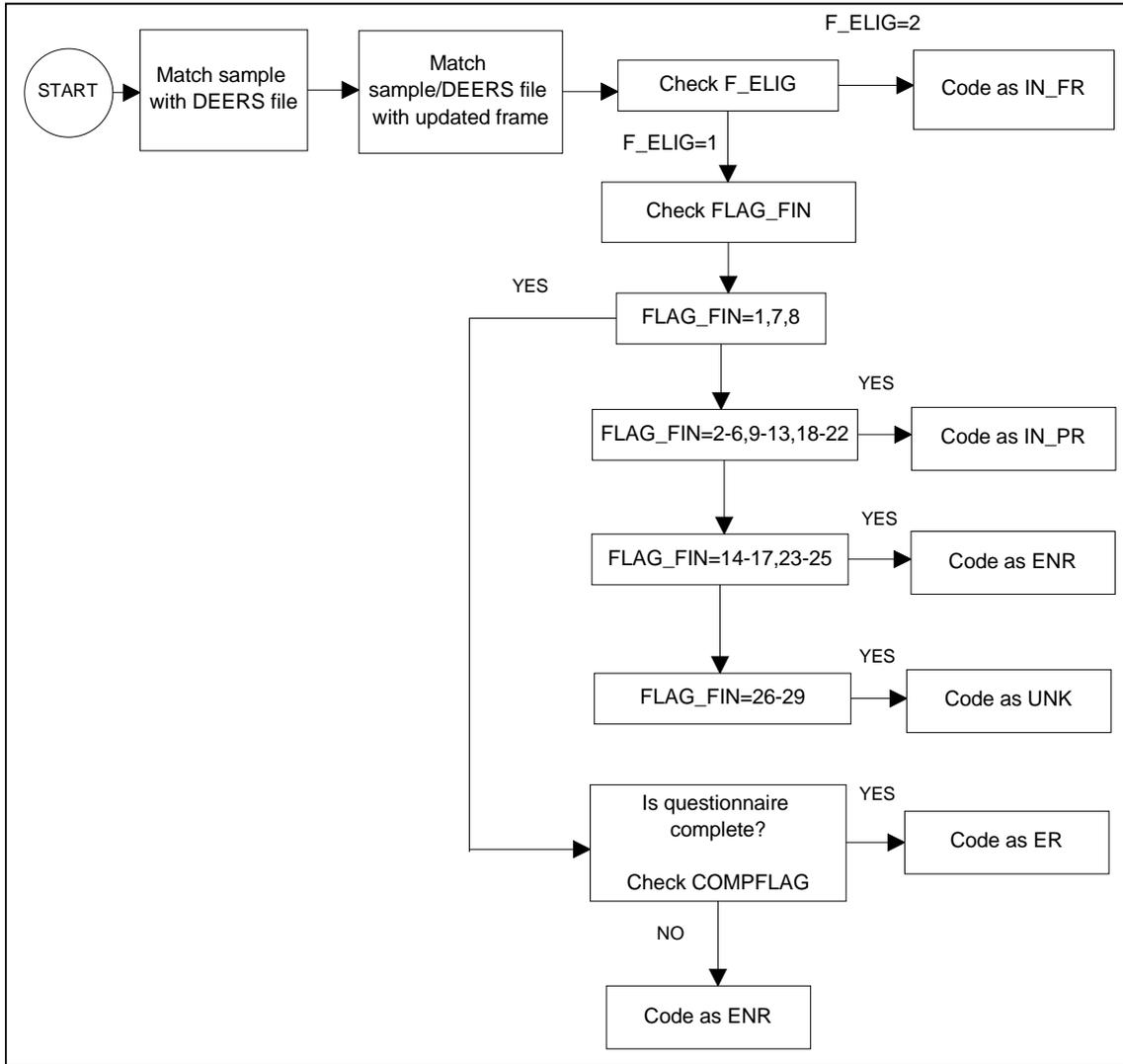
The eligibility status was derived as illustrated in Figure 1. First, ineligible sample members prior to data collection were coded as frame ineligible. Next, members who did not respond were classified as either eligible nonrespondent, proxy ineligible, or unknown eligibility depending on the values of FLAG\_FIN and SCSINEL. The response to the first survey question was checked. Members who indicated they were retired or separated were coded ineligible. Any remaining members who did not self report as ineligible and members who returned the questionnaire were classified as eligible respondents or eligible nonrespondents based on the degree of completion of the survey.

After assigning disposition codes, all combinations of variables used to determine eligibility status were checked for inconsistencies. Any inconsistencies were reported to DMDC for review. Table 5 presents the final disposition of cases. Figure 1 illustrates the hierarchical use of system control variables to determine eligibility.

**Table 4.**  
***Variable Combinations Used to Determine Disposition Codes***

| Eligibility   | Completed | Sampled Cases | Percentage of Sample Cases | Sum of Base Weights | Percentage of Sum of Base Weights |
|---|-----------|---------------|----------------------------|---------------------|-----------------------------------|
| Eligible Respondents                                |           |               |                            |                     |                                   |
| Returned Survey                                     | Yes       | 26,773        | 31.05                      | 384,258             | 28.83                             |
| Return (deployed)                                   | Yes       | 17            | 0.02                       | 282                 | 0.02                              |
| Return (all other reasons)                          | Yes       | 77            | 0.09                       | 1,128               | 0.08                              |
| Eligible Nonrespondents                             |           |               |                            |                     |                                   |
| Returned Survey                                     | No        | 3,151         | 3.65                       | 50,223              | 3.77                              |
| Return (deployed)                                   | No        | 9             | 0.01                       | 157                 | 0.01                              |
| Return (all other reasons)                          | No        | 159           | 0.18                       | 2,207               | 0.17                              |
| Returned Blank (active refusal)                     | No        | 3             | 0.00                       | 43                  | 0.00                              |
| Returned Blank (deployed)                           | No        | 10            | 0.01                       | 93                  | 0.01                              |
| Returned Blank (no reason)                          | No        | 5             | 0.01                       | 33                  | 0.00                              |
| No Return (active refusal)                          | Blank     | 592           | 0.69                       | 8,406               | 0.63                              |
| No Return (deployed)                                | Blank     | 187           | 0.22                       | 3,241               | 0.24                              |
| No Return (all other reasons)                       | Blank     | 1             | 0.00                       | 2                   | 0.00                              |
| Ineligible as Reported by Proxy                     |           |               |                            |                     |                                   |
| Returned Survey                                     | No        | 186           | 0.22                       | 2,470               | 0.19                              |
| Return (separated/retired)                          | No        | 17            | 0.02                       | 235                 | 0.02                              |
| Return (separated/retired)                          | Yes       | 5             | 0.01                       | 57                  | 0.00                              |
| Return (all other reasons)                          | No        | 1             | 0.00                       | 5                   | 0.00                              |
| Returned Blank (separated/retired)                  | No        | 3             | 0.00                       | 15                  | 0.00                              |
| No Return (deceased)                                | Blank     | 28            | 0.03                       | 375                 | 0.03                              |
| No Return (separated/retired)                       | Blank     | 156           | 0.18                       | 1,825               | 0.14                              |
| No Return (all other reasons)                       | Blank     | 3             | 0.00                       | 36                  | 0.00                              |
| Ineligible as Reported by the Frame                 |           |               |                            |                     |                                   |
| Returned Survey                                     | No        | 168           | 0.19                       | 2,510               | 0.19                              |
| Returned Survey                                     | Yes       | 49            | 0.06                       | 790                 | 0.06                              |
| Return (separated/retired)                          | No        | 4             | 0.00                       | 56                  | 0.00                              |
| Return (all other reasons)                          | No        | 2             | 0.00                       | 3                   | 0.00                              |
| Returned Blank (separated/retired)                  | No        | 4             | 0.00                       | 62                  | 0.00                              |
| Returned Blank (no reason)                          | No        | 2             | 0.00                       | 67                  | 0.01                              |
| No Return (deceased)                                | Blank     | 11            | 0.01                       | 99                  | 0.01                              |
| No Return (separated/retired)                       | Blank     | 95            | 0.11                       | 1,551               | 0.12                              |
| No Return (active refusal)                          | Blank     | 5             | 0.01                       | 51                  | 0.00                              |
| No Return (no reason)                               | Blank     | 869           | 1.01                       | 14,828              | 1.11                              |
| Postal Non-Deliverable (PND) (no address remaining) | Blank     | 150           | 0.17                       | 2,526               | 0.19                              |
| Postal Non-Deliverable (PND) (address remains)      | Blank     | 375           | 0.43                       | 6,609               | 0.50                              |
| Eligibility Unknown                                 |           |               |                            |                     |                                   |
| No Return (no reason)                               | Blank     | 41,254        | 47.85                      | 663,248             | 49.76                             |
| Not Deliverable (no address remains)                | Blank     | 2,664         | 3.09                       | 43,680              | 3.28                              |
| Not Deliverable (address remains)                   | Blank     | 9,172         | 10.64                      | 141,544             | 10.62                             |
| Original Non-Locatable                              | Blank     | 6             | 0.01                       | 78                  | 0.01                              |

**Figure 1.**  
*Sequential Assignment of the 2006 WGRA Disposition Codes*



**Table 5.**  
*Eligibility Status*

| <b>Eligibility Status</b> | <b>Sample Cases</b> | <b>Percentage Sample Cases</b> | <b>Sum of Base Weights</b> | <b>Percentage of Sum of Base Weights</b> |
|---------------------------|---------------------|--------------------------------|----------------------------|--|
| Eligible Respondents      | 26,867              | 31.16%                         | 385,667                    | 28.94%                                   |
| Eligible Nonrespondents   | 4,117               | 4.78%                          | 64,405                     | 4.83%                                    |
| Record Ineligible         | 1,734               | 2.01%                          | 29,150                     | 2.19%                                    |
| Proxy Reported Ineligible | 399                 | 0.46%                          | 5,017                      | 0.38%                                    |
| Unknown                   | 53,096              | 61.59%                         | 848,551                    | 63.67%                                   |
| Total                     | 86,213              | 100.00%                        | 1,332,791                  | 100.00%                                  |



## **Weighting Procedures**

The analysis of survey data from complex sample designs requires the use of weights to (1) compensate for variable sample member probabilities of selection; (2) adjust for differential member response rates; and (3) improve the precision of survey-based estimates (Skinner et al., 1989). To develop the weights for the 2006 WGRA survey, we proceeded using the following steps.

First, base weights equal to the reciprocal of the probability of selection were assigned to each member selected for the sample. Second, the base weights were adjusted for nonresponse using weighting classes defined by relevant variables available on the February 2006 sampling frame file. Third, the nonresponse-adjusted weights were raked to population counts from the updated June 2006 ADMF frame. This last adjustment compensated for changes in the eligible population between the time of sample selection and the beginning of data collection. Details of this weighting methodology are described in this section.

### **Calculation of Base Weights**

The 2006 WGRA sample was randomly selected without replacement from a stratified frame. As such, the overall probabilities of selection vary by design strata in order to satisfy the precision goals specified by the study. Let  $U$  be the frame of the  $N$  units in the population (i.e., active duty members at the time of sampling). Note that the frame size  $N$  includes some units who were ineligible at the time the survey was conducted because, for example, they had left the Service. The frame  $U$  was partitioned into  $H$  non-overlapping strata  $U_1, \dots, U_H$  consisting of  $N_h$  units in each stratum  $h$  so that

$$N = \sum_{h=1}^H N_h.$$

A simple random sample of size  $n_h$  was selected without replacement within each stratum  $U_h$ . Given this design, the base weight for the

$i$ -th sampled member in stratum  $h$  was calculated as:

$$w_{hi} = \frac{N_h}{n_h} \quad i = 1, \dots, n_h .$$

For each individual classified in stratum  $h$ , the base weight is the ratio of the total number of individuals in the stratum to the stratum-level sample size. The base weight  $w_{hi}$  is equal to the reciprocal of the probability of selection and is attached to each sample unit in the data file. Note that  $n_h$  is the number of persons initially sampled in stratum  $h$  without regard to whether or not the member ultimately participated in the survey.

### **Weighting Adjustments**

In an ideal survey, all the units in the inference population are eligible to be selected into the sample and all those that are selected participate in the survey. In practice, these conditions

only rarely, if ever, occur. Some sampled units do not respond (unit nonresponse); some sample units are discovered to be ineligible; and the eligibility status of some units cannot be determined. If these circumstances are not addressed, survey estimates will be biased. We used nonresponse weight adjustments to deal with unknown eligibility and unit nonresponse. Raking was used to account for changes in the distribution of the population between the times of sampling and data collection. The following section describes these methodologies in detail.

### ***Unit Nonresponse Adjustments***

Unit nonresponse (i.e., whole questionnaire nonresponse) occurs when a sampled member fails to respond for any reason. For example, nonresponse could result from failure to locate the member because of mobility or invalid/incorrect addresses in the frame, or from the unwillingness of some members to participate in the survey. Because the (unweighted) response rate (defined later) in the survey was substantially less than 100 percent, adjusting for unit nonresponse was an important step in attempting to reduce bias.

To compensate for losses due to nonresponse, we adjusted weights in two stages. The first stage of adjustment accounts for the fact that the eligibility status of some sample persons could not be determined. The second stage of adjustment compensated for losses due to eligible sample persons who did not complete the questionnaire. At each stage the base weights of usable cases were inflated to account for cases that were unusable. These adjustments were done within homogeneous classes of service members.

This form of adjustment is referred to as weighting class adjustment since it adjusts the weighted distribution of the respondents across the weighting classes to that of the total sample (Kalton & Kasprzyk, 1989).

A potential drawback to nonresponse adjustment is that it may increase the variability of the weights and, thus, increase the sampling variance of some estimates (Kish, 1992). Ideally, the reduction in bias from using a nonresponse adjustment more than compensates for increase in variance. When the weighting classes contain sufficient cases and the adjustment factors do not become either inordinately large or substantially different from each other, the effect on variances is modest. Very large adjustment factors or factors that are much different from others can occur in weighting classes with high nonresponse rates or small numbers of respondents. To avoid the second situation, weighting classes with few respondents were combined to form new cell with a minimum of 30 cases.

For sample weighting adjustments to be effective in reducing nonresponse biases, it is desirable that the weighting classes be internally homogeneous with respect to response propensity. Equivalently, a criterion for constructing the weighting classes is that the variation in response propensity between the classes be as large as possible without unduly inflating sampling variances. The criteria that we used to create the weighting classes are described later.

As noted previously, each sampled member was assigned to an appropriate response-status group (*ER*, *ENR*, *IN\_FR*, *IN\_PR*, or *UNK*). At the first stage of weight adjustment, we assumed that the unknowns (Group *UNK*) would have been distributed among the *ER*, *ENR*, and *IN\_PR* categories had it been possible to determine their status. In particular, we assumed that

there are no cases among the unknowns that were like the *IN\_FR* cases, which were ineligible based on the February 2006 DEERS File. Thus, the *IN\_FR* cases did not have their weights increased to represent any of the unknowns (all truly *IN\_FR* cases were identified). The first-stage nonresponse adjustment factor was calculated within weighting class *c* as:

$$f_c^{A1} = \begin{cases} \frac{\sum_{i \in ER_c} w_i + \sum_{i \in ENR_c} w_i + \sum_{i \in IN\_PR_c} w_i + \sum_{i \in UNK_c} w_i}{\sum_{i \in ER_c} w_i + \sum_{i \in ENR_c} w_i + \sum_{i \in IN\_PR_c} w_i} & \text{If the } i\text{-th sample person classified in} \\ & \text{weighting class } c \text{ belongs to response} \\ & \text{group } ER_c, ENR_c, \text{ or } IN\_PR_c. \\ \\ 1 & \text{If the } i\text{-th sample person in class } c \\ & \text{belongs to response group } IN\_FR_c. \\ \\ 0 & \text{If the } i\text{-th sample person in class } c \text{ is in} \\ & UNK_c. \end{cases}$$

The sums in the numerator of  $f_c^{A1}$  extend over the following types of persons in class *c*: eligible respondents (*ER*), eligible nonrespondents (*ENR*), the proxy-reported ineligible (*IN\_PR*), and the unknowns (*UNK*). The term  $w_i$  is the base weight for the *i*-th sampled person in class *c*. (As a notational convenience, the subscript *h* is omitted for the sampling stratum since a class *c* may extend across strata. However, as described subsequently, the eligibility adjustments and the nonresponse adjustments are almost always made using classes that are subdivisions of design strata or the design strata themselves.)

The first nonresponse-adjusted weight  $w_i^{A1}$  for a sample member in class *c* was then computed as:

$$w_i^{A1} = f_c^{A1} w_i.$$

Thus, if persons with unknown eligibility accounted for 50 percent of the weight in class *c*, the weights on the other units were increased by a factor of 2.

The second nonresponse adjustment increased the adjusted weight of eligible respondents to account for eligible nonrespondents. The second-stage nonresponse adjustment factor for class *c* was computed as:

$$f_c^{A2} = \begin{cases} \frac{\sum_{i \in ER_c} w_i^{A1} + \sum_{i \in ENR_c} w_i^{A1}}{\sum_{i \in ER_c} w_i^{A1}} & \text{If the } i\text{-th sample person in weighting} \\ & \text{class } c \text{ belongs to response group } ER_c. \\ 0 & \text{If the } i\text{-th sample person sampled in} \\ & \text{weighting class } c \text{ belongs to response} \\ & \text{group } ENR_c. \\ 1 & \text{If the } i\text{-th sample person is in } IN\_PR_c \\ & \text{or } IN\_FR_c. \end{cases}$$

The first sum in the numerator of  $f_c^{A2}$  for eligible respondents extends over the respondents (Group *ER*) in class *c*; the second extends over the eligible nonrespondents (Group *ENR*) in class *c*; and  $w_i^{A1}$  is the previously adjusted weight of the *i*-th sample member.

The second nonresponse-adjusted weight  $w_i^{A2}$  for the *i*-th sample member classified in weighting class *c* was computed as:

$$w_i^{A2} = f_c^{A2} w_i^{A1}.$$

After the two stages of nonresponse adjustment, the weight for a respondent in weighting class *c* becomes

$$w_i^{A2} = f_c^{A2} f_c^{A1} w_i.$$

Note that after the two stages of nonresponse adjustment, the persons with non-zero weight are those in *ER*, *IN\_PR*, and *IN\_FR*. The members with unknown eligibility (*UNK*) and eligible nonrespondents (*ENR*) have zero weight.

### **Construction of Weighting Classes**

The main objective in constructing weighting classes is to group respondents and nonrespondents with similar characteristics into the same cells. Ideally, the characteristics should be related to both the likelihood of responding to the survey and to values of the data items collected. Each of the characteristics must be available for all initial sample persons in order to create classes. In this case sampling strata were used as the starting point for the creation of weighting classes. The sampling strata were created from variables that were related to survey response propensity and/or important domains in the survey topics. For the 2006 *WGRA*, the stratification variables were Service (Army, Navy, Marine Corps, Air Force, and Coast Guard), paygroup (E1-E3, E4, E5-E6, E7-E9, W1-W5, O1-O3, and O4-O6), race/ethnicity (non-minority, minority), sex (male, female), and time away for duty occupations due to deployment or extended training, for example, or as defined by receiving family separation allowance or imminent danger pay (low, high).

The creation of the weighting classes depended on the number of respondents in the sampling strata. The weighting class corresponded to the sampling stratum when the number of respondents was greater than 30 and smaller than 500. Any sampling stratum with fewer than 30 respondents was combined with another "nearby" stratum to form a new weighting class. When combining strata, we preserved the characteristics for Service, and race/ethnicity. These two stratification variables were considered as hard boundaries that were not crossed when combining strata. We also avoided combining strata with different paygrade groups (Enlisted, Warrant Officers and Commissioned Officers) whenever possible.

Strata with more than 500 respondents were subdivided into smaller weighting classes. This subdivision into smaller cells was done using a categorical search algorithm called CHAID (Chi-squared Automatic Interaction Detector) (Kass, 1980). CHAID attempts to divide the data set into groups so that the response rates between cells are as different as possible. Given a set of categorical predictors of response probabilities, CHAID divides the data set into groups in a stepwise fashion. Through a series of chi-square tests for equality of distributions, CHAID identifies the most important predictor of response and splits the data set into categories. Each of those categories is further segmented based on other predictors. Categories of a variable that are not significantly different can be merged together. The merging and splitting continues until no more statistically significant predictors are found or until a user-specified stopping rule is met. Each subdivision contained at least 30 respondents.

The nonresponse adjustment was done within each weighting class created from the original or combined sampling strata. We examined any classes having unusually large values of the adjustment factors  $f_c^{A1}$  or  $f_c^{A2}$ . Weighting classes with large adjustment factors were combined with other similar ones to form new weighting classes with smaller adjustments. Member characteristics considered for creation of weighting classes are displayed in Table 6.

**Table 6.**  
***Member Characteristics Used for Creation of Nonresponse Weighting Classes in Large Strata***

| <b>Description</b>                      | <b>Values</b>                        |
|---|--------------------------------------|
| Gender                                  | Male                                 |
|   | Female                               |
| Paygrade                                | E1–E9                                |
|   | W1–W5                                |
|   | O1–O6                                |
|   | Unknown                              |
| Marital Status                          | Married                              |
|   | Other                                |
| Detailed Region                         | U.S. Northeast                       |
|   | U.S. South                           |
|   | U.S. Midwest                         |
|   | U.S. West                            |
|   | Europe                               |
|   | Asia or Pacific Islands              |
|   | Other                                |
| Education                               | Less than High School                |
|   | High School Graduate                 |
|   | Some College                         |
|   | 4-Year or Graduate Degree            |
|   | Unknown                              |
| Occupation<br>Minority<br>Density Group | Low (Enlisted, 0.133543 - 0.406664)  |
|   | High (Enlisted, 0.410113 - 0.678089) |
|   | Low (Officer, 0.079124 - 0.211896)   |
|   | High (Officer, 0.219736 - 0.666667)  |
| Occupation<br>Black Density<br>Group    | Low (Enlisted, 0.028492 - 0.22659)   |
|   | High (Enlisted, 0.226799 - 0.419884) |
|   | Low (Officer, 0.017021 - 0.104863)   |
|   | High (Officer, 0.104946 - 0.359873)  |
| Occupation<br>Hispanic<br>Density Group | Low (Enlisted, 0.035559 - 0.109963)  |
|   | High (Enlisted, 0.111396 - 0.16168)  |
|   | Low (Officer, 0.017857 - 0.047548)   |
|   | High (Officer, 0.047962 - 0.333333)  |
| Years of Service                        | 6 months to less than 3 years        |
|   | 3 to less than 6                     |
|   | 6 to less than 10                    |
|   | 10 to highest                        |
|   | Unknown                              |

The weighting classes are available upon request. These cells were used for both the first and second stages of nonresponse adjustment. The adjustment factors  $f_c^{A1}$  and  $f_c^{A2}$  for each weighting class are also available upon request.

### ***Poststratification Versus Raking***

Poststratification and raking are two alternative ways of using population control information when creating weights. Both methods are commonly used in survey estimation and will produce approximately unbiased estimates as long as the nonresponse-adjusted weights give unbiased estimates.

Raking is an estimation procedure in which estimates are controlled to marginal population totals. Raking can be thought of as a multidimensional poststratification procedure, because the weights are poststratified to one set of control totals (a dimension), then these adjusted weights are poststratified to another dimension, etc. After all dimensions are adjusted, the process is repeated until the control totals for all the dimensions are simultaneously satisfied (within a specified tolerance). Brackstone and Rao (1979) and Deville and Särndal (1992) also describe some aspects of raking.

To illustrate the difference between the two approaches, consider using Service and gender as auxiliary variables with H and J classes for either poststratification or raking (we limit discussion to two variables for simplicity, but five are used in the 2006 WGRA). If the cross of Service-by-gender is used to create poststrata, then each cell in the two-way table would be a poststratum, and a control total is needed for each cell. In raking, only marginal totals for each category of Service and gender are required. If we cross-classify the variables and the sample counts in some cells are small, then poststratification produces unstable estimates unless the cells in the cross-tabulation are collapsed. With five dimensions, the level of collapsing would have to be very extensive. This is not an issue in raking since the weights are adjusted to the marginal totals of the counts rather than the cell counts used in poststratification.

Raking is very efficient in reducing the variance of the estimates if the estimates in the cross-tabulation are consistent with a model that ignores the interactions between variables. In the Service-gender example the raked weight can be written as  $\tilde{w}_{cd,i} = w_{cd} \hat{\alpha}_c \hat{\beta}_d$ , where  $w_{cd}$  is the pre-raked weight of an observation in cell  $(c, d)$  of the cross-tabulation,  $\hat{\alpha}_c$  is the effect of the first variable (Service), and  $\hat{\beta}_d$  is the effect of the second variable (gender). Note that in this formulation there is no interaction effect. In this sense, the weights are determined by the marginal distributions of the control variables.

In practical terms, raking is somewhat more flexible than poststratification in the sense of allowing a larger number of variables as controls without running into computational limitations. For example, matching administrative record counts for Service, gender, paygrade group, and other demographics would have cosmetic appeal for users who compare DMDC survey estimates to administrative record systems. However, the universe represented by the 2006 WGRA does not coincide with that of an administrative record system like DEERS or ADMF at a particular date. The survey universe consists of those personnel who were eligible at the time of sampling (i.e., February 2006 DEERS) and are still eligible at the start of data collection (April 2006

DEERS). This set of “surviving eligibles” is not the same as either the set covered by the September 2005 ADMF or the June 2006 ADMF.

Another practical issue is how to calculate sampling errors that reflect the method of estimation (Poststratification or Raking) that is actually used. WesVar can appropriately handle either method since weights are recomputed for every replicate subsample using all steps in estimation, including adjustment by either poststratification or raking. Linearization variance estimates in SUDAAN<sup>®</sup> (Research Triangle Institute 1997) can properly account for poststratification but not raking. When raking is used, one possibility is to identify one raking variable that has the most effect on standard errors and to tell SUDAAN that the weights were poststratified on that variable. Another option in SUDAAN version 8 is to use replicate weights, in which case the standard errors will be identical to those produced by WesVar<sup>®</sup> (Westat 2000).

For the 2006 WGRA, the choice of final adjustment was raking. A total of five dimensions were used during weighting. Control totals were computed using the June 2006 ADMF. The categories and control totals for each of these dimensions are listed in Table 7 - Table 12. Note that by creating composite variables for raking that are crosses of two or more individual variables, we also account for some degree of interaction.

**Table 7.**  
*Combinations of Variables Used for Raking Dimensions*

| <b>Dimension</b> | <b>Variables</b>          |
|------------------|---------------------------|
| DIM1             | Service by sex by age     |
| DIM2             | Service by education      |
| DIM3             | Service by race/ethnicity |
| DIM4             | Service by Paygrade group |
| DIM5             | Detailed Paygrade         |

**Table 8.**  
***Definition and Control Total of the First Dimension (DIM1) Used in Raking***

| <b>DIM1</b> | <b>Service</b> | <b>Gender</b> | <b>Age Group</b>       | <b>Control Total</b> |
|-------------|----------------|---------------|------------------------|----------------------|
| 1           | Army           | Male          | Less Than 25 + Unknown | 166,323              |
| 2           | Army           | Male          | 25-29                  | 95,011               |
| 3           | Army           | Male          | 30-34                  | 63,315               |
| 4           | Army           | Male          | 35 and Older           | 97,789               |
| 5           | Army           | Female        | Less Than 25 + Unknown | 29,805               |
| 6           | Army           | Female        | 25-29                  | 15,266               |
| 7           | Army           | Female        | 30-34                  | 9,527                |
| 8           | Army           | Female        | 35 and Older           | 14,523               |
| 9           | Navy           | Male          | Less Than 25 + Unknown | 111,242              |
| 10          | Navy           | Male          | 25-29                  | 66,477               |
| 11          | Navy           | Male          | 30-34                  | 45,166               |
| 12          | Navy           | Male          | 35 and Older           | 75,187               |
| 13          | Navy           | Female        | Less Than 25 + Unknown | 22,936               |
| 14          | Navy           | Female        | 25-29                  | 12,165               |
| 15          | Navy           | Female        | 30-34                  | 6,136                |
| 16          | Navy           | Female        | 35 and Older           | 8,739                |
| 17          | Marine Corps   | Male          | Less Than 25 + Unknown | 102,492              |
| 18          | Marine Corps   | Male          | 25-29                  | 29,684               |
| 19          | Marine Corps   | Male          | 30-34                  | 16,230               |
| 20          | Marine Corps   | Male          | 35 and Older           | 19,365               |
| 21          | Marine Corps   | Female        | Less Than 25 + Unknown | 7,124                |
| 22          | Marine Corps   | Female        | 25-29                  | 2,034                |
| 23          | Marine Corps   | Female        | 30-34                  | 843                  |
| 24          | Marine Corps   | Female        | 35 and Older           | 919                  |
| 25          | Air Force      | Male          | Less Than 25 + Unknown | 89,954               |
| 26          | Air Force      | Male          | 25-29                  | 63,288               |
| 27          | Air Force      | Male          | 30-34                  | 42,987               |
| 28          | Air Force      | Male          | 35 and Older           | 83,106               |
| 29          | Air Force      | Female        | Less Than 25 + Unknown | 26,974               |
| 30          | Air Force      | Female        | 25-29                  | 17,560               |
| 31          | Air Force      | Female        | 30-34                  | 9,730                |
| 32          | Air Force      | Female        | 35 and Older           | 14,171               |
| 33          | Coast Guard    | Male          | Less Than 25 + Unknown | 10,422               |
| 34          | Coast Guard    | Male          | 25-29                  | 8,698                |
| 35          | Coast Guard    | Male          | 30-34                  | 5,468                |
| 36          | Coast Guard    | Male          | 35 and Older           | 10,600               |
| 37          | Coast Guard    | Female        | Less Than 25 + Unknown | 1,903                |
| 38          | Coast Guard    | Female        | 25-29                  | 1,302                |
| 39          | Coast Guard    | Female        | 30-34                  | 604                  |
| 40          | Coast Guard    | Female        | 35 and Older           | 907                  |
| Total       |                |               |                        | 1,405,972            |

**Table 9.*****Definition and Control Total of the Second Dimension (DIM2) Used in Raking***

| <b>DIM2</b> | <b>Service</b> | <b>Education</b>                        | <b>Control Total</b> |
|-------------|----------------|---|----------------------|
| 1           | Army           | High School Degree or Less              | 359,086              |
| 2           | Army           | Some College but Less Than 4-yr. Degree | 39,422               |
| 3           | Army           | 4-Yr. College Degree or Graduate School | 93,051               |
| 4           | Navy           | High School Degree or Less              | 291,190              |
| 5           | Navy           | Some College but Less Than 4-yr. Degree | 15,785               |
| 6           | Navy           | 4-Yr. College Degree or Graduate School | 41,073               |
| 7           | Marine Corps   | High School Degree or Less              | 154,670              |
| 8           | Marine Corps   | Some College but Less Than 4-yr. Degree | 4,772                |
| 9           | Marine Corps   | 4-Yr. College Degree or Graduate School | 19,249               |
| 10          | Air Force      | High School Degree or Less              | 220,916              |
| 11          | Air Force      | Some College but Less Than 4-yr. Degree | 44,356               |
| 12          | Air Force      | 4-Yr. College Degree or Graduate School | 82,498               |
| 13          | Coast Guard    | All                                     | 39,904               |
| Total       |                |   | 1,405,972            |

**Table 10.*****Definition and Control Totals of the Third Dimension (DIM3) Used in Raking***

| <b>DIM3</b> | <b>Service</b> | <b>Race/Ethnicity</b> | <b>Control Total</b> |
|-------------|----------------|-----------------------|----------------------|
| 1           | Army           | Hispanic              | 52,170               |
| 2           | Army           | Black, non-Hispanic   | 103,506              |
| 3           | Army           | Other                 | 335,883              |
| 4           | Navy           | Hispanic              | 43,968               |
| 5           | Navy           | Black, non-Hispanic   | 63,503               |
| 6           | Navy           | Other                 | 240,577              |
| 7           | Marine Corps   | Hispanic              | 24,069               |
| 8           | Marine Corps   | Black, non-Hispanic   | 19,111               |
| 9           | Marine Corps   | Other                 | 135,511              |
| 10          | Air Force      | Hispanic              | 19,374               |
| 11          | Air Force      | Black, non-Hispanic   | 50,828               |
| 12          | Air Force      | Other                 | 277,568              |
| 13          | Coast Guard    | Hispanic              | 3,752                |
| 14          | Coast Guard    | Black, non-Hispanic   | 2,381                |
| 15          | Coast Guard    | Other                 | 33,771               |
| Total       |                |                       | 1,405,972            |

**Table 11.**  
***Definition and Control Total of the Fourth Dimension (DIM4) Used in Raking***

| <b>DIM4</b>  | <b>Service</b> | <b>Paygrade Group</b> | <b>Control Total</b> |
|--------------|----------------|-----------------------|----------------------|
| 1            | Army           | E1—E3                 | 105,463              |
| 2            | Army           | E4                    | 111,005              |
| 3            | Army           | E5—E6, Unknown        | 140,769              |
| 4            | Army           | E7—E9                 | 52,019               |
| 5            | Army           | W1—W5                 | 12,639               |
| 6            | Army           | O1—O6                 | 69,664               |
| 7            | Navy           | E1—E3                 | 79,362               |
| 8            | Navy           | E4                    | 58,385               |
| 9            | Navy           | E5—E6, Unknown        | 125,653              |
| 10           | Navy           | E7—E9                 | 31,702               |
| 11           | Navy           | W1—W5                 | 1,582                |
| 12           | Navy           | O1—O6                 | 51,364               |
| 13           | Marine Corps   | E1—E3                 | 73,025               |
| 14           | Marine Corps   | E4                    | 33,409               |
| 15           | Marine Corps   | E5—E6, Unknown        | 40,075               |
| 16           | Marine Corps   | E7—E9                 | 13,080               |
| 17           | Marine Corps   | W1—W5                 | 1,955                |
| 18           | Marine Corps   | O1—O6                 | 17,147               |
| 19           | Air Force      | E1—E3                 | 61,913               |
| 20           | Air Force      | E4                    | 59,194               |
| 21           | Air Force      | E5—E6, Unknown        | 117,258              |
| 22           | Air Force      | E7—E9                 | 37,094               |
| 23           | Air Force      | O1—O6                 | 72,311               |
| 24           | Coast Guard    | E1—E3                 | 6,047                |
| 25           | Coast Guard    | E4                    | 7,849                |
| 26           | Coast Guard    | E5—E6, Unknown        | 13,757               |
| 27           | Coast Guard    | E7—E9                 | 4,229                |
| 28           | Coast Guard    | W1—W5                 | 1,580                |
| 29           | Coast Guard    | O1—O6                 | 6,442                |
| <b>Total</b> |                |                       | <b>1,405,972</b>     |

**Table 12.**  
**Definition and Control Total of the Fifth Dimension (DIM5) Used in Raking**

| <b>DIM5</b> | <b>Paygrade Group</b> | <b>Control Total</b> |
|-------------|-----------------------|----------------------|
| 1           | E1                    | 53,686               |
| 2           | E2                    | 81,572               |
| 3           | E3                    | 190,565              |
| 4           | E4                    | 269,842              |
| 5           | E5                    | 256,080              |
| 6           | E6                    | 181,414              |
| 7           | E7                    | 99,881               |
| 8           | E8                    | 27,354               |
| 9           | E9                    | 10,889               |
| 10          | W1                    | 2,920                |
| 11          | W2                    | 6,865                |
| 12          | W3                    | 4,964                |
| 13          | W4—W5                 | 3,007                |
| 14          | O1                    | 25,203               |
| 15          | O2                    | 29,050               |
| 16          | O3                    | 75,048               |
| 17          | O4                    | 46,407               |
| 18          | O5                    | 29,157               |
| 19          | O6                    | 12,068               |
| Total       |                       | 1,405,972            |

### ***Raking Adjustment***

The nonresponse-adjusted weights were raked to force sample estimates of numbers of persons to equal known population totals. In the 2006 WGRA, the function of raking was variance reduction and adjustment of the February 2006 sample to reflect the June 2006 distribution among categories defined by the raking dimensions.

The population control totals were produced using the June 2006 ADMF frame, which was also used for eligibility determination. The updated frame reflected any changes in the population between the time of sampling and the start of the field period.

To compute the control totals, we used the variable MAILELIG (see previous section on *Frame Eligibility*) that was defined for all the records on the frame, including both sample and nonsample persons. The control totals for each raking dimension were computed by counting the eligible members in the June 2006 ADMF frame using the member characteristics.

The mechanics of the raking weight adjustment proceeded as follows. The population was partitioned, based on the first raking dimension, into groups denoted by  $U_1, \dots, U_G$ . The

groups are by definition mutually exclusive and exhaustive of the population. Let  $N_g$  be the size of  $U_g$ , so that  $N = \sum_{g=1}^G N_g$ . The eligible respondents in the sample were also partitioned into groups  $s_1, \dots, s_G$ . The expression for the initial weighting adjustment factor for all the units classified in cell  $g$  is

$$\tilde{f}_g^R = \frac{N_g}{\sum_{i \in s_g} w_i^A}.$$

The raked weight  $\tilde{w}_i^R$  for the  $i$ -th sample person classified in cell  $g$  of the first raking dimension was then computed as:

$$\tilde{w}_i^R = \tilde{f}_g^R w_i^A, i \in s_g.$$

A similar adjustment was then made after classifying the sample based on the second raking dimension, and so on, for the third, fourth, and fifth dimensions. Successively adjusting the weights based on all five dimensions constitutes the first iteration of the process. The adjustments for dimensions 2–5 result in the sum of weights for persons classified by dimension 1 not equaling the control totals for dimension 1. The adjustments for dimensions 1–5 are then repeated beginning with the adjusted weights from the first iteration. The iterative process continues until the sum of the weights for each raking dimension is acceptably close to the corresponding control total. For the 2006 WGRA the sum of the raked weights differed by at most 10 persons from each control total. For most categories this is a relative error of less than 1 percent. The final raked weight  $w_i^R$  for the  $i$ -th sample person was then computed as:

$$\tilde{w}_i^R = \tilde{f}_g^R w_i^{A2}, i \in s_g$$

where  $\tilde{f}_i^R$  is the product of the iterative adjustments applied to the  $i$ -th sample person.

Some sample members who were eligible on the December frame were reported by themselves or proxies as actually being ineligible. Those persons received a separate ineligibility code (*IN\_PR*) as noted earlier. Existence of such persons was evidence that the December frame also contained some ineligible cases. Consequently, sample persons coded as eligible respondents (*ER*) and ineligibles (*IN\_PR*) were both included in raking.

After raking, the cases with non-zero weights were those in *ER* and *IN\_PR*. Cases coded as *ENR*, *IN\_FR*, and *UNK* had zero weights.

Table 13 summarizes which cases were included in each step of the weighting process. The last column shows the general form of the final weight applied to persons in the various disposition categories. Only eligible respondents (*ER*) and proxy-reported ineligibles (*IN\_PR*) received a non-zero final weight.

**Table 13.**  
**Cases Assigned Weights in Each Step of the Weighting Process by Type of Disposition**

| <b>Disposition</b>             | <b>Nonresponse Adjustment Factor, Step 1</b> | <b>Nonresponse Adjustment Factor, Step 2</b> | <b>Nonresponse Adjusted Weight</b> | <b>Raking Factor</b> | <b>Final Weight</b>           |
|--------------------------------|--|--|------------------------------------|----------------------|-------------------------------|
| <i>Eligible Respondent</i>     | $f_c^{A1}$                                   | $f_c^{A2}$                                   | $f_c^{A1} f_c^{A2} w_i$            | $f_g^P$              | $f_c^{A1} f_c^{A2} f_g^P w_i$ |
| <i>Eligible Non-Respondent</i> | $f_c^{A1}$                                   | 0  | 0                                  | 0                    | 0                             |
| <i>Ineligible Proxy Report</i> | $f_c^{A1}$                                   | 1  | $f_c^{A1} w_i$                     | $f_g^P$              | $f_c^{A1} f_g^P w_i$          |
| <i>Ineligible Frame</i>        | 1  | 1  | $w_i$                              | 0                    | 0                             |
| <i>Unknown</i>                 | 0  | 0  | 0                                  | 0                    | 0                             |

### **Computation of Variance Estimates**

Variance estimation procedures are developed to account for the sample design and estimators employed in a complex survey. Using these procedures, analysts can appropriately reflect factors such as sample selection in multiple stages and the use of differential sampling rates to oversample a targeted subpopulation in estimates of sampling error. The two main methods for estimating variances from a complex survey are referred to as linearization (or Taylor series variance estimation) and replication. Wolter (2007) describes the theory and applications of these methods, while Shao (1996) provides a review paper that compares these methods. The discussion below describes how these methods can be implemented to compute variances of the estimates for the 2006 WGRA.

#### **Linearization (i.e. Taylor Series) Methods to Compute Variances**

A widely used method for estimating variances in complex surveys is based on the Taylor series approximation. A linear approximation to a statistic is formed and then substituted into the formula for calculating the variance of a linear estimate appropriate for the sample design. The Taylor series method relies on the simplicity associated with estimating the variance for a linear statistic, even with a complex sample design, and is valid in large samples. In this formulation, the variance strata and primary sampling units (PSUs) must be defined.

SUDAAN is a software package designed to produce variance estimates for complex surveys using the Taylor series method. SUDAAN computes standard errors of the estimates by taking into account most features of complex sample designs and estimators. SUDAAN is also capable of reflecting stratum-by-stratum finite population correction (*fpc*) factors in the computation of variances. This is particularly important for surveys conducted by DMDC, where some strata are sampled at high rates.

For descriptive statistics, SUDAAN offers three procedures: PROC CROSSTAB for categorical variables, PROC DESCRIPT for continuous variables, and PROC RATIO for ratios

of totals. These procedures can be used to compute statistics of interest, such as estimated totals, means, and percentages along with their corresponding standard errors, design effects, and confidence intervals. SUDAAN can be used to reflect the facts that:

- (i) the December frame contains members who were proxy-reported as ineligible, or would had been found ineligible had they been surveyed; and
- (ii) the *fpc* is important in some strata.

SUDAAN cannot completely account for the fact that raking was used. An expedient that should produce standard errors that are approximately correct is to identify the one raking dimension that has the most effect on standard errors and to tell SUDAAN that the variable representing that dimension was used for poststratification. SUDAAN can account for the effect of poststratifying weights to control totals through the use of POSTVAR and POSTWGT statements. The estimates of standard errors will reflect the effect of poststratification. The option is valid only in PROC DESCRIPT and PROC RATIO and design effects are not computed with this option.

Differences of table cell estimates can also be computed in PROC DESCRIPT and PROC RATIO. The statements that control these calculations are CONTRAST, DIFFVAR, and PAIRWISE.

To reflect the effect of the design in variance estimation, SUDAAN requires variables that indicate the variance estimation strata and sampled PSUs. The variance estimation strata are generally the original sampling design strata from which the sample was drawn. The sampled PSU corresponds to the individual sampled person. In some design strata the initial sample will be small and will be even further reduced due to nonresponse. Small sample sizes can lead to unstable variance estimates. We have limited this problem by collapsing original strata with fewer than 30 respondents. The variance estimation strata are available upon request.

The variance strata and PSU indicator variables are part of the data set delivered to DMDC so that estimates and their standard errors can be computed using SUDAAN.

SAS version 9<sup>®</sup> (SAS Institute, 2000) has four procedures for analyzing survey data: PROC SURVEYMEANS, PROC SURVEYREG, PROC SURVEYLOGISTIC, and PROC SURVEYFREQ. All use the Taylor series linearization approach to estimate standard errors. SURVEYMEANS produces estimates of means, proportions, and totals, while SURVEYREG fits linear regression models. No design effects are estimated with either PROC. Estimates of differences or other linear combinations are not available in SURVEYMEANS. SURVEYFREQ produces one-way frequencies and multi-way cross tabulations; design effects are estimated.

These procedures are new in SAS and do not contain as many features as some other packages. Finite population correction factors can be included in variance estimates for the 2006 WGRA, but the effect of nonresponse adjustments and raking cannot. Accounting for the December frame containing some ineligible units is done by using a DOMAIN statement to treat the eligibles as a subpopulation of the weighted cases.

## **Replication Methods**

The basic idea behind replication is to draw subsamples from the full sample, compute the estimate from each of the subsamples, and estimate the variance from the subsample estimates. The subsamples are called replicates and the estimates from the subsamples are called replicate estimates. Rust and Rao (1996) discuss replication methods, show how the units included in the subsamples can be defined using variance strata and units, and describe how these methods can be implemented using weights.

Replicate weights are created to derive a corresponding set of replicate estimates. Each replicate weight will be constructed using the same estimation steps as the full sample weight, but using only the subsample of cases composing each replicate.

WesVar is a computer software program that generates measures of variability (e.g., standard errors, coefficients of variation, and confidence intervals) for estimates using a specified set of replicate weights. WesVar allows derived statistics, like differences or ratios, to be calculated using the Cell Function feature of tables.

An advantage of using replication as the method to estimate variances is the ability to reflect all aspects of weighting: the design, the effect of the nonresponse adjustments, and raking. Since the sampling rate is high for some strata, we also include provisions to approximately reflect the finite population correction factors in the computation of variances. Once replicate weights are constructed, no special care is needed for subgroups of interest, and no knowledge of the sample design is required.

For reference, Table 14 lists some of the features available in SUDAAN, SAS, and WesVar that are relevant to the 2006 WGRA analysis. This list is not exhaustive, particularly for SUDAAN and WesVar. There are other analysis features in SUDAAN and WesVar that may also be of interest to some data users.

**Table 14.**  
**Comparison of Features of Three Software Packages for the Analysis of Survey Data**

| Feature  | SUDAAN | SAS | WesVar |
|--|--------|-----|--------|
| Estimation features reflected in variance estimates                    |        |     |        |
| Stratification   | X      | X   | X      |
| Ineligible cases in poststratification frame                           | X      | X   | X      |
| Differential weights among cases                                       | X      | X   | X      |
| Nonresponse adjustments (unknown eligibility, eligible nonrespondents) | X*     | NA  | X      |
| Poststratification   | X      | NA  | X      |
| Raking   | X*     | NA  | X      |
| Finite population correction factors                                   | X      | X   | X **   |
| Tables   |        |     |        |
| Totals/standard errors   | X      | X   | X      |
| Means/standard errors  | X      | X   | X      |
| Proportions/standard errors  | X      | X   | X      |
| Multi-way tables   | X      | X   | X      |
| Differences of cell estimates/standard errors                          | X      | NA  | X      |
| Ratios of cell estimates   | X      | NA  | X      |
| Linear regression  |        |     |        |
| Parameter estimates/standard errors                                    | X      | X   | X      |
| Confidence intervals for parameters                                    | X      | X   | X      |
| Logistic regression  |        |     |        |
| Parameter estimates/standard errors                                    | X      | X   | X      |
| Confidence intervals for parameters                                    | X      | X   | X      |
| Odds ratios/confidence intervals                                       | X      | X   | X      |
| Multinomial logistic regression (unordered categories)                 |        |     |        |
| Parameter estimates/standard errors                                    | X      | X   | X      |
| Odds ratios/confidence intervals                                       | X      | X   | X      |
| Multinomial logistic regression (ordered categories)                   |        |     |        |
| Parameter estimates/standard errors                                    | X      | X   | NA     |
| Odds ratios/confidence intervals                                       | X      | X   | NA     |

Note. NA = not available.

\* Available in SUDAAN when estimates based on replication methods are computed.

\*\* Common fpc's at the replicate level.

### **The Jackknife Method**

The method of replication used in the 2006 WGRA is known as the stratified, delete-one jackknife. The general procedure is to form groups of sample persons, and then to form replicates or subsamples by deleting one group at a time. The method is called JK<sub>n</sub> in WesVar. The method is discussed in some depth in Chapter 4 of Wolter (2007) and in Rust (1986).

To implement the method, variance strata (denoted in WesVar as *VARSTRAT*) and variance units (denoted as *VARUNIT*) were created. The variance strata were combinations of design strata. The variance units were groups of initial sample persons, including eligibles, ineligibles, and unknowns. Let  $\tilde{h}$  be a variance stratum and denote the number of *VARUNIT*s in

stratum  $\tilde{h}$  by  $n_{\tilde{h}}$ . Since one *VARUNIT* is omitted at a time in the JK<sub>n</sub> method, the total number of replicate estimates is

$$G = \sum_{\tilde{h}=1}^{\tilde{H}} n_{\tilde{h}}$$

where  $\tilde{H}$  is the number of variance strata. Note that  $\tilde{H}$  may be different from the number of design strata.

Let  $g$  denote a particular combination of *VARSTRAT* and *VARUNIT*. Denote the replicate estimate formed by deleting *VARSTRAT-VARUNIT*  $g$  by  $\hat{t}_{(g)}$ . Because one *VARUNIT* is omitted at a time for JK<sub>n</sub>,  $g$  can be used to identify the *VARUNIT* itself, the set of sample units (i.e., the replicate) that remains after omitting unit  $g$ , and the estimate computed from that replicate set of sample units.

The weights used in calculating  $\hat{t}_{(g)}$  account for the deletion of  $g$  from the sample as follows. Suppose that  $g$  identifies a *VARUNIT* in *VARSTRAT*  $\tilde{h}$ . When *VARSTRAT-VARUNIT*  $g$  is omitted, the base weights associated with the other  $n_{\tilde{h}} - 1$  variance units in *VARSTRAT*  $\tilde{h}$  are multiplied by the factor:

$$\frac{n_{\tilde{h}}}{n_{\tilde{h}} - 1}.$$

The base weight for *VARSTRAT-VARUNIT*  $g$  is multiplied by 0 to indicate that replicate  $g$  is deleted. The weights on all *VARUNIT*s in all other *VARSTRAT* are unchanged. The two nonresponse adjustment steps and the poststratification step, described above, are then carried through using the sample units in replicate  $g$  and their modified base weights. The estimate from replicate  $g$ ,  $\hat{t}_{(g)}$ , thus, reflects all stages of weighting.

The JK<sub>n</sub> variance estimate for the full sample estimate  $\hat{t}$  is then

$$v(\hat{t}) = \sum_{g=1}^G f_g h_g [\hat{t}_{(g)} - \hat{t}]^2$$

where  $f_g$  is the finite population correction (*fpc*) factor associated with the variance stratum containing unit  $g$  and  $h_g = (n_{\tilde{h}} - 1)/n_{\tilde{h}}$  where  $\tilde{h}$  is the *VARSTRAT* that contains unit  $g$ . The  $h_g$  are referred to as "JK<sub>n</sub> factors." In forming variance strata, it is important to put design strata having the same or nearly the same *fpc* together in a variance stratum. This can be done only approximately since the sampling rates vary considerably among the 2006 WGRA design strata.

Each sample person's record in the data file will have  $G + 1$  weights attached—one for the full sample and  $G$  replicate sample weights, computed as described above. In WesVar a data set called a VAR file is created that contains an indicator that the JK<sub>n</sub> method was used to create weights, the weights themselves, the finite population correction factors, and the  $h_g$  factors.

When a user does tabulations or other analyses in WesVar using the VAR file, WesVar automatically evaluates variances using the JK<sub>n</sub> formula.

### **Number of Replicates**

A key step in designing the replicate structure is to determine the number of replicates. The choice of the number of replicates is based on the desire to obtain an adequate number of degrees of freedom ( $DF$ ) to ensure stable estimates of variance while not having so many as to make the time or cost of computing variance estimates unnecessarily high. At  $DF=30$ , percentiles of the  $t$ -distribution are near those for the normal distribution; at  $DF=60$ , they are virtually the same as those for the normal. A rule of thumb is, thus, that at least 30 degrees of freedom are needed to obtain relatively stable variance estimates. The stability of a variance estimate for a subgroup is related to the number of VARSTRAT and VARUNITs contributing to the subgroup estimate. Some subgroups, like white males, are found in many design strata while others like females in the Coast Guard are in few.

Note that having an adequate number of  $DF$  is not a concern in SUDAAN because the linearization variance estimates will have thousands of degrees of freedom for full sample estimates. Domain estimates will have variances with fewer  $DF$  but probably still enough to insure stability.

### **Formation of Replicates**

The inclusion of the finite population correction ( $fpc$ ) factor is not a straightforward process when replicates are used. As shown in the expression for the variance when JK<sub>n</sub> replicates are used, the inclusion of the  $fpc$  (factor  $f_g$ ) is only possible at the replicate level. Ideally, the creation of the replicate should be restricted to include the records from a single stratum only, in order to reflect the effect of the  $fpc$  in that specific stratum. At the same time, as described before, to make more precise estimates at the stratum level, at least 30 replicates per stratum need to be created. Then the total number of replicates to create would be approximated as:

$$\text{Total replicates} \geq 30 * (\text{Number of strata}).$$

The 2006 WGRA survey has 245 strata and, with the rule above, the required number of replicates needed to fully reflect the  $fpc$  in each design stratum would be about 7,350. Such a large number of replicates would be burdensome in practice. To solve this problem, we used an overall  $fpc$  for groups with similar sampling fractions, and collapsed design strata when the variance strata were created. The  $fpc$  for a stratum  $h$  is

$$fpc_h = 1 - r_h = 1 - \frac{n_h}{N_h}$$

where  $r_h$  = the sampling fraction or sampling rate defined as the ratio of the sample size  $n_h$  to the total population  $N_h$  in stratum  $h$ .

The pertinent sampling rate here is the achieved rate defined as the number of respondents (not the initial sample size) divided by the population size.

We created zones of strata such that the design strata within a zone all have approximately the same  $fpc$ . The zones were then equated to the *VARSTRAT* for use in WesVar. Table 15 shows the ranges of stratum sampling rates in each zone and the number of design strata in each.

**Table 15.**  
***Replicate Zones for the 2006 WGRA***

| <b>Zone</b> | <b>Range of Sampling Rate</b> | <b>Number of Strata</b> | <b>Percentage</b> |
|-------------|-------------------------------|-------------------------|-------------------|
| 1           | [0.40, 1.00]                  | 21                      | 8.07              |
| 2           | [0.20, 0.38]                  | 46                      | 9.94              |
| 3           | [0.10, 0.20]                  | 67                      | 24.90             |
| 4           | [0.01, 0.10]                  | 111                     | 57.09             |
| Total       |                               | 245                     | 100.00            |

An overall  $fpc$  factor was applied to the strata within each zone. The overall  $fpc$  factor was computed using the minimum sampling rate within the zone. The overall  $fpc$  is an approximation of the actual stratum  $fpc$  except for the stratum with the minimum sampling rate where these are the same. Except in this case, the overall  $fpc$  is larger than the actual stratum  $fpc$ , leading to an overestimation of the variance for estimates for these strata. As a result, this procedure yields somewhat conservative variance estimates. Nevertheless, large improvements are expected in the precision of some domain estimates compared with the case where the  $fpc$  is ignored entirely. The  $fpc$  for each zone is reported in Table 16.

An alternative is to use an overall  $fpc$  computed using the average of the sampling rates of the strata within each zone. However, in this case, the variances can be underestimated for all strata with  $fpc$  larger than the average  $fpc$ .

**Table 16.**  
*Overall fpc for the Replicate Zones*

| <b>Zone</b> | <b>Minimum Sampling Rate</b> | <b>Overall fpc Factor</b> |
|-------------|------------------------------|---------------------------|
| 1           | 0.4011                       | 0.5989                    |
| 2           | 0.2002                       | 0.7999                    |
| 3           | 0.1006                       | 0.8994                    |
| 4           | 0.0133                       | 0.9867                    |

The design strata can be collapsed (or “folded”) into pseudo-strata or replicate variance strata (*VARSTRAT*) to reduce the number of replicates. The number of variance strata and the number of replicates created within each variance stratum affect the number of degrees of freedom of the estimate of variance. As described before, each design stratum should ideally contain at least 30 replicates. Since the replicate zones had already been formed by collapsing the design strata, they were used as variance strata. Table 17 shows the number of variance strata and number of replicates created within each variance stratum.

**Table 17.**  
*VARSTRAT and VARUNIT for the 2006 WGRA*

| <b>VARSTRAT</b> | <b>Number of Replicates (VARUNIT)</b> | <b>JKn Factor (<math>h_g</math>)</b> |
|-----------------|---------------------------------------|--------------------------------------|
| 1               | 30                                    | 0.96667                              |
| 2               | 30                                    | 0.96667                              |
| 3               | 45                                    | 0.97778                              |
| 4               | 80                                    | 0.98750                              |
| Total           | 185                                   |                                      |

To assign the value of *VARUNIT*, we sorted all the records in the same random order in which they were sampled within *VARSTRAT*. The value of *VARUNIT* is a sequential number starting from 1 that is assigned to each record. When the sequential number reached the maximum number of *VARUNIT* within *VARSTRAT*, it restarts at one. This process was repeated until each record had a value of *VARUNIT*. For example, if 30 replicates were assigned to *VARSTRAT*=1 (i.e., zone = 1) the records were serially numbered 1, 2, ..., 30; 1, 2... 30 and so on. All of the records numbered 1 were assigned to *VARUNIT* 1; all of the records numbered 2 were assigned to *VARUNIT* 2, and so on. The records with *VARUNIT*=1 were, thus, a subsample of the sample from all design strata assigned to *VARSTRAT*=1, as are the records in the other *VARUNIT*s. Because the ordering of the sample persons was random, this method effectively divided the sample in each *VARSTRAT* into random groups.

To form the replicates, we created a series of factors  $REPF(\tilde{h}, g)$  (replicate factor for *VARUNIT*=g in *VARSTRAT*= $\tilde{h}$ ) with the following values:

$$REPF(\tilde{h}, g) = \begin{cases} 0 & \text{if the person is in } VARSTRAT = \tilde{h} \text{ and } VARUNIT = g \\ \frac{n_{\tilde{h}}}{n_{\tilde{h}} - 1} & \text{if the person is in } VARSTRAT = \tilde{h} \text{ and } VARUNIT \neq g \\ 1 & \text{if the person is in } VARSTRAT \neq \tilde{h} \end{cases}$$

where

$n_{\tilde{h}}$  = the number of *VARUNIT*s in *VARSTRAT* =  $\tilde{h}$ .

The replicate base weight is the product of  $REPF(\tilde{h}, g)$  and the full-sample base weight.

The assignment of *VARSTRAT* for the design strata is available upon request.

### Calculation of Response Rates

Several rates for the 2006 WGRA have been computed in accordance with the standards defined by the Council of American Survey Research Organizations (CASRO, 1982). The rates are referred to as:

- Location rate (*LR*);
- Completion rate (*CR*); and
- Response rate (*RR*).

These quantities were computed in such a way that  $RR = LR * CR$ . The rates are adjusted, as described below, to account for the fact that the eligibility of some units is unknown.

The location rate used for the 2006 WGRA is

$$LR = \frac{\text{adjusted located sample}}{\text{adjusted eligible sample}} = \frac{N_L}{N_E}.$$

The *completion rate* is defined as

$$CR = \frac{\text{usable responses}}{\text{adjusted located sample}} = \frac{N_R}{N_L}.$$

The *response rate* is defined as

$$RR = \frac{\text{usable responses}}{\text{adjusted eligible sample}} = \frac{N_R}{N_E}.$$

where,

$N_L$  = Adjusted located sample

$N_E$  = Adjusted eligible sample

$N_R$  = Usable responses.

The adjustments account for the fact that the eligibility status of some persons is unknown so that the proportion of eligibles among the unknowns must be estimated. An assumption in these calculations is that there are ineligibles among the persons with unknown disposition ( $ELIG = UNK$ ). That is, the updated frame file is assumed to properly identify all other ineligibles. To facilitate computation of the CASRO rates, we created a separate code ( $CAS\_ELIG$ ) that identified cases that contributed to the components of  $LR$ ,  $CR$ , and  $RR$ , as defined in Table 18.

**Table 18.**  
**Disposition Codes for CASRO Response Rates (CAS\_ELIG)**

| Eligibility Code for CASRO Response Rates (CAS_ELIG) | Weighting Eligibility Code (ELIG) | Sample Cases | Sum of Weights |
|--|-----------------------------------|--------------|----------------|
| Eligible Respondent                                  | ER                                | 26,867       | 385,667        |
| Eligible Incomplete                                  | ENR                               | 3,319        | 52,587         |
| Eligible – Returned blank                            | ENR                               | 203          | 3,369          |
| Eligible – Refused                                   | ENR                               | 595          | 8,449          |
| Ineligible – Proxy Report                            | IN_PR                             | 399          | 5,017          |
| Postal NonDeliverable                                | UNK_NoLoc                         | 11,842       | 185,303        |
| Nonrespondent  | UNK_NoRet                         | 41,254       | 663,248        |
| Record Ineligible                                    | IN_FR                             | 1,734        | 29,150         |
| Total  |                                   | 86,213       | 1,332,791      |

The expressions for the numbers of located persons, eligible persons, and usable responses in terms of CAS\_ELIG are given below. As notational shorthand, CAS\_ELIG codes are used to stand for counts of persons in the formulas. For example, *ER* denotes the count of eligible respondents.

$$\begin{aligned}
 N_L &= (\text{Eligible respondents}) + (\text{Eligible nonrespondents}) + (\text{Estimate of eligibles among unknowns who were located but did not return a questionnaire}) \\
 &= ER + ENR + UNK\_NORET \cdot \left( \frac{ER + ENR}{ER + ENR + IN\_PR} \right) \\
 &= ER + ENR + UNK\_NORET \cdot P\_E
 \end{aligned}$$

where  $P\_E = \frac{ER + ENR}{ER + ENR + IN\_PR}$  and

$$ENR = ENR\_NOQCOMP + ENR\_BLANK + ENR\_ACTIVE.$$

$$\begin{aligned}
 N_E &= (\text{Eligible respondents}) + (\text{Estimate of eligibles among all unknowns}) \\
 &= ER + ENR + (UNK\_NORET + UNK\_NOLOC) \cdot \left( \frac{ER + ENR}{ER + ENR + IN\_PR} \right) \\
 &= ER + ENR + UNK \cdot P\_E
 \end{aligned}$$

where  $UNK = UNK\_NORET + UNK\_NOLOC$ .

$$\begin{aligned}
 N_R &= (\text{Usable responses}) \\
 &= ER.
 \end{aligned}$$

The adjusted located count,  $N_L$ , and the adjusted eligible count,  $N_E$ , can also be expressed by subtracting various counts from the total sample as shown below. DMDC has used this method (see below) on earlier surveys.

$$\begin{aligned}
 N_E &= \text{Adjusted eligible sample} \\
 &= (\text{Total sample}) \\
 &\quad - (\text{Known ineligible}) \\
 &\quad - (\text{Estimate of proxy-reported ineligible among non-located unknowns}) \\
 &\quad - (\text{Estimate of proxy-reported ineligible among other unknowns}) \\
 &= TOTAL - (IN\_FR + IN\_PR) - (UNK\_NOLOC + UNK\_NORET) \cdot \frac{IN\_PR}{ER + ENR + IN\_PR} \\
 &= ER + ENR + UNK \cdot P\_E
 \end{aligned}$$

using the facts that

$$1) \quad TOTAL = ER + ENR + IN\_FR + IN\_PR + UNK\_NOLOC + UNK\_NORET$$

$$2) \quad IN\_PR / (ER + ENR + IN\_PR) = 1 - P\_E.$$

$$3) \quad N_L = \text{Adjusted located sample}$$

$$\begin{aligned}
 &= (\text{Total sample}) \\
 &\quad - (\text{Known ineligible}) \\
 &\quad - (\text{Non-located unknowns}) \\
 &\quad - (\text{Estimate of proxy-reported ineligible among other unknowns}) \\
 &= TOTAL - (IN\_FR + IN\_PR) - UNK\_NOLOC - UNK\_NORET \cdot \left( \frac{IN\_PR}{ER + ENR + IN\_PR} \right) \\
 &= ER + ENR + UNK\_NORET \cdot P\_E
 \end{aligned}$$

Weighted and unweighted location, completion, and response rates were calculated for the full sample as well as for Service, gender, paygrade group, race/ethnicity, occupational PERSTEMPO status, and age group as shown in Table 19. In all cases, base weights were used in computing the weighted rates.



**Table 19.**  
***Unweighted and Weighted Location, Completion, and Response Rates for the Full Sample and Categories of Service, Paygrade, Gender, Race/Ethnicity, and Tempo Status***

| Group       | Adjusted Eligible Sample | Adjusted Located Sample | Complete Response | Unweighted      |                   |                 | Weighted        |                   |                 |
|-------------|--------------------------|-------------------------|-------------------|-----------------|-------------------|-----------------|-----------------|-------------------|-----------------|
|             |                          |                         |                   | Location Rate % | Completion Rate % | Response Rate % | Location Rate % | Completion Rate % | Response Rate % |
| Full Sample | 83,405                   | 71,714                  | 26,867            | 86              | 37                | 32              | 86              | 35                | 30              |
| DoD         |                          |                         |                   |                 |                   |                 |                 |                   |                 |
| Army        | 26,670                   | 23,248                  | 9,532             | 87              | 41                | 36              | 84              | 35                | 30              |
| Navy        | 16,928                   | 14,522                  | 5,592             | 86              | 39                | 33              | 86              | 36                | 30              |
| USMC        | 16,752                   | 12,415                  | 3,070             | 74              | 25                | 18              | 73              | 23                | 17              |
| USAF        | 16,359                   | 15,383                  | 5,982             | 94              | 39                | 37              | 94              | 37                | 35              |
| Total       | 76,709                   | 65,568                  | 24,176            | 86              | 37                | 32              | 86              | 35                | 30              |
| NonDoD      |                          |                         |                   |                 |                   |                 |                 |                   |                 |
| USCG        | 6,667                    | 6,132                   | 2,691             | 92              | 44                | 40              | 92              | 45                | 41              |
| Gender      |                          |                         |                   |                 |                   |                 |                 |                   |                 |
| Male        | 58,306                   | 50,029                  | 18,856            | 86              | 38                | 32              | 85              | 34                | 29              |
| Female      | 25,100                   | 21,685                  | 8,011             | 86              | 37                | 32              | 88              | 38                | 33              |
| Paygrade    |                          |                         |                   |                 |                   |                 |                 |                   |                 |
| E1 - E3     | 21,579                   | 15,517                  | 2,638             | 72              | 17                | 12              | 73              | 16                | 12              |
| E4          | 13,243                   | 10,641                  | 2,562             | 80              | 24                | 19              | 80              | 23                | 18              |
| E5 - E6     | 17,224                   | 15,684                  | 5,830             | 91              | 37                | 34              | 91              | 37                | 34              |
| E7 - E9     | 7,051                    | 6,768                   | 3,669             | 96              | 54                | 52              | 96              | 55                | 53              |
| W1 - W5     | 6,144                    | 5,893                   | 3,129             | 96              | 53                | 51              | 96              | 54                | 52              |
| O1 - O3     | 10,238                   | 9,510                   | 4,402             | 93              | 46                | 43              | 93              | 46                | 43              |
| O4 - O6     | 7,945                    | 7,716                   | 4,637             | 97              | 60                | 58              | 97              | 60                | 58              |

*Note. The frequencies provided in Adjusted Eligible Sample and Adjusted Located Sample do not add up since they are based on estimates.*

**Table 19. (continued)**

| Group                           | Adjusted Eligible Sample | Adjusted Located Sample | Complete Response | Unweighted |    |    | Weighted |    |    |
|---------------------------------|--------------------------|-------------------------|-------------------|------------|----|----|----------|----|----|
| <b>Race/Ethnicity</b>           |                          |                         |                   |            |    |    |          |    |    |
| Unknown                         | 21,579                   | 15,517                  | 2,638             | 72         | 17 | 12 | 76       | 19 | 14 |
| Minority                        | 52,045                   | 41,841                  | 11,030            | 80         | 26 | 21 | 84       | 31 | 26 |
| Nonminority                     | 23,434                   | 22,171                  | 11,200            | 95         | 51 | 48 | 95       | 52 | 49 |
| <b>Race/Ethnicity(2)</b>        |                          |                         |                   |            |    |    |          |    |    |
| American Indian, Alaskan Native | 1,249                    | 992                     | 283               | 79         | 29 | 23 | 79       | 24 | 19 |
| Asian                           | 2,546                    | 2,143                   | 810               | 84         | 38 | 32 | 85       | 36 | 30 |
| Black                           | 15,179                   | 13,080                  | 4,386             | 86         | 34 | 29 | 86       | 32 | 27 |
| White                           | 52,881                   | 45,758                  | 18,186            | 87         | 40 | 34 | 86       | 36 | 31 |
| Hispanic                        | 8,069                    | 6,695                   | 2,102             | 83         | 31 | 26 | 84       | 30 | 25 |
| Hawaiian/Pacific Islander       | 267                      | 207                     | 62                | 78         | 30 | 23 | 79       | 30 | 24 |
| Multi Race                      | 887                      | 782                     | 281               | 88         | 36 | 32 | 86       | 31 | 27 |
| Unknown                         | 2,337                    | 2,062                   | 757               | 88         | 37 | 32 | 88       | 37 | 32 |
| <b>Tempo</b>                    |                          |                         |                   |            |    |    |          |    |    |
| Unknown                         | 2,811                    | 2,049                   | 769               | 73         | 38 | 27 | 73       | 38 | 27 |
| Low                             | 29,643                   | 27,182                  | 12,466            | 92         | 46 | 42 | 91       | 42 | 38 |
| High                            | 50,959                   | 42,487                  | 13,632            | 83         | 32 | 27 | 84       | 31 | 26 |
| <b>Age (in years)</b>           |                          |                         |                   |            |    |    |          |    |    |
| Less than 25                    | 33,730                   | 25,344                  | 5,245             | 75         | 21 | 16 | 76       | 20 | 15 |
| 25-29                           | 15,580                   | 13,811                  | 4,645             | 89         | 34 | 30 | 88       | 32 | 28 |
| 30-34                           | 11,674                   | 10,940                  | 4,892             | 94         | 45 | 42 | 93       | 43 | 41 |
| More than 34                    | 22,463                   | 21,651                  | 12,085            | 96         | 56 | 54 | 96       | 54 | 51 |

*Note. The frequencies provided in Adjusted Eligible Sample and Adjusted Located Sample do not add up since they are based on estimates.*

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**Appendix A.**  
**Sample Selection Tables**



**Table A1.**  
***Anticipated Precision for the WGRA 2006***

| <b>Domain Number</b> | <b>Eligible Population Percentage</b> | <b>Domain Size</b> | <b>Prevalence</b> | <b>Confidence Interval Half Width</b> | <b>Domain Label</b>        |
|----------------------|---------------------------------------|--------------------|-------------------|---------------------------------------|----------------------------|
| 1                    | 94.00%                                | 1,253,316          | 0.5               | 0.01                                  | All Domains                |
| 2                    | 80.50%                                | 1,072,726          | 0.5               | 0.01                                  | All Domains*Male           |
| 3                    | 13.50%                                | 180,590            | 0.5               | 0.01                                  | All Domains*Female         |
| 4                    | 30.70%                                | 408,826            | 0.5               | 0.02                                  | All Domains*AnyHar         |
| 5                    | 22.50%                                | 300,628            | 0.5               | 0.03                                  | All Domains*Male*AnyHar    |
| 6                    | 8.10%                                 | 108,198            | 0.5               | 0.02                                  | All Domains*Female*AnyHar  |
| 7                    | 0.80%                                 | 11,048             | 0.5               | 0.13                                  | All Domains*AnyAslt        |
| 8                    | 0.50%                                 | 6,683              | 0.5               | 0.2                                   | All Domains*Male*AnyAslt   |
| 9                    | 0.30%                                 | 4,365              | 0.5               | 0.1                                   | All Domains*Female*AnyAslt |
| 10                   | 91.60%                                | 1,221,188          | 0.5               | 0.01                                  | DoD                        |
| 11                   | 32.80%                                | 437,065            | 0.5               | 0.02                                  | Army                       |
| 12                   | 24.40%                                | 325,827            | 0.5               | 0.02                                  | Navy                       |
| 13                   | 10.40%                                | 138,260            | 0.5               | 0.02                                  | Marine Corps               |
| 14                   | 24.00%                                | 320,036            | 0.5               | 0.02                                  | Air Force                  |
| 15                   | 2.40%                                 | 32,128             | 0.5               | 0.02                                  | Coast Guard                |
| 16                   | 7.50%                                 | 100,389            | 0.5               | 0.04                                  | Deployed Past 12 Months    |
| 17                   | 77.40%                                | 1,031,549          | 0.5               | 0.01                                  | Enlisted*DoD               |
| 18                   | 39.30%                                | 524,356            | 0.5               | 0.02                                  | E1-E4*DoD                  |
| 19                   | 21.70%                                | 288,705            | 0.5               | 0.02                                  | E1-E3*DoD                  |
| 20                   | 17.70%                                | 235,651            | 0.5               | 0.02                                  | E4*DoD                     |
| 21                   | 38.00%                                | 507,193            | 0.5               | 0.01                                  | E5-E9*DoD                  |
| 22                   | 29.00%                                | 386,743            | 0.5               | 0.02                                  | E5-E6*DoD                  |
| 23                   | 9.00%                                 | 120,450            | 0.5               | 0.02                                  | E7-E9*DoD                  |
| 24                   | 14.20%                                | 189,639            | 0.5               | 0.01                                  | Officer*DoD                |
| 25                   | 0.90%                                 | 12,605             | 0.5               | 0.03                                  | W1-W5*DoD                  |
| 26                   | 7.50%                                 | 100,541            | 0.5               | 0.02                                  | O1-O3*DoD                  |
| 27                   | 5.70%                                 | 76,493             | 0.5               | 0.02                                  | O4-O6*DoD                  |
| 28                   | 60.50%                                | 807,102            | 0.5               | 0.01                                  | Non-minority*DoD           |
| 29                   | 31.10%                                | 414,086            | 0.5               | 0.02                                  | Minority*DoD               |
| 30                   | 78.30%                                | 1,044,170          | 0.5               | 0.01                                  | DoD*Male                   |
| 31                   | 28.20%                                | 376,368            | 0.5               | 0.02                                  | Army*Male                  |
| 32                   | 21.00%                                | 279,538            | 0.5               | 0.02                                  | Navy*Male                  |
| 33                   | 9.80%                                 | 130,125            | 0.5               | 0.02                                  | Marine Corps*Male          |
| 34                   | 19.40%                                | 258,139            | 0.5               | 0.02                                  | Air Force*Male             |

**Table A-1. (continued)**

| <b>Domain Number</b> | <b>Eligible Population Percentage</b> | <b>Domain Size</b> | <b>Prevalence</b> | <b>Confidence Interval Half Width</b> | <b>Domain Label</b>            |
|----------------------|---------------------------------------|--------------------|-------------------|---------------------------------------|--------------------------------|
| 35                   | 2.10%                                 | 28,556             | 0.5               | 0.02                                  | Coast Guard*Male               |
| 36                   | 6.80%                                 | 90,423             | 0.5               | 0.05                                  | Deployed Past 12 Months*Male   |
| 37                   | 66.20%                                | 882,935            | 0.5               | 0.01                                  | Enlisted*Male*DoD              |
| 38                   | 33.20%                                | 443,236            | 0.5               | 0.02                                  | E1-E4*Male*DoD                 |
| 39                   | 33.00%                                | 439,699            | 0.5               | 0.02                                  | E5-E9*Male*DoD                 |
| 40                   | 12.10%                                | 161,235            | 0.5               | 0.01                                  | Officer*Male*DoD               |
| 41                   | 0.90%                                 | 11,681             | 0.5               | 0.03                                  | W1-W5*Male*DoD                 |
| 42                   | 6.20%                                 | 82,687             | 0.5               | 0.02                                  | O1-O3*Male*DoD                 |
| 43                   | 5.00%                                 | 66,867             | 0.5               | 0.02                                  | O4-O6*Male*DoD                 |
| 44                   | 13.30%                                | 177,018            | 0.5               | 0.01                                  | DoD*Female                     |
| 45                   | 4.60%                                 | 60,697             | 0.5               | 0.02                                  | Army*Female                    |
| 46                   | 3.50%                                 | 46,289             | 0.5               | 0.02                                  | Navy*Female                    |
| 47                   | 0.60%                                 | 8,135              | 0.5               | 0.04                                  | Marine Corps*Female            |
| 48                   | 4.60%                                 | 61,897             | 0.5               | 0.02                                  | Air Force*Female               |
| 49                   | 0.30%                                 | 3,572              | 0.5               | 0.06                                  | Coast Guard*Female             |
| 50                   | 0.70%                                 | 9,966              | 0.5               | 0.07                                  | Deployed Past 12 Months*Female |
| 51                   | 11.10%                                | 148,614            | 0.5               | 0.01                                  | Enlisted*Female*DoD            |
| 52                   | 6.10%                                 | 81,120             | 0.5               | 0.02                                  | E1-E4*Female*DoD               |
| 53                   | 5.10%                                 | 67,494             | 0.5               | 0.02                                  | E5-E9*Female*DoD               |
| 54                   | 2.10%                                 | 28,404             | 0.5               | 0.02                                  | Officer*Female*DoD             |
| 55                   | 0.10%                                 | 924                | 0.5               | 0.09                                  | W1-W5*Female*DoD               |
| 56                   | 1.30%                                 | 17,854             | 0.5               | 0.03                                  | O1-O3*Female*DoD               |
| 57                   | 0.70%                                 | 9,626              | 0.5               | 0.03                                  | O4-O6*Female*DoD               |
| 58                   | 53.50%                                | 713,464            | 0.5               | 0.01                                  | Male*Non-minority*DoD          |
| 59                   | 7.00%                                 | 93,638             | 0.5               | 0.02                                  | Female*Non-minority*DoD        |
| 60                   | 24.80%                                | 330,706            | 0.5               | 0.02                                  | Male*Minority*DoD              |
| 61                   | 6.30%                                 | 83,380             | 0.5               | 0.02                                  | Female*Minority*DoD            |
| 62                   | 29.80%                                | 396,955            | 0.5               | 0.02                                  | DoD*AnyHar                     |
| 63                   | 11.20%                                | 149,575            | 0.5               | 0.04                                  | Army*AnyHar                    |
| 64                   | 8.40%                                 | 111,457            | 0.5               | 0.04                                  | Navy*AnyHar                    |
| 65                   | 3.10%                                 | 40,952             | 0.5               | 0.04                                  | Marine Corps*AnyHar            |
| 66                   | 7.10%                                 | 94,971             | 0.5               | 0.04                                  | Air Force*AnyHar               |
| 67                   | 0.90%                                 | 11,871             | 0.5               | 0.04                                  | Coast Guard*AnyHar             |
| 68                   | 26.00%                                | 346,099            | 0.5               | 0.02                                  | Enlisted*DoD*AnyHar            |
| 69                   | 15.10%                                | 201,789            | 0.5               | 0.03                                  | E1-E4*DoD*AnyHar               |
| 70                   | 8.70%                                 | 115,741            | 0.5               | 0.04                                  | E1-E3*DoD*AnyHar               |
| 71                   | 6.50%                                 | 86,048             | 0.5               | 0.05                                  | E4*DoD*AnyHar                  |

**Table A-1. (continued)**

| <b>Domain Number</b> | <b>Eligible Population Percentage</b> | <b>Domain Size</b> | <b>Prevalence</b> | <b>Confidence Interval Half Width</b> | <b>Domain Label</b>            |
|----------------------|---------------------------------------|--------------------|-------------------|---------------------------------------|--------------------------------|
| 72                   | 10.80%                                | 144,310            | 0.5               | 0.03                                  | E5-E9*DoD*AnyHar               |
| 73                   | 8.70%                                 | 116,618            | 0.5               | 0.04                                  | E5-E6*DoD*AnyHar               |
| 74                   | 2.10%                                 | 27,692             | 0.5               | 0.05                                  | E7-E9*DoD*AnyHar               |
| 75                   | 3.80%                                 | 50,856             | 0.5               | 0.03                                  | Officer*DoD*AnyHar             |
| 76                   | 0.20%                                 | 2,409              | 0.5               | 0.05                                  | W1-W5*DoD*AnyHar               |
| 77                   | 2.30%                                 | 30,207             | 0.5               | 0.04                                  | O1-O3*DoD*AnyHar               |
| 78                   | 1.40%                                 | 18,240             | 0.5               | 0.04                                  | O4-O6*DoD*AnyHar               |
| 79                   | 19.00%                                | 253,275            | 0.5               | 0.03                                  | Non-minority*DoD*AnyHar        |
| 80                   | 10.80%                                | 143,680            | 0.5               | 0.03                                  | Minority*DoD*AnyHar            |
| 81                   | 21.80%                                | 291,134            | 0.5               | 0.03                                  | DoD*Male*AnyHar                |
| 82                   | 8.30%                                 | 110,325            | 0.5               | 0.05                                  | Army*Male*AnyHar               |
| 83                   | 6.10%                                 | 81,430             | 0.5               | 0.05                                  | Navy*Male*AnyHar               |
| 84                   | 2.60%                                 | 35,295             | 0.5               | 0.05                                  | Marine Corps*Male*AnyHar       |
| 85                   | 4.80%                                 | 64,084             | 0.5               | 0.05                                  | Air Force*Male*AnyHar          |
| 86                   | 0.70%                                 | 9,494              | 0.5               | 0.05                                  | Coast Guard*Male*AnyHar        |
| 87                   | 19.20%                                | 256,363            | 0.5               | 0.03                                  | Enlisted*Male*DoD*AnyHar       |
| 88                   | 11.10%                                | 148,536            | 0.5               | 0.04                                  | E1-E4*Male*DoD*AnyHar          |
| 89                   | 8.10%                                 | 107,827            | 0.5               | 0.04                                  | E5-E9*Male*DoD*AnyHar          |
| 90                   | 2.60%                                 | 34,771             | 0.5               | 0.03                                  | Officer*Male*DoD*AnyHar        |
| 91                   | 0.10%                                 | 1,936              | 0.5               | 0.05                                  | W1-W5*Male*DoD*AnyHar          |
| 92                   | 1.40%                                 | 19,312             | 0.5               | 0.05                                  | O1-O3*Male*DoD*AnyHar          |
| 93                   | 1.00%                                 | 13,523             | 0.5               | 0.05                                  | O4-O6*Male*DoD*AnyHar          |
| 94                   | 7.90%                                 | 105,821            | 0.5               | 0.02                                  | DoD*Female*AnyHar              |
| 95                   | 2.90%                                 | 39,250             | 0.5               | 0.03                                  | Army*Female*AnyHar             |
| 96                   | 2.30%                                 | 30,027             | 0.5               | 0.03                                  | Navy*Female*AnyHar             |
| 97                   | 0.40%                                 | 5,657              | 0.5               | 0.05                                  | Marine Corps*Female*AnyHar     |
| 98                   | 2.30%                                 | 30,887             | 0.5               | 0.04                                  | Air Force*Female*AnyHar        |
| 99                   | 0.20%                                 | 2,377              | 0.5               | 0.08                                  | Coast Guard*Female*AnyHar      |
| 100                  | 6.70%                                 | 89,736             | 0.5               | 0.02                                  | Enlisted*Female*DoD*AnyHar     |
| 101                  | 4.00%                                 | 53,253             | 0.5               | 0.02                                  | E1-E4*Female*DoD*AnyHar        |
| 102                  | 2.70%                                 | 36,483             | 0.5               | 0.03                                  | E5-E9*Female*DoD*AnyHar        |
| 103                  | 1.20%                                 | 16,085             | 0.5               | 0.04                                  | Officer*Female*DoD*AnyHar      |
| 104                  | 0.00%                                 | 473                | 0.5               | 0.15                                  | W1-W5*Female*DoD*AnyHar        |
| 105                  | 0.80%                                 | 10,895             | 0.5               | 0.05                                  | O1-O3*Female*DoD*AnyHar        |
| 106                  | 0.40%                                 | 4,717              | 0.5               | 0.05                                  | O4-O6*Female*DoD*AnyHar        |
| 107                  | 14.60%                                | 195,057            | 0.5               | 0.03                                  | Male*Non-minority*DoD*AnyHar   |
| 108                  | 4.40%                                 | 58,218             | 0.5               | 0.02                                  | Female*Non-minority*DoD*AnyHar |

**Table A-1. (continued)**

| <b>Domain Number</b> | <b>Eligible Population Percentage</b> | <b>Domain Size</b> | <b>Prevalence</b> | <b>Confidence Interval Half Width</b> | <b>Domain Label</b>         |
|----------------------|---------------------------------------|--------------------|-------------------|---------------------------------------|-----------------------------|
| 109                  | 7.20%                                 | 96,077             | 0.5               | 0.05                                  | Male*Minority*DoD*AnyHar    |
| 110                  | 3.60%                                 | 47,603             | 0.5               | 0.03                                  | Female*Minority*DoD*AnyHar  |
| 111                  | 0.80%                                 | 10,623             | 0.5               | 0.13                                  | Enlisted*DoD*AnyAslt        |
| 112                  | 0.60%                                 | 7,365              | 0.5               | 0.16                                  | E1-E4*DoD*AnyAslt           |
| 113                  | 0.40%                                 | 5,891              | 0.5               | 0.17                                  | E1-E3*DoD*AnyAslt           |
| 114                  | 0.10%                                 | 1,474              | 0.5               | 0.36                                  | E4*DoD*AnyAslt              |
| 115                  | 0.20%                                 | 3,258              | 0.5               | 0.25                                  | E5-E9*DoD*AnyAslt           |
| 116                  | 0.20%                                 | 2,809              | 0.5               | 0.28                                  | E5-E6*DoD*AnyAslt           |
| 117                  | 0.00%                                 | 449                | 0.5               | 0.39                                  | E7-E9*DoD*AnyAslt           |
| 118                  | 0.00%                                 | 309                | 0.5               | 0.37                                  | Officer*DoD*AnyAslt         |
| 119                  | 0.00%                                 | 3                  | 0.5               |                                       | W1-W5*DoD*AnyAslt           |
| 120                  | 0.00%                                 | 284                | 0.5               | 0.39                                  | O1-O3*DoD*AnyAslt           |
| 121                  | 0.00%                                 | 22                 | 0.5               | 0.84                                  | O4-O6*DoD*AnyAslt           |
| 122                  | 0.40%                                 | 5,605              | 0.5               | 0.17                                  | Non-minority*DoD*AnyAslt    |
| 123                  | 0.40%                                 | 5,327              | 0.5               | 0.19                                  | Minority*DoD*AnyAslt        |
| 124                  | 0.50%                                 | 6,681              | 0.5               | 0.2                                   | DoD*Male*AnyAslt            |
| 125                  | 0.20%                                 | 2,170              | 0.5               | 0.42                                  | Army*Male*AnyAslt           |
| 126                  | 0.10%                                 | 1,575              | 0.5               | 0.41                                  | Navy*Male*AnyAslt           |
| 127                  | 0.10%                                 | 790                | 0.5               | 0.37                                  | Marine Corps*Male*AnyAslt   |
| 128                  | 0.20%                                 | 2,146              | 0.5               | 0.32                                  | Air Force*Male*AnyAslt      |
| 129                  | 0.00%                                 | 2                  | 0.5               |                                       | Coast Guard*Male*AnyAslt    |
| 130                  | 0.50%                                 | 6,587              | 0.5               | 0.2                                   | Enlisted*Male*DoD*AnyAslt   |
| 131                  | 0.30%                                 | 3,952              | 0.5               | 0.27                                  | E1-E4*Male*DoD*AnyAslt      |
| 132                  | 0.20%                                 | 2,635              | 0.5               | 0.3                                   | E5-E9*Male*DoD*AnyAslt      |
| 133                  | 0.00%                                 | 94                 | 0.5               | 0.79                                  | Officer*Male*DoD*AnyAslt    |
| 134                  | 0.30%                                 | 4,251              | 0.5               | 0.1                                   | DoD*Female*AnyAslt          |
| 135                  | 0.10%                                 | 1,709              | 0.5               | 0.16                                  | Army*Female*AnyAslt         |
| 136                  | 0.10%                                 | 1,341              | 0.5               | 0.18                                  | Navy*Female*AnyAslt         |
| 137                  | 0.00%                                 | 410                | 0.5               | 0.23                                  | Marine Corps*Female*AnyAslt |
| 138                  | 0.10%                                 | 791                | 0.5               | 0.23                                  | Air Force*Female*AnyAslt    |
| 139                  | 0.00%                                 | 114                | 0.5               | 0.45                                  | Coast Guard*Female*AnyAslt  |
| 140                  | 0.30%                                 | 4,036              | 0.5               | 0.1                                   | Enlisted*Female*DoD*AnyAslt |
| 141                  | 0.30%                                 | 3,413              | 0.5               | 0.11                                  | E1-E4*Female*DoD*AnyAslt    |
| 142                  | 0.00%                                 | 623                | 0.5               | 0.29                                  | E5-E9*Female*DoD*AnyAslt    |
| 143                  | 0.00%                                 | 215                | 0.5               | 0.4                                   | Officer*Female*DoD*AnyAslt  |
| 144                  | 0.00%                                 | 3                  | 0.5               |                                       | W1-W5*Female*DoD*AnyAslt    |
| 145                  | 0.00%                                 | 190                | 0.5               | 0.44                                  | O1-O3*Female*DoD*AnyAslt    |

**Table A-1. (continued)**

| <b>Domain Number</b> | <b>Eligible Population Percentage</b> | <b>Domain Size</b> | <b>Prevalence</b> | <b>Confidence Interval Half Width</b> | <b>Domain Label</b>             |
|----------------------|---------------------------------------|--------------------|-------------------|---------------------------------------|---------------------------------|
| 146                  | 0.00%                                 | 22                 | 0.5               | 0.84                                  | O4-O6*Female*DoD*AnyAslt        |
| 147                  | 0.20%                                 | 3,320              | 0.5               | 0.28                                  | Male*Non-minority*DoD*AnyAslt   |
| 148                  | 0.20%                                 | 2,285              | 0.5               | 0.13                                  | Female*Non-minority*DoD*AnyAslt |
| 149                  | 0.30%                                 | 3,361              | 0.5               | 0.29                                  | Male*Minority*DoD*AnyAslt       |
| 150                  | 0.10%                                 | 1,966              | 0.5               | 0.15                                  | Female*Minority*DoD*AnyAslt     |
| 151                  | 24.10%                                | 320,585            | 0.5               | 0.02                                  | Army*Enlisted*Male              |
| 152                  | 3.80%                                 | 51,221             | 0.5               | 0.02                                  | Army*Enlisted*Female            |
| 153                  | 4.20%                                 | 55,783             | 0.5               | 0.02                                  | Army*Officer*Male               |
| 154                  | 0.70%                                 | 9,476              | 0.5               | 0.04                                  | Army*Officer*Female             |
| 155                  | 18.30%                                | 243,355            | 0.5               | 0.02                                  | Navy*Enlisted*Male              |
| 156                  | 3.00%                                 | 40,139             | 0.5               | 0.03                                  | Navy*Enlisted*Female            |
| 157                  | 2.70%                                 | 36,183             | 0.5               | 0.02                                  | Navy*Officer*Male               |
| 158                  | 0.50%                                 | 6,150              | 0.5               | 0.05                                  | Navy*Officer*Female             |
| 159                  | 8.70%                                 | 115,567            | 0.5               | 0.02                                  | Marine Corps*Enlisted*Male      |
| 160                  | 0.50%                                 | 7,250              | 0.5               | 0.04                                  | Marine Corps*Enlisted*Female    |
| 161                  | 1.10%                                 | 14,558             | 0.5               | 0.04                                  | Marine Corps*Officer*Male       |
| 162                  | 0.10%                                 | 885                | 0.5               | 0.05                                  | Marine Corps*Officer*Female     |
| 163                  | 15.30%                                | 203,428            | 0.5               | 0.02                                  | Air Force*Enlisted*Male         |
| 164                  | 3.70%                                 | 50,004             | 0.5               | 0.02                                  | Air Force*Enlisted*Female       |
| 165                  | 4.10%                                 | 54,711             | 0.5               | 0.02                                  | Air Force*Officer*Male          |
| 166                  | 0.90%                                 | 11,893             | 0.5               | 0.04                                  | Air Force*Officer*Female        |
| 167                  | 2.00%                                 | 26,368             | 0.5               | 0.02                                  | Coast Guard*Enlisted*Male       |
| 168                  | 0.20%                                 | 3,259              | 0.5               | 0.06                                  | Coast Guard*Enlisted*Female     |
| 169                  | 0.20%                                 | 2,188              | 0.5               | 0.07                                  | Coast Guard*Officer*Male        |
| 170                  | 0.00%                                 | 313                | 0.5               | 0.09                                  | Coast Guard*Officer*Female      |
| 171                  | 12.90%                                | 171,642            | 0.5               | 0.03                                  | Army*E1-E4*Male                 |
| 172                  | 2.20%                                 | 29,764             | 0.5               | 0.03                                  | Army*E1-E4*Female               |
| 173                  | 11.20%                                | 148,943            | 0.5               | 0.03                                  | Army*E5-E9*Male                 |
| 174                  | 1.60%                                 | 21,457             | 0.5               | 0.03                                  | Army*E5-E9*Female               |
| 175                  | 1.90%                                 | 25,141             | 0.5               | 0.04                                  | Army*O1-O3*Male                 |
| 176                  | 0.40%                                 | 5,483              | 0.5               | 0.06                                  | Army*O1-O3*Female               |
| 177                  | 1.60%                                 | 21,854             | 0.5               | 0.03                                  | Army*O4-O6*Male                 |
| 178                  | 0.20%                                 | 3,250              | 0.5               | 0.05                                  | Army*O4-O6*Female               |
| 179                  | 8.30%                                 | 111,256            | 0.5               | 0.04                                  | Navy*E1-E4*Male                 |
| 180                  | 1.70%                                 | 22,171             | 0.5               | 0.03                                  | Navy*E1-E4*Female               |
| 181                  | 9.90%                                 | 132,099            | 0.5               | 0.03                                  | Navy*E5-E9*Male                 |
| 182                  | 1.30%                                 | 17,968             | 0.5               | 0.04                                  | Navy*E5-E9*Female               |

**Table A-1. (continued)**

| <b>Domain Number</b> | <b>Eligible Population Percentage</b> | <b>Domain Size</b> | <b>Prevalence</b> | <b>Confidence Interval Half Width</b> | <b>Domain Label</b>       |
|----------------------|---------------------------------------|--------------------|-------------------|---------------------------------------|---------------------------|
| 183                  | 1.40%                                 | 18,210             | 0.5               | 0.04                                  | Navy*O1-O3*Male           |
| 184                  | 0.30%                                 | 3,585              | 0.5               | 0.08                                  | Navy*O1-O3*Female         |
| 185                  | 1.20%                                 | 16,662             | 0.5               | 0.03                                  | Navy*O4-O6*Male           |
| 186                  | 0.20%                                 | 2,489              | 0.5               | 0.06                                  | Navy*O4-O6*Female         |
| 187                  | 5.50%                                 | 73,468             | 0.5               | 0.03                                  | Marine Corps*E1-E4*Male   |
| 188                  | 0.40%                                 | 4,676              | 0.5               | 0.05                                  | Marine Corps*E1-E4*Female |
| 189                  | 3.20%                                 | 42,099             | 0.5               | 0.04                                  | Marine Corps*E5-E9*Male   |
| 190                  | 0.20%                                 | 2,574              | 0.5               | 0.07                                  | Marine Corps*E5-E9*Female |
| 191                  | 0.60%                                 | 7,926              | 0.5               | 0.06                                  | Marine Corps*O1-O3*Male   |
| 192                  | 0.00%                                 | 640                | 0.5               | 0.05                                  | Marine Corps*O1-O3*Female |
| 193                  | 0.40%                                 | 5,050              | 0.5               | 0.06                                  | Marine Corps*O4-O6*Male   |
| 194                  | 0.00%                                 | 140                | 0.5               | 0.09                                  | Marine Corps*O4-O6*Female |
| 195                  | 6.50%                                 | 86,870             | 0.5               | 0.04                                  | Air Force*E1-E4*Male      |
| 196                  | 1.80%                                 | 24,509             | 0.5               | 0.03                                  | Air Force*E1-E4*Female    |
| 197                  | 8.70%                                 | 116,558            | 0.5               | 0.03                                  | Air Force*E5-E9*Male      |
| 198                  | 1.90%                                 | 25,495             | 0.5               | 0.04                                  | Air Force*E5-E9*Female    |
| 199                  | 2.40%                                 | 31,410             | 0.5               | 0.03                                  | Air Force*O1-O3*Male      |
| 200                  | 0.60%                                 | 8,146              | 0.5               | 0.05                                  | Air Force*O1-O3*Female    |
| 201                  | 1.70%                                 | 23,301             | 0.5               | 0.03                                  | Air Force*O4-O6*Male      |
| 202                  | 0.30%                                 | 3,747              | 0.5               | 0.05                                  | Air Force*O4-O6*Female    |
| 203                  | 0.90%                                 | 11,434             | 0.5               | 0.04                                  | Coast Guard*E1-E4*Male    |
| 204                  | 0.10%                                 | 1,675              | 0.5               | 0.09                                  | Coast Guard*E1-E4*Female  |
| 205                  | 1.10%                                 | 14,934             | 0.5               | 0.03                                  | Coast Guard*E5-E9*Male    |
| 206                  | 0.10%                                 | 1,584              | 0.5               | 0.09                                  | Coast Guard*E5-E9*Female  |
| 207                  | 0.00%                                 | 665                | 0.5               | 0.12                                  | Coast Guard*O1-O3*Male    |
| 208                  | 0.00%                                 | 165                | 0.5               | 0.11                                  | Coast Guard*O1-O3*Female  |
| 209                  | 0.10%                                 | 1,521              | 0.5               | 0.08                                  | Coast Guard*O4-O6*Male    |
| 210                  | 0.00%                                 | 147                | 0.5               | 0.14                                  | Coast Guard*O4-O6*Female  |

Note. 1. The domain sizes exclude 79,475 persons classified into the unknown stratum.

2. The precision constraint is imposed as the maximum half-width of a 95 percent confidence interval.

**Table A-2.**  
***Stratum Definition for the WGRA 2006***

| <b>Stratum</b> | <b>Service</b> | <b>Gender</b> | <b>Paygrade Group</b> | <b>Race/Ethnicity</b> | <b>Occupational Tempo</b> | <b>Population Size</b> | <b>Sample Size</b> |
|----------------|----------------|---------------|-----------------------|-----------------------|---------------------------|------------------------|--------------------|
| 1              | Army           | Male          | E1-E3                 | Non-Minority          | Low                       | 8,844                  | 285                |
| 2              | Army           | Male          | E1-E3                 | Non-Minority          | High                      | 51,527                 | 1,631              |
| 3              | Army           | Male          | E1-E3                 | Minority              | Low                       | 3,942                  | 120                |
| 4              | Army           | Male          | E1-E3                 | Minority              | High                      | 21,431                 | 767                |
| 5              | Army           | Male          | E4                    | Non-Minority          | Low                       | 9,838                  | 233                |
| 6              | Army           | Male          | E4                    | Non-Minority          | High                      | 47,122                 | 1,308              |
| 7              | Army           | Male          | E4                    | Minority              | Low                       | 6,023                  | 151                |
| 8              | Army           | Male          | E4                    | Minority              | High                      | 22,915                 | 728                |
| 9              | Army           | Male          | E5-E6                 | Non-Minority          | Low                       | 9,815                  | 166                |
| 10             | Army           | Male          | E5-E6                 | Non-Minority          | High                      | 53,306                 | 950                |
| 11             | Army           | Male          | E5-E6                 | Minority              | Low                       | 8,516                  | 180                |
| 12             | Army           | Male          | E5-E6                 | Minority              | High                      | 37,020                 | 818                |
| 13             | Army           | Male          | E7-E9                 | Non-Minority          | Low                       | 4,356                  | 151                |
| 14             | Army           | Male          | E7-E9                 | Non-Minority          | High                      | 17,361                 | 642                |
| 15             | Army           | Male          | E7-E9                 | Minority              | Low                       | 3,962                  | 190                |
| 16             | Army           | Male          | E7-E9                 | Minority              | High                      | 14,607                 | 736                |
| 17             | Army           | Male          | W1-W5                 | Non-Minority          | Low                       | 2,207                  | 1,163              |
| 18             | Army           | Male          | W1-W5                 | Non-Minority          | High                      | 4,478                  | 2,279              |
| 19             | Army           | Male          | W1-W5                 | Minority              | Low                       | 1,172                  | 542                |
| 20             | Army           | Male          | W1-W5                 | Minority              | High                      | 931                    | 612                |
| 21             | Army           | Male          | O1-O3                 | Non-Minority          | Low                       | 10,928                 | 863                |
| 22             | Army           | Male          | O1-O3                 | Non-Minority          | High                      | 8,786                  | 550                |
| 23             | Army           | Male          | O1-O3                 | Minority              | Low                       | 3,462                  | 319                |
| 24             | Army           | Male          | O1-O3                 | Minority              | High                      | 1,965                  | 154                |
| 25             | Army           | Male          | O4-O6                 | Non-Minority          | Low                       | 13,062                 | 1,062              |
| 26             | Army           | Male          | O4-O6                 | Non-Minority          | High                      | 5,066                  | 367                |
| 27             | Army           | Male          | O4-O6                 | Minority              | Low                       | 2,922                  | 313                |
| 28             | Army           | Male          | O4-O6                 | Minority              | High                      | 804                    | 77                 |
| 29             | Army           | Female        | E1-E3                 | Non-Minority          | Low                       | 2,416                  | 347                |
| 30             | Army           | Female        | E1-E3                 | Non-Minority          | High                      | 5,107                  | 864                |
| 31             | Army           | Female        | E1-E3                 | Minority              | Low                       | 2,211                  | 318                |
| 32             | Army           | Female        | E1-E3                 | Minority              | High                      | 5,036                  | 1,146              |
| 33             | Army           | Female        | E4                    | Non-Minority          | Low                       | 2,892                  | 266                |
| 34             | Army           | Female        | E4                    | Non-Minority          | High                      | 3,488                  | 567                |
| 35             | Army           | Female        | E4                    | Minority              | Low                       | 3,778                  | 531                |
| 36             | Army           | Female        | E4                    | Minority              | High                      | 4,836                  | 926                |
| 37             | Army           | Female        | E5-E6                 | Non-Minority          | Low                       | 2,204                  | 195                |
| 38             | Army           | Female        | E5-E6                 | Non-Minority          | High                      | 2,875                  | 339                |
| 39             | Army           | Female        | E5-E6                 | Minority              | Low                       | 4,960                  | 464                |
| 40             | Army           | Female        | E5-E6                 | Minority              | High                      | 6,503                  | 994                |

**Table A-2. (continued)**

| Stratum | Service | Gender | Paygrade Group | Race/Ethnicity | Occupational Tempo | Population Size | Sample Size |
|---------|---------|--------|----------------|----------------|--------------------|-----------------|-------------|
| 41      | Army    | Female | E7-E9          | Non-Minority   | Low                | 696             | 57          |
| 42      | Army    | Female | E7-E9          | Non-Minority   | High               | 553             | 51          |
| 43      | Army    | Female | E7-E9          | Minority       | Low                | 1,781           | 201         |
| 44      | Army    | Female | E7-E9          | Minority       | High               | 1,885           | 208         |
| 45      | Army    | Female | W1-W5          | Non-Minority   | Low                | 208             | 48          |
| 46      | Army    | Female | W1-W5          | Non-Minority   | High               | 110             | 30          |
| 47      | Army    | Female | W1-W5          | Minority       | Low                | 339             | 87          |
| 48      | Army    | Female | W1-W5          | Minority       | High               | 86              | 26          |
| 49      | Army    | Female | O1-O3          | Non-Minority   | Low                | 3,033           | 370         |
| 50      | Army    | Female | O1-O3          | Non-Minority   | High               | 311             | 37          |
| 51      | Army    | Female | O1-O3          | Minority       | Low                | 2,009           | 241         |
| 52      | Army    | Female | O1-O3          | Minority       | High               | 130             | 23          |
| 53      | Army    | Female | O4-O6          | Non-Minority   | Low                | 2,088           | 420         |
| 54      | Army    | Female | O4-O6          | All Races      | High               | 121             | 30          |
| 55      | Army    | Female | O4-O6          | Minority       | Low                | 1,041           | 215         |
| 56      | Navy    | Male   | E1-E3          | Non-Minority   | Low                | 4,735           | 192         |
| 57      | Navy    | Male   | E1-E3          | Non-Minority   | High               | 34,931          | 1,307       |
| 58      | Navy    | Male   | E1-E3          | Minority       | Low                | 3,870           | 124         |
| 59      | Navy    | Male   | E1-E3          | Minority       | High               | 21,165          | 750         |
| 60      | Navy    | Male   | E4             | Non-Minority   | Low                | 4,137           | 118         |
| 61      | Navy    | Male   | E4             | Non-Minority   | High               | 23,733          | 747         |
| 62      | Navy    | Male   | E4             | Minority       | Low                | 3,945           | 115         |
| 63      | Navy    | Male   | E4             | Minority       | High               | 14,740          | 399         |
| 64      | Navy    | Male   | E5-E6          | Non-Minority   | Low                | 12,278          | 273         |
| 65      | Navy    | Male   | E5-E6          | Non-Minority   | High               | 47,800          | 1,019       |
| 66      | Navy    | Male   | E5-E6          | Minority       | Low                | 9,820           | 202         |
| 67      | Navy    | Male   | E5-E6          | Minority       | High               | 32,719          | 779         |
| 68      | Navy    | Male   | E7-E9          | Non-Minority   | Low                | 4,951           | 237         |
| 69      | Navy    | Male   | E7-E9          | Non-Minority   | High               | 15,159          | 637         |
| 70      | Navy    | Male   | E7-E9          | Minority       | Low                | 2,704           | 76          |
| 71      | Navy    | Male   | E7-E9          | Minority       | High               | 6,668           | 249         |
| 72      | Navy    | Male   | W1-W5          | Non-Minority   | Low                | 689             | 323         |
| 73      | Navy    | Male   | W1-W5          | Non-Minority   | High               | 257             | 115         |
| 74      | Navy    | Male   | W1-W5          | Minority       | Low                | 270             | 165         |
| 75      | Navy    | Male   | W1-W5          | Minority       | High               | 95              | 80          |
| 76      | Navy    | Male   | O1-O3          | Non-Minority   | Low                | 9,120           | 653         |
| 77      | Navy    | Male   | O1-O3          | Non-Minority   | High               | 5,435           | 443         |
| 78      | Navy    | Male   | O1-O3          | Minority       | Low                | 2,616           | 223         |
| 79      | Navy    | Male   | O1-O3          | Minority       | High               | 1,039           | 112         |
| 80      | Navy    | Male   | O4-O6          | Non-Minority   | Low                | 11,257          | 872         |
| 81      | Navy    | Male   | O4-O6          | Non-Minority   | High               | 3,246           | 241         |
| 82      | Navy    | Male   | O4-O6          | Minority       | Low                | 1,737           | 132         |

**Table A-2. (continued)**

| <b>Stratum</b> | <b>Service</b> | <b>Gender</b> | <b>Paygrade Group</b> | <b>Race/Ethnicity</b> | <b>Occupational Tempo</b> | <b>Population Size</b> | <b>Sample Size</b> |
|----------------|----------------|---------------|-----------------------|-----------------------|---------------------------|------------------------|--------------------|
| 83             | Navy           | Male          | O4-O6                 | Minority              | High                      | 422                    | 48                 |
| 84             | Navy           | Female        | E1-E3                 | Non-Minority          | Low                       | 1,603                  | 308                |
| 85             | Navy           | Female        | E1-E3                 | Non-Minority          | High                      | 5,376                  | 1,076              |
| 86             | Navy           | Female        | E1-E3                 | Minority              | Low                       | 1,472                  | 166                |
| 87             | Navy           | Female        | E1-E3                 | Minority              | High                      | 4,487                  | 1,017              |
| 88             | Navy           | Female        | E4                    | Non-Minority          | Low                       | 1,571                  | 99                 |
| 89             | Navy           | Female        | E4                    | Non-Minority          | High                      | 2,912                  | 245                |
| 90             | Navy           | Female        | E4                    | Minority              | Low                       | 1,888                  | 190                |
| 91             | Navy           | Female        | E4                    | Minority              | High                      | 2,862                  | 419                |
| 92             | Navy           | Female        | E5-E6                 | Non-Minority          | Low                       | 2,769                  | 209                |
| 93             | Navy           | Female        | E5-E6                 | Non-Minority          | High                      | 3,917                  | 383                |
| 94             | Navy           | Female        | E5-E6                 | Minority              | Low                       | 3,727                  | 321                |
| 95             | Navy           | Female        | E5-E6                 | Minority              | High                      | 5,360                  | 511                |
| 96             | Navy           | Female        | E7-E9                 | Non-Minority          | Low                       | 592                    | 48                 |
| 97             | Navy           | Female        | E7-E9                 | Non-Minority          | High                      | 599                    | 47                 |
| 98             | Navy           | Female        | E7-E9                 | Minority              | Low                       | 533                    | 67                 |
| 99             | Navy           | Female        | E7-E9                 | Minority              | High                      | 471                    | 61                 |
| 100            | Navy           | Female        | W1-W5                 | All Races             | Low/High                  | 76                     | 17                 |
| 101            | Navy           | Female        | O1-O3                 | Non-Minority          | Low                       | 2,104                  | 222                |
| 102            | Navy           | Female        | O1-O3                 | Non-Minority          | High                      | 522                    | 66                 |
| 103            | Navy           | Female        | O1-O3                 | Minority              | Low                       | 841                    | 84                 |
| 104            | Navy           | Female        | O1-O3                 | Minority              | High                      | 118                    | 24                 |
| 105            | Navy           | Female        | O4-O6                 | Non-Minority          | Low                       | 1,929                  | 377                |
| 106            | Navy           | Female        | O4-O6                 | All Races             | High                      | 69                     | 18                 |
| 107            | Navy           | Female        | O4-O6                 | Minority              | Low                       | 491                    | 114                |
| 108            | USMC           | Male          | E1-E3                 | Non-Minority          | Low                       | 2,875                  | 305                |
| 109            | USMC           | Male          | E1-E3                 | Non-Minority          | High                      | 33,471                 | 3,776              |
| 110            | USMC           | Male          | E1-E3                 | Minority              | Low                       | 1,044                  | 131                |
| 111            | USMC           | Male          | E1-E3                 | Minority              | High                      | 11,463                 | 1,232              |
| 112            | USMC           | Male          | E4                    | Non-Minority          | Low                       | 1,803                  | 180                |
| 113            | USMC           | Male          | E4                    | Non-Minority          | High                      | 15,011                 | 1,299              |
| 114            | USMC           | Male          | E4                    | Minority              | Low                       | 793                    | 65                 |
| 115            | USMC           | Male          | E4                    | Minority              | High                      | 7,008                  | 672                |
| 116            | USMC           | Male          | E5-E6                 | Non-Minority          | Low                       | 3,231                  | 212                |
| 117            | USMC           | Male          | E5-E6                 | Non-Minority          | High                      | 15,374                 | 956                |
| 118            | USMC           | Male          | E5-E6                 | Minority              | Low                       | 2,400                  | 237                |
| 119            | USMC           | Male          | E5-E6                 | Minority              | High                      | 10,289                 | 769                |
| 120            | USMC           | Male          | E7-E9                 | Non-Minority          | Low                       | 1,324                  | 112                |
| 121            | USMC           | Male          | E7-E9                 | Non-Minority          | High                      | 5,098                  | 348                |
| 122            | USMC           | Male          | E7-E9                 | Minority              | Low                       | 728                    | 49                 |
| 123            | USMC           | Male          | E7-E9                 | Minority              | High                      | 3,655                  | 245                |
| 124            | USMC           | Male          | W1-W5                 | Non-Minority          | Low                       | 963                    | 468                |

**Table A-2. (continued)**

| Stratum | Service | Gender | Paygrade Group | Race/Ethnicity | Occupational Tempo | Population Size | Sample Size |
|---------|---------|--------|----------------|----------------|--------------------|-----------------|-------------|
| 125     | USMC    | Male   | W1-W5          | Non-Minority   | High               | 177             | 71          |
| 126     | USMC    | Male   | W1-W5          | Minority       | Low                | 377             | 5           |
| 127     | USMC    | Male   | W1-W5          | Minority       | High               | 65              | 6           |
| 128     | USMC    | Male   | O1-O3          | Non-Minority   | Low                | 3,886           | 289         |
| 129     | USMC    | Male   | O1-O3          | Non-Minority   | High               | 2,567           | 226         |
| 130     | USMC    | Male   | O1-O3          | Minority       | Low                | 1,095           | 139         |
| 131     | USMC    | Male   | O1-O3          | Minority       | High               | 378             | 40          |
| 132     | USMC    | Male   | O4-O6          | Non-Minority   | Low                | 2,592           | 227         |
| 133     | USMC    | Male   | O4-O6          | Non-Minority   | High               | 1,832           | 187         |
| 134     | USMC    | Male   | O4-O6          | Minority       | Low                | 418             | 68          |
| 135     | USMC    | Male   | O4-O6          | Minority       | High               | 208             | 32          |
| 136     | USMC    | Female | E1-E3          | Non-Minority   | Low                | 281             | 97          |
| 137     | USMC    | Female | E1-E3          | Non-Minority   | High               | 1,489           | 525         |
| 138     | USMC    | Female | E1-E3          | Minority       | Low                | 180             | 54          |
| 139     | USMC    | Female | E1-E3          | Minority       | High               | 996             | 381         |
| 140     | USMC    | Female | E4             | Non-Minority   | Low                | 205             | 57          |
| 141     | USMC    | Female | E4             | Non-Minority   | High               | 738             | 215         |
| 142     | USMC    | Female | E4             | Minority       | Low                | 141             | 47          |
| 143     | USMC    | Female | E4             | Minority       | High               | 646             | 244         |
| 144     | USMC    | Female | E5-E6          | Non-Minority   | Low                | 274             | 73          |
| 145     | USMC    | Female | E5-E6          | Non-Minority   | High               | 617             | 166         |
| 146     | USMC    | Female | E5-E6          | Minority       | Low                | 246             | 79          |
| 147     | USMC    | Female | E5-E6          | Minority       | High               | 897             | 306         |
| 148     | USMC    | Female | E7-E9          | Non-Minority   | Low                | 80              | 23          |
| 149     | USMC    | Female | E7-E9          | Non-Minority   | High               | 152             | 33          |
| 150     | USMC    | Female | E7-E9          | Minority       | Low                | 66              | 28          |
| 151     | USMC    | Female | E7-E9          | Minority       | High               | 242             | 65          |
| 152     | USMC    | Female | W1-W5          | All Races      | Low/High           | 105             | 36          |
| 153     | USMC    | Female | O1-O3          | Non-Minority   | Low                | 399             | 399         |
| 154     | USMC    | Female | O1-O3          | All Races      | High               | 84              | 84          |
| 155     | USMC    | Female | O1-O3          | Minority       | Low                | 157             | 157         |
| 156     | USMC    | Female | O4-O6          | All Races      | Low/High           | 140             | 140         |
| 157     | USAF    | Male   | E1-E3          | Non-Minority   | Low                | 13,474          | 390         |
| 158     | USAF    | Male   | E1-E3          | Non-Minority   | High               | 22,698          | 631         |
| 159     | USAF    | Male   | E1-E3          | Minority       | Low                | 3,914           | 108         |
| 160     | USAF    | Male   | E1-E3          | Minority       | High               | 5,916           | 192         |
| 161     | USAF    | Male   | E4             | Non-Minority   | Low                | 4,651           | 119         |
| 162     | USAF    | Male   | E4             | Non-Minority   | High               | 24,209          | 722         |
| 163     | USAF    | Male   | E4             | Minority       | Low                | 2,382           | 65          |
| 164     | USAF    | Male   | E4             | Minority       | High               | 9,626           | 337         |
| 165     | USAF    | Male   | E5-E6          | Non-Minority   | Low                | 14,602          | 349         |
| 166     | USAF    | Male   | E5-E6          | Non-Minority   | High               | 50,553          | 1,143       |

**Table A-2. (continued)**

| <b>Stratum</b> | <b>Service</b> | <b>Gender</b> | <b>Paygrade Group</b> | <b>Race/Ethnicity</b> | <b>Occupational Tempo</b> | <b>Population Size</b> | <b>Sample Size</b> |
|----------------|----------------|---------------|-----------------------|-----------------------|---------------------------|------------------------|--------------------|
| 167            | USAF           | Male          | E5-E6                 | Minority              | Low                       | 7,034                  | 177                |
| 168            | USAF           | Male          | E5-E6                 | Minority              | High                      | 15,998                 | 388                |
| 169            | USAF           | Male          | E7-E9                 | Non-Minority          | Low                       | 5,620                  | 293                |
| 170            | USAF           | Male          | E7-E9                 | Non-Minority          | High                      | 15,410                 | 697                |
| 171            | USAF           | Male          | E7-E9                 | Minority              | Low                       | 2,531                  | 107                |
| 172            | USAF           | Male          | E7-E9                 | Minority              | High                      | 4,810                  | 243                |
| 173            | USAF           | Male          | O1-O3                 | Non-Minority          | Low                       | 20,758                 | 1,368              |
| 174            | USAF           | Male          | O1-O3                 | Non-Minority          | High                      | 5,864                  | 449                |
| 175            | USAF           | Male          | O1-O3                 | Minority              | Low                       | 4,261                  | 314                |
| 176            | USAF           | Male          | O1-O3                 | Minority              | High                      | 527                    | 31                 |
| 177            | USAF           | Male          | O4-O6                 | Non-Minority          | Low                       | 16,379                 | 1,293              |
| 178            | USAF           | Male          | O4-O6                 | Non-Minority          | High                      | 4,618                  | 310                |
| 179            | USAF           | Male          | O4-O6                 | Minority              | Low                       | 2,077                  | 173                |
| 180            | USAF           | Male          | O4-O6                 | Minority              | High                      | 227                    | 24                 |
| 181            | USAF           | Female        | E1-E3                 | Non-Minority          | Low                       | 4,908                  | 539                |
| 182            | USAF           | Female        | E1-E3                 | Non-Minority          | High                      | 3,895                  | 448                |
| 183            | USAF           | Female        | E1-E3                 | Minority              | Low                       | 2,374                  | 221                |
| 184            | USAF           | Female        | E1-E3                 | Minority              | High                      | 1,574                  | 169                |
| 185            | USAF           | Female        | E4                    | Non-Minority          | Low                       | 2,851                  | 280                |
| 186            | USAF           | Female        | E4                    | Non-Minority          | High                      | 3,711                  | 435                |
| 187            | USAF           | Female        | E4                    | Minority              | Low                       | 2,565                  | 173                |
| 188            | USAF           | Female        | E4                    | Minority              | High                      | 2,631                  | 286                |
| 189            | USAF           | Female        | E5-E6                 | Non-Minority          | Low                       | 7,036                  | 369                |
| 190            | USAF           | Female        | E5-E6                 | Non-Minority          | High                      | 5,200                  | 467                |
| 191            | USAF           | Female        | E5-E6                 | Minority              | Low                       | 5,897                  | 419                |
| 192            | USAF           | Female        | E5-E6                 | Minority              | High                      | 3,506                  | 330                |
| 193            | USAF           | Female        | E7-E9                 | Non-Minority          | Low                       | 1,311                  | 93                 |
| 194            | USAF           | Female        | E7-E9                 | Non-Minority          | High                      | 1,015                  | 97                 |
| 195            | USAF           | Female        | E7-E9                 | Minority              | Low                       | 933                    | 76                 |
| 196            | USAF           | Female        | E7-E9                 | Minority              | High                      | 597                    | 68                 |
| 197            | USAF           | Female        | O1-O3                 | Non-Minority          | Low                       | 5,740                  | 531                |
| 198            | USAF           | Female        | O1-O3                 | All Races             | High                      | 411                    | 74                 |
| 199            | USAF           | Female        | O1-O3                 | Minority              | Low                       | 1,995                  | 236                |
| 200            | USAF           | Female        | O4-O6                 | Non-Minority          | Low                       | 2,957                  | 558                |
| 201            | USAF           | Female        | O4-O6                 | All Races             | High                      | 73                     | 22                 |
| 202            | USAF           | Female        | O4-O6                 | Minority              | Low                       | 717                    | 158                |
| 203            | USCG           | Male          | E1-E3                 | Non-Minority          | Low                       | 2,394                  | 520                |
| 204            | USCG           | Male          | E1-E3                 | Non-Minority          | High                      | 868                    | 154                |
| 205            | USCG           | Male          | E1-E3                 | Minority              | Low                       | 1,174                  | 220                |
| 206            | USCG           | Male          | E1-E3                 | Minority              | High                      | 451                    | 88                 |
| 207            | USCG           | Male          | E4                    | Non-Minority          | Low                       | 787                    | 148                |
| 208            | USCG           | Male          | E4                    | Non-Minority          | High                      | 4,348                  | 847                |

**Table A-2. (continued)**

| Stratum | Service | Gender | Paygrade Group | Race/Ethnicity | Occupational Tempo | Population Size | Sample Size |
|---------|---------|--------|----------------|----------------|--------------------|-----------------|-------------|
| 209     | USCG    | Male   | E4             | Minority       | Low                | 254             | 48          |
| 210     | USCG    | Male   | E4             | Minority       | High               | 1,158           | 207         |
| 211     | USCG    | Male   | E5-E6          | Non-Minority   | Low                | 1,038           | 198         |
| 212     | USCG    | Male   | E5-E6          | Non-Minority   | High               | 7,825           | 1,397       |
| 213     | USCG    | Male   | E5-E6          | Minority       | Low                | 390             | 99          |
| 214     | USCG    | Male   | E5-E6          | Minority       | High               | 2,044           | 448         |
| 215     | USCG    | Male   | E7-E9          | Non-Minority   | Low                | 332             | 65          |
| 216     | USCG    | Male   | E7-E9          | Non-Minority   | High               | 2,728           | 451         |
| 217     | USCG    | Male   | E7-E9          | Minority       | Low                | 82              | 30          |
| 218     | USCG    | Male   | E7-E9          | Minority       | High               | 495             | 96          |
| 219     | USCG    | Male   | W1-O3          | Non-Minority   | Low                | 360             | 63          |
| 220     | USCG    | Male   | W1-O3          | Non-Minority   | High               | 184             | 31          |
| 221     | USCG    | Male   | W1-O3          | Minority       | Low                | 95              | 26          |
| 222     | USCG    | Male   | W1-O3          | Minority       | High               | 28              | 10          |
| 223     | USCG    | Male   | O4-O6          | Non-Minority   | Low                | 806             | 128         |
| 224     | USCG    | Male   | O4-O6          | Non-Minority   | High               | 580             | 121         |
| 225     | USCG    | Male   | O4-O6          | Minority       | Low                | 85              | 18          |
| 226     | USCG    | Male   | O4-O6          | Minority       | High               | 50              | 19          |
| 227     | USCG    | Female | E1-E3          | Non-Minority   | Low                | 483             | 80          |
| 228     | USCG    | Female | E1-E3          | All Races      | High               | 183             | 26          |
| 229     | USCG    | Female | E1-E3          | Minority       | Low                | 188             | 27          |
| 230     | USCG    | Female | E4             | Non-Minority   | Low                | 239             | 34          |
| 231     | USCG    | Female | E4             | Non-Minority   | High               | 402             | 66          |
| 232     | USCG    | Female | E4             | Minority       | Low                | 76              | 13          |
| 233     | USCG    | Female | E4             | Minority       | High               | 104             | 18          |
| 234     | USCG    | Female | E5-E6          | Non-Minority   | Low                | 352             | 91          |
| 235     | USCG    | Female | E5-E6          | Non-Minority   | High               | 587             | 144         |
| 236     | USCG    | Female | E5-E6          | Minority       | Low                | 179             | 61          |
| 237     | USCG    | Female | E5-E6          | Minority       | High               | 238             | 80          |
| 238     | USCG    | Female | E7-E9          | All Races      | Low                | 93              | 41          |
| 239     | USCG    | Female | E7-E9          | All Races      | High               | 135             | 49          |
| 240     | USCG    | Female | W1-O3          | Non-Minority   | Low                | 99              | 82          |
| 241     | USCG    | Female | W1-O3          | Non-Minority   | High               | 24              | 24          |
| 242     | USCG    | Female | W1-O3          | Minority       | Low/High           | 43              | 43          |
| 243     | USCG    | Female | O4-O6          | All Races      | Low                | 107             | 107         |
| 244     | USCG    | Female | O4-O6          | All Races      | High               | 40              | 40          |
| 245     | Unknown |        |                |                |                    | 79,475          | 5,150       |
| Total   |         |        |                |                |                    | 1,332,791       | 86,213      |



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