Defense Research, Surveys, and Statistics Center (RSSC)

2015 Workplace and Gender Relations Survey of Reserve Component Members

Statistical Methodology Report

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2015 WORKPLACE AND GENDER RELATIONS SURVEY OF RESERVE COMPONENT MEMBERS: STATISTICAL METHODOLOGY REPORT

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RSSC's Statistical Methods Branch, under the guidance of Mr. David McGrath, Branch Chief, is responsible for all statistical aspects used in DMDC's survey program, including sampling, weighting, nonresponse bias (NRB) analysis, imputation, and statistical hypothesis testing. Mr. Eric Falk, Team Lead of the Statistical Methods Branch, was responsible for the sampling for the *2015 Workplace and Gender Relations Survey of Reserve Component Members* (*2015 WGRR)*. Mr. Tim Markham, mathematical statistician within the Statistical Methods Branch, used the DMDC Sampling Tool to design the sample. Ms. Carole Massey and Ms. Sue Reinhold, DMDC, provided the data processing support. Dr. Bob Fay, Dr. Minsun Riddles, and Mr. Richard Sigman, Westat, developed complex weights for this survey and developed the weighting section of this report. Mr. Eric Falk, Mr. Tim Markham, Mr. Dave McGrath, Mr. Jeff Schneider, and Ms. Ada Harris wrote this methodology report.

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2015 WORKPLACE AND GENDER RELATIONS SURVEY OF RESERVE COMPONENT MEMBERS: STATISTICAL METHODOLOGY REPORT

Introduction

This report describes the statistical methodologies for the *2015 Workplace and Gender Relations Survey of Reserve Component Members* (*2015 WGRR*). The first section describes the sample design and selection of the sample. The second section describes weighting and variance estimation, as well as a comparison to the *2014 RAND Military Workplace Study*. The third section describes the statistical tests used for the *2015 WGRR*. The fourth section describes the calculation of location, completion, and response rates for the full sample and population subgroups. The final section contains the nonresponse bias (NRB) analysis. Estimates for all survey questions are found in the *2015 Workplace and Gender Relations Survey of Reserve Component Members: Tabulation Volume* (DMDC, 2016a).

Sample Design and Selection

Target Population

The *2015 WGRR* was designed to represent individuals meeting the following criteria:

- Members of the Selected Reserve who are in Reserve Unit, Active Guard/Reserve (AGR/FTS/AR; Title 10 and Title 32), and Individual Mobilization Augmentee (IMA) programs from:
  - Army National Guard (ARNG),
  - US Army Reserve (USAR),
  - US Navy Reserve (USNR),
  - US Marine Corps Reserve (USMCR),
  - Air National Guard (ANG), or
  - US Air Force Reserve (USAFR);
- Up to and including paygrade O6 as of March 2015; Reserve component members who entered the Service after March 2015 are excluded from the population.
- The sampling frame was developed five months prior to fielding the survey so the sampling population included those that had been in the Selected Reserve for at least five months.

Data were collected on the web between August 7, 2015 and October 19, 2015. If sample members had not responded within the first month of the fielding period, they were sent the paper-and-pen survey.

Sampling Frame

The sampling frame consisted of 817,007 Reserve component members using the March 2015 *Reserve Components Common Personnel Data System (RCCPDS) Master File*. Auxiliary frame data was obtained from the following files:

- March 2015 Reserve Family Database File (contains the member's family information, (e.g. marital status and children))
- March 2015 Contingency Tracking System (CTS) File (contains deployment information)
- April 2015 Defense Enrollment Eligibility Reporting System (DEERS) Medical Point-In-Time Extract (PITE) (contains personnel information)
- Time on Active Duty (TOAD) File, pulled August 2015 (contains activation information)

In addition, after selecting the sample, DMDC performed additional checks to verify the member was still eligible before the survey fielded. Any ineligible member in the sample was excluded from any further mailings and notifications; this saved additional costs associated with the survey process. Using the May 2014 *RCCPDS*, DMDC determined 10,630 sample members (2.2 percent unweighted) were record ineligible and excluded them from mailings and notifications (see Table 3).

Sample Design

The sample for the *2015 WGRR* survey used a single-stage stratified design. Four population characteristics defined the stratification dimensions for the *2015 WGRR* sample:

- Reserve component (Army National Guard, Army Reserve, Navy Reserve, Marine Corps Reserve, Air National Guard, Air Force Reserve)
- Gender (Male, Female),
- Paygrade grouping (E1-E4, E5-E9, W1-W5, O1-O3, O4-O6), and
- Reserve program (Troop Program Unit [TPU], Active Guard/Reserve [AGR], Military Technician [MilTech], and Individual Mobilization Augmentee [IMA]).

Table 1 shows these four variables and associated variable levels.

Table 1.
Stratifying Variables

Variable	Variable Name	Categories
Reserve Component	RORG_CD	1. Army National Guard
		2. US Army Reserve
		3. US Navy Reserve
		4. US Marine Corps Reserve
		5. Air National Guard
		6. US Air Force Reserve
Gender	RSEX2	1. Male
		2. Female
Paygrade Grouping	RPAYGRP9	1. E1-E4
		2. E5-E9
		3. W1-W5
		4. O1-O3
		5. O4-O6
Reserve Program	RPROG1	1. TPU
		2. AGR
		3. MilTech
		4. IMA

DMDC partitioned the population frame of 817,007 members into 128 strata that were initially determined by a full cross-classification of the four stratification variables. Levels were collapsed when there were less than 200 members in the stratum, usually for Reserve program and rarely paygrade grouping. Dimensions within Reserve component and gender were always preserved.

DMDC selected individuals with equal probability and without replacement within each stratum. However, because allocation was not proportional to the size of the strata, selection probabilities varied among strata and individuals were not selected with equal probability overall. To achieve adequate sample sizes for all domains (reporting categories) DMDC used a non-proportional allocation. Appendix A shows the estimation domains along with their sample sizes, expected number of respondents, and estimated precisions.

Sample Allocation

DMDC based the total sample size on a census of females and 50 percent sample of males. The goal was to achieve reliable precision on estimates for outcomes associated with reporting a sexual assault (i.e., retaliation) and other measures that were only asked of a very small subset of members, especially for males. Given estimated variable survey costs and anticipated eligibility and response rates, DMDC used an optimization algorithm to determine the minimum-cost allocation that simultaneously satisfied the domain precision requirements. Response rates from previous surveys were used to estimate eligibility and response rates for all strata. The *2013 Status of Forces Survey of Reserve Component Members*, the *2014 Status of*

Forces Survey of Reserve Component Members, and the *2012 Workplace and Gender Relations Survey of Reserve Component Members* were used to estimate these rates.

DMDC determined the sample allocation given the census of females and 50 percent of males by means of the DMDC Sample Planning Tool (SPT), Version 2.1 (Dever & Mason, 2003). This application is based on the method originally developed by J. R. Chromy (1987) and described in Mason, Wheeless, George, Dever, Riemer, and Elig (1995). The SPT defines domain variance equations in terms of unknown stratum sample sizes and user-specified precision constraints. A cost function is defined in terms of the unknown stratum sample sizes and the per-unit cost of data collection, editing, and processing. The variance equations are solved simultaneously, subject to the constraints imposed, for the sample size that minimizes the cost function. Estimated eligibility rates are used and they modify the estimated prevalence rates used in the variance equations, thus affecting the allocation; response rates inflate the allocation, thus affecting the final sample size. Prevalence rates refer to a percentage that is used in determining the estimated variance used for the calculation of the sample size. For example, DMDC used 50 percent since it is most conservative and yields the largest estimated sample size.

There were 93 reporting domains defined for the *2015 WGRR* and the initial goal was to achieve below 5 percent precision on estimates. The precision requirement for each domain is typically based on an estimated prevalence rate of 0.5 with a 95 percent confidence interval half-width no greater than 0.05. However, given the rarity of events covered by many of the *2015 WGRR* questions, DMDC ensured that a much tighter precision would be met for questions seen by all respondents, while making it likely that confidence interval half-widths of 0.05 could be met for questions that are relevant to only a small portion of respondents. Therefore, DMDC tightened the precision constraints until the sample included a census of all females and at least 50 percent of all males.

The *2015 WGRR* total sample size was 485,774; Table 2 provides the sample sizes by stratification variables.

Table 2.
Sample Size by Stratification Variables

Stratification Variable	Total	Army National Guard	US Army Reserve	US Navy Reserve	US Marine Corps Reserve	Air National Guard	US Air Force Reserve
Sample	485,774	186,481	121,036	36,245	36,364	61,695	43,953
Gender							
Male	331,332	130,498	75,898	23,406	34,750	41,090	25,690
Female	154,442	55,983	45,138	12,839	1,614	20,605	18,263
Paygrade Grouping							
E1-E4	238,102	104,338	62,526	9,995	25,784	20,656	14,803
E5-E9	179,140	62,876	39,436	18,417	6,315	31,745	20,351
W1-W5	5,773	3,823	1,651	40	259	0	0
O1-O3	33,684	11,143	10,659	3,235	1,729	4,002	2,916
O4-O6	29,075	4,301	6,764	4,558	2,277	5,292	5,883
Reserve Program							
TPU	414,431	167,140	109,335	30,467	32,111	41,924	33,454
AGR	33,432	10,010	6,890	5,737	1,621	8,132	1,042
MilTech	29,273	9,331	3,213	0	0	11,639	5,090
IMA	8,638	0	1,598	41	2,632	0	4,367

Survey Administration

Information about administration of the survey and detailed documentation of the survey dataset are found in the *2015 Workplace and Gender Relations Survey of Reserve Component Members: Administration, Datasets, and Codebook* (DMDC, 2016b).

Weighting

Analytical weights for the *2015 WGRR* were created to account for unequal probabilities of selection and varying response rates among population subgroups. Sampling weights were computed as the inverse of the selection probabilities. The sampling weights were then adjusted for nonresponse using models that considered over 50 possible correlates of nonresponse. The adjusted weights were post-stratified to match population totals and to reduce bias unaccounted for by the previous weighting steps.

Case Dispositions

As the first step in the weighting process, case dispositions were assigned based on eligibility for the survey and on completion of the questionnaire. Execution of the weighting process and computation of response rates both depended on this classification.

Final case dispositions for weighting were determined using information from personnel records, field operations (as recorded in the Survey Control System [SCS]), and returned questionnaires. No single source of information is entirely complete and correct for determining

the case disposition; inconsistencies among sources were resolved according to the order of precedence shown in Table 3. This order of execution is critical to resolving case dispositions. For example, suppose an individual in the sample refused the survey, with the reason that it was too long; in the absence of any other information, the disposition would be "eligible nonrespondent." Another example would be if we were provided a proxy report that the sample member had been hospitalized and was unable to complete the survey, in this instance the disposition would be "ineligible."

Case disposition counts for the *2015 WGRR* are shown in Table 3. Table 4 presents the number of complete eligible respondents (SAMP_DC=4) by stratification variables: gender, paygrade groups, reserve programs, and reserve organizations.

Table 3.
Case Dispositions for Weighting

Case Disposition (SAMP_DC)	Information Source	Conditions	Eligibility Known	Sample Size
1. Record ineligible	Personnel record	DMDC determined whether sampled members had a record in the DEERS point-in-time extract (PITE) prior to fielding the survey. No record in DEERS indicated the member either separated from the military, passed away, etc.	NA	10,630
2. Ineligible by self- or proxy-report	Survey Control System (SCS)	The sampled member or a proxy reported that member was ineligible due to such reasons as "Retired," "Ill," "Incarcerated," "No longer employed by DoD," or "Deceased."	Yes	210
3. Ineligible by survey self-report	Survey eligibility question	The sampled member was determined to be ineligible based on their response to Q1 of the survey questionnaire asking if retired or separated.	Yes	1,331
4. Eligible, complete response	Item response rate	Respondents needed to answer one of the six critical questions related to sexual assault.	Yes	87,127
5. Eligible, incomplete response	Item response rate	Survey is not blank but none of the critical sexual assault questions were answered.	Yes	1,985
8. Refusal	SCS	Survey is returned blank due to such reasons as "Refused-too long," "Refused-inappropriate/intrusive," "Refused-other," "Unreachable at this address," "Refused by current resident," "Refused additional e-mails," or "Concerned about security/confidentiality."	No	1,176
9. Blank return	SCS	Blank questionnaire returned with no reason given.	No	611
10. PND	SCS	Postal non-deliverable or original address is non-locatable.	No	46,592
11. Nonrespondent	Remainder	Remaining sampled members did not respond to survey.	No	336,112
Total				**485,774**

Table 4.
Complete Eligible Respondents by Stratification Variables

Stratification Variable	Total	Army National Guard	US Army Reserve	US Navy Reserve	US Marine Corps Reserve	Air National Guard	US Air Force Reserve
Sample	**87,127**	**25,172**	**18,674**	**8,053**	**4,002**	**19,195**	**12,031**
Gender							
Male	52,421	15,329	10,288	5,028	3,673	11,730	6,373
Female	34,706	9,843	8,386	3,025	329	7,465	5,658
Paygrade Grouping							
E1-E4	18,575	6,096	3,834	1,034	1,883	3,512	2,216
E5-E9	45,178	12,798	8,807	4,095	1,022	11,972	6,484
W1-W5	2,203	1,425	667	21	90	0	0
O1-O3	9,125	2,830	2,642	1,014	334	1,422	883
O4-O6	12,046	2,023	2,724	1,889	673	2,289	2,448
Reserve Program							
TPU	57,902	16,526	14,166	6,514	2,822	9,916	7,958
AGR	13,773	4,711	2,711	1,519	511	3,876	445
MilTech	12,737	3,935	1,246	0	0	5,403	2,153
IMA	2,715	0	551	20	669	0	1,475

Nonresponse Adjustments and Final Weights

After case dispositions were resolved, the sampling weights were adjusted for nonresponse. First, the sampling weights for cases of known eligibility (SAMP_DC = 2, 3, 4, or 5) were adjusted to account for cases of unknown eligibility (SAMP_DC = 8, 9, 10, or 11). Next, the eligibility-adjusted weights for eligible respondents with completed questionnaires (SAMP_DC = 4) were adjusted to account for eligible sample members who returned an incomplete questionnaire (SAMP_DC = 5). All weights for the record ineligibles (SAMP_DC=1) are set to 0 and this weight is transferred to the other cases.

The weighting adjustment factors for eligibility and completion were computed as the inverse of model-predicted probabilities. The 2015 models used to predict these probabilities changed substantially from the models for the *2012 WGRR*. The 2015 models paralleled those developed by RAND for the *2014 RAND Military Workplace Study (2014 RMWS)* (Morral, Gore, & Schell, 2014, 2015), which surveyed both the active duty and Reserve members. The sample size for the *2015 WGRR*, 485,774, was considerably larger than either the sample size for the *2012 WGRR*, 75,436, or the Reserve sample size in the *2014 RMWS*, 67,559.

For the *2012 WGRR*, a logistic regression model was used to predict the probability of known eligibility for the survey (that is, the probability of determining eligibility). A second logistic regression model was used to predict the probability of response among eligible sample members (complete response vs. nonresponse). CHAID (Chi-squared Automatic Interaction Detector) was used to determine the best predictors for each logistic regression model. The

models were weighted. Predictors included the following population characteristics: paygrade group, gender, reserve program, reserve component, education, family status, combat/non-combat flag, deployment, and race/ethnicity.

The methods used to adjust for nonresponse to the *2015 WGRR* survey more closely paralleled methods in the *2014 RMWS* than the methods used for the *2012 WGRR*. The *RMWS* methods began with the identification of key survey outcome variables. For the larger survey of the active duty component in 2014, RAND identified six key survey outcome variables: three types of sexual assault (penetrative, non-penetrative, and attempted penetrative) and three types of Military Equal Opportunity (MEO) violations (sexually hostile work environment, sexual quid pro quo, and gender discrimination). Because of the smaller sample size of the 2014 Reserve component sample, however, RAND focused on just three outcome variables: Sexual harassment, gender discrimination, and sexual assault.

The *2014 RMWS* nonresponse adjustment involved two steps, each of which produced a set of models. For both Reserve and active duty sample populations, the first step used data from the eligible respondents with completed responses to develop models for the key outcome variables. The models were fitted separately by gender. For Reserve members of each gender, the three outcomes were modeled as a function of an extensive set of administrative variables available for both respondents and nonrespondents, resulting in six separate models in total. Predicted values or combination variables (Morral, 2015) were computed for both respondents and nonrespondents, and then these combination variables were used in a second model for the probability of response, along with a limited number of other predictors: gender, reserve component, paygrade, and survey form type (paper vs. web). The reciprocals of the predicted values from the second model were used as nonresponse adjustments and applied to the respondents.

The approach to weighting used in the *2014 RMWS* incorporated two significant innovations. First, a specific form of machine learning model, generalized boosted regression (GBM), was used in place of the logistic regression model used in the *2012 WGRR*. In general, the GBM model adapts more readily to complex relationships among the dependent variable and candidate independent variables. Second, previous work of Little and Vartivarian (2004) guided the *2014 RMWS* approach. Little and Vartivarian argued only information related to key survey outcomes should be included in a nonresponse model, otherwise additional information will only increase the variance without reducing bias for the key outcomes. The *2014 RMWS* used GBM to summarize the relationship between the extensive auxiliary information and each of the key outcome variables in the form of the predicted values from the GBM fit. The nonresponse adjustment based on the combination variables and a limited number of other characteristics could be then expected to reduce nonresponse bias while limiting the increase in sampling variance.

Preliminary analyses published by RAND (Morral, Gore, & Schell, 2014, 2015) suggested advantages to the nonresponse approach used in the *2014 RMWS*, although their evidence was based primarily on the active duty results the survey. On this basis, nonresponse adjustment for the *2015 WGRR* adopted these methods, but modifications were necessary. Using completed 2015 cases, six outcome variables were modeled for females: sexual harassment, gender discrimination, sexual quid pro quo, sexual assault, non-penetrative sexual assault, and

penetrative sexual assault. For males, only sexual harassment, gender discrimination, and sexual assault were modeled because few incidents were reported for the other three variables. Table 5 provides a list of the candidate auxiliary variables considered for the GBM models. Appendix B provides a more detailed version of the table identifying the levels for each categorical variable in Table 5.

Unlike the *2014 RMWS*, the survey protocol of the *2015 WGRR* excluded sample respondents who were no longer Reserve component members. Consequently, the *2015 WGRR* paralleled the *2012 WGRR* in the division of nonrespondents by eligibility and completion of the survey. The first step of modeling nonresponse in the *2015 WGRR* followed the general plan of the *2014 RMWS*, creating combination variables corresponding to each key variable. The second step in the *2014 RMWS* of modeling the propensity to respond became two steps in the *2015 WGRR*: (1) modeling known eligibility status to derive a nonresponse adjustment for known eligibility status, and (2) fitting a model to eligible cases to determine the probability of completing the survey in order to derive a second nonresponse adjustment. Both the eligibility and completion models incorporated the combination variables as well as auxiliary variables that are used in the raking adjustments that follow: paygrade, reserve program, race/ethnicity, and component. Both sets of models were fitted separately by gender. Like the *2012 WGRR* analysis, the GBM models were weighted; the first by the sampling weight, and the second by the eligibility-adjusted weight resulting from multiplying the sampling weight by the eligibility status adjustment.

To further detail the nonresponse adjustments used in the *2015 WGRR*, in Table 3, case dispositions 2, 3, 4, and 5 denote cases with known eligibility, whereas case dispositions 8, 9, 10, and 11 correspond to cases for which eligibility is unknown. Consequently, the first of the two nonresponse adjustments increased the weights for case dispositions 2, 3, 4, and 5 to represent dispositions 8, 9, 10, and 11. The second adjustment increased the weights of complete cases with disposition 4 to compensate for incomplete eligible cases with disposition 5.

To increase response to the *2015 WGRR*, nonrespondents to the web version of the survey were sent a paper form of the questionnaire. The paper version included the key survey items, but it omitted many secondary items on the web questionnaire, presenting the recipient with approximately 100 questions instead of the approximately 230 on the web version. The primary set of weights was based on responses from the full data set including both the web and paper versions. To support analysis of items only on the web version, a second set of weights was produced, following the same steps as the full data set including the paper questionnaire. For this weighting, all paper questionnaire respondents were treated as nonrespondents, including in the fitting of the GBM models. This second set of weights is intended solely for analysis of web-only items. The primary set of weights provides the basis for estimating the key outcomes from the survey items collected on both the web and paper versions of the questionnaire.

Table 5.
Variables Used for the Eligibility and Completion Adjustments

Demographic Factors
- AFQT Score Percentile
- Age as of August 2015
- Family Status
- Education
- Race/Ethnic Category
- US Citizenship Origin Code
- US Citizenship Status Code

Military Career Factors
- Military Accession Program
- Active Duty Status
- Active Duty and Special Operations Status
- Active Duty Begin Date
- Active Duty End Date
- Number of Occurrences on Active Duty from July 2014 through July 2015
- Number of Days Activated from July 2014 through July 2015
- Active Guard & Reserve, or Full Time National Guard Duty Statue ID
- Combat Occupation Flag
- Current Deployment Status
- Number of Deployments
- Deployment Flag in the Last 12 months
- Deployment Flag in the Last 24 months
- Number of Months Deployed since 9/11/2011
- Number of Months Deployed from August 2014 through August 2015
- Duty DoD Occupation Code
- Paygrade
- Primary Occupation Code
- DoD Primary Occupation Area Code[1]
- Primary Regular Component Service Indicator
- Selected Reserve Obligated Service Projected End Date
- Date of First Affiliation or Enlistment in Reserve Component
- Date of First Appointment, Enlistment, or Conscription into a Uniformed Service of the US
- Eligibility Status as of August 2015

Military Career Factors (continued)
- Years of service
- Reserve Category Programs
- Reserve Organization Code
- Reserve Category Group Code
- Reserve Subcategory Code
- Reserve Category Code
- Reserve Component Category Code

Military Environment Factors
- Number of Members[1] in Member's Assigned UIC
- Number of Males[1] in Member's Assigned UIC
- Number of Members[1] in Member's Duty UIC
- Number of Males[2] in Member's Duty UIC
- Number of Members[1] in Member's Primary Occupation[3]
- Number of Males[2] in Member's Primary Occupation[3]
- Number of Members[1] in Member's Area Occupation[3]
- Number of Males[2] in Member's Area Occupation
- Percent of Males[2] in Member's Assigned UIC.
- Percent of Males[2] in Member's Duty UIC.
- Percent of Males[2] in Member's Primary Occupation[3]
- Percent of Males[2] in Member's Area Occupation[3]
- Assigned UIC Change of Station Flag as of March 2014
- Assigned UIC Change of Station Flag as of August 2015
- Duty UIC Change of Station Flag as of March 2014
- Duty UIC Change of Station Flag as of August 2015

Survey Fielding Factors
- Invalid Army Email Address Flag
- Email Address Purchase Flag
- Email Address Flag
- Number of Email Addresses
- First Letter Returned as PND
- Mail Address Flag
- Change in Mailing Address since Sample Frame Development
- Home Address Flag

[1] Reserve members
[2] Reserve males
[3] Collapsed primary occupation (first 2 digits of primary occupation code)

The nonresponse-adjusted weights were then modified through a process called raking. The purpose of raking is to use known information about the survey population to increase the precision of population estimates. This information consists of totals for different levels of variables (such as demographic characteristics). For example, the variable of gender has two

levels: male and female. During the raking process, sampled individuals are first categorized into the cells of a table defined by two or more variables—called raking dimensions. The goal of raking is to adjust the weights so that they add up to the known totals—called control totals—for the different levels within each raking dimension. Proceeding one dimension at a time, raking computes a proportional adjustment to the weights associated with each level of the raking dimension.[1] After all dimensions are adjusted, the process is repeated until the totals for all levels of the raking dimensions are equal to the corresponding control totals (at least within a specified tolerance).

Control totals were computed from information from the sampling frame. There were five raking dimensions, defined by gender, pay-grade groupings, Reserve component, Reserve program, and race/ethnicity, as follows:

- Paygrade groupings (7 levels)
- Gender (2 levels) by pay-grade groupings (5 levels)
- Gender (2 levels) by Reserve program (4 levels)
- Gender (2 levels) by race/ethnicity (2 levels)
- Gender (2 levels) by Reserve component (6 levels) by pay-grade groupings (2 levels)

Table 6 provides additional details about the levels of the variables used to define the five raking dimensions.

[1] Raking is so named because it is analogous to smoothing the soil in a garden plot by alternately working soil back and forth with a rake in two perpendicular directions.

Table 6.
Description of Raking Dimensions

Dimension #	Variable 1		Variable 2		Variable 3	
	Description	Categories	Description	Categories	Description	Categories
1	Paygrade groupings	E1–E3, E4, E5–E6, E7–E9, W1–W5, O1–O3, O4–O6				
2	Gender	Female, Male	Paygrade groupings	E1–E4, E5–E9, W1–E5, O1–O3, O4–O6,		
3	Gender	Female, Male	Reserve program	TPU, AGR, MilTech, IMA		
4	Gender	Female, Male	Race/ethnicity	Non-Hispanic White, Total Minority		
5	Gender	Female, Male	Reserve component	ARNG, ANG, USAR, USNR, USMCR, USAFR	Paygrade groupings	Enlisted, Officers

Table 7 summarizes the distributions of the sampling weights, intermediate weights, final weights, and corresponding adjustment factors by eligibility status for the primary weights. Eligible respondents are those individuals who were not only eligible to participate in the survey but also completed at least one of the critical sexual assault questions. Record ineligible individuals are those who were not eligible to participate in the survey according to administrative records; no weights were computed for these cases. Table 7 also indicates the mean of the sampling weights, intermediate weights, and final weights by eligibility status. Two tables in Appendix C and Appendix D show summary of weights by gender.

The sampling weights, which are the reciprocals of the probability of selection into the sample, take the value 1 for the census of females, who were all selected for the study. The mean of the sampling weights for males is 2.32. The nonresponse adjustment for eligibility status that follows next makes the biggest single adjustment to the weights, in terms of increasing both the mean and the coefficient of variation (c.v.) of the weights. The two remaining adjustments for nonresponse among the eligible population and the final raking have a modest effect on increasing the mean weight. The corresponding factors shown in the last two columns of Table 7

have small c.v.'s; in other words, the factors in each column differ from each other by relatively small amounts.

Table 7.
Distribution of Weights and Adjustment Factors by Eligibility Status

Eligibility Status	Statistic	Sampling Weight	Eligibility Status Adjusted Weight	Complete Eligible Response Adjusted Weight	Final Weight With Nonresponse and Raking Factors	Eligibility Status Factor	Complete Eligible Response Factor	Raking Factor
Eligible Respondents	N	87,127	87,127	87,127	87,127	87,127	87,127	87,127
	MIN	1.00	1.14	1.17	1.18	1.07	1.01	0.77
	MAX	5.69	121.51	125.96	135.92	64.72	1.12	1.35
	MEAN	1.79	8.55	8.74	9.10	5.05	1.02	1.03
	STD	0.96	8.17	8.36	8.95	4.64	0.01	0.08
	CV	0.53	0.96	0.96	0.98	0.92	0.01	0.08
Eligible, Incomplete Response	N	1,985	1,985	1,985	1,985	1,985	1,985	1,985
	MIN	1.00	1.18	0.00	0.00	1.18	0.00	
	MAX	5.69	57.32	0.00	0.00	30.53	0.00	
	MEAN	1.65	8.48	0.00	0.00	5.31	0.00	
	STD	0.92	8.35	0.00	0.00	4.76	0.00	
	CV	0.56	0.98			0.90		
Self/Proxy Ineligibles	N	1,541	1,541	1,541	1,541	1,541	1,541	1,541
	MIN	1.00	1.43	1.43	1.48	1.40	1.00	0.77
	MAX	5.69	114.73	114.73	123.58	64.72	1.00	1.34
	MEAN	1.74	15.06	15.06	15.89	9.07	1.00	1.05
	STD	0.80	14.62	14.62	15.57	8.34	0.00	0.08
	CV	0.46	0.97	0.97	0.98	0.92	0.00	0.08
Nonrespondents	N	384,491	384,491	384,491	384,491	384,491	384,491	384,491
	MIN	1.00	0.00	0.00	0.00	0.00		
	MAX	5.69	0.00	0.00	0.00	0.00		
	MEAN	1.66	0.00	0.00	0.00	0.00		
	STD	0.65	0.00	0.00	0.00	0.00		
	CV	0.39						
Record Ineligibles	N	10,630	10,630	10,630	10,630	10,630	10,630	10,630
	MIN	1.00	1.00	1.00	0.00			
	MAX	5.69	5.69	5.69	0.00			
	MEAN	1.59	1.59	1.59	0.00			
	STD	0.58	0.58	0.58	0.00			
	CV	0.36	0.36	0.36				

Under simplifying assumptions that were applied based on Kish (Kish, 1965) which approximates the relative increase due to weight variation as approximately 1 plus the c.v. of the weights squared. Because the coefficient of variation of the weights is less than 1, especially when analyzed for females, 0.84, and males, 0.81, separately, the increase in variance due to weighting is less than a factor of 2. Given the task of the weighting adjustments is to compensate for differential nonresponse and its possible impact on the bias of key outcome variables, the outcomes shown in Table 7 appear reasonable.

Table 8 exhibits the sum of the weights at different stages of weighting. The weights adjusted for known eligibility status distribute the sampling weights for nonrespondents with unknown eligibility status among the remaining dispositions. The eligible response adjusted weights then compensate for eligible respondents providing incomplete surveys. By design, the final raking adjustments redistribute record ineligibles and other dispositions excluded from the final weights to match total number in the original frame.

Table 8.
Sum of Weights by Eligibility Status

Eligibility Category	Sum of Sampling Weights	Sum of Eligibility Status Adjusted Weights	Sum of Complete Eligible Response Adjusted Weights	Sum of Final Weights With Nonresponse and Raking Adjustments
Eligible Respondents	156,111	744,723	761,538	792,528
Eligible, Incomplete Response	3,273	16,841	0	0
Self/proxy Ineligibles	2,677	23,208	23,208	24,479
Nonrespondents	638,042	0	0	0
Record ineligibles	16,904	16,904	16,904	0
Total	817,007	801,676	801,650	817,007

Comparison to the 2014 RAND Military Workplace Study

RAND found that increasing the number of weighting variables and using GBM improved the *2014 RMWS* survey weights, therefore, DMDC decided to also use this approach for the *2015 WGRR*. The description of the *2015 WGRR* weighting was set in the context of the *2014 RMWS* in the preceding section. The comparison is further elaborated here.

The software used for the *2015 WGRR* was built on the approach used in *2014 RMWS*. Both weightings used the statistical computing software R and specifically functions from the packages gbm (Ridgeway, 2009) and twang (Ridgeway, 2004). RAND researchers provided the specific R scripts they used for their final production runs of the *2014 RMWS* weighting.

The weighting for the *2015 WGRR* also differed in some respects from the *2014 RMWS*. The *2015 WGRR* weighting incorporated the two nonresponse steps used in the *2012 WGRR*, necessitating use of weights throughout the analysis. Some of the modeling in the *2014 RMWS* had been unweighted. In *2015 WGRR*, the nonresponse models were separated by gender at both the initial stage of creating the combined variables and at the second stage of creating the nonresponse weights, whereas both genders had been combined in the second stage in the *2014 RMWS*.

Variance Estimation

Sampling error is the uncertainty associated with an estimate that is based on data gathered from a sample of the population rather than the full population. Note that sample-based estimates will vary depending on the particular sample selected from the population. Measures of the magnitude of sampling error, such as the variance and the standard error (the square root of the variance), reflect the variation in the estimates over all possible samples that could have been selected from the population using the same sampling methodology. Analysis of the *2015 WGRR* data required a variance estimation procedure that accounted for the weighting procedures. The final step of the weighting process was to define strata for variance estimation by Taylor series linearization. The *2015 WGRR* variance estimation strata correspond exactly with the 128 strata used to select the sample. For each strata/variance strata, DMDC ensured that there were at least 30 complete eligible responses with non-zero final weights.

Multiple Comparison Adjustment

When statistically comparing groups (e.g., Army vs. Navy estimates of the effectiveness of the training), a statistical hypothesis whether there are no differences (null hypothesis) versus there are differences (alternative hypothesis) is tested. DMDC mainly uses independent two sample t-tests for its statistical tests. The conclusions are usually based on the p-value associated with the test-statistic. If the p-value is less than the critical value then the null hypothesis is rejected. Any time a null hypothesis is rejected (a conclusion that estimates are significantly different), it is possible this conclusion is incorrect. In reality, the null hypothesis may have been true, and the significant result may have been due to chance. A p-value of 0.05 means there is a five percent chance of finding a difference as large as the observed result if the null hypothesis were true.

In survey research there is often interest in conducting multiple comparisons. For example, 1) testing whether the percentage of sexual assaults among Army Reserve is the same as the percentage of sexual assaults across all other components, and 2) testing that the percentage of sexual harassments for Navy Reserve is the same as the percentage of sexual harassments with all other components and so on. When performing multiple independent comparisons on the same data the question becomes: "Does the interpretation of the p-value for a single statistical test hold for multiple comparisons?" If 200 independent statistical (significance) tests were conducted at the 0.05 significance level, and the null hypothesis is supported for all, 10 of the tests would be expected to be significant at the p-value < 0.05 level simply due to chance. These 10 tests would have incorrectly assumed to be statistically significant—known as false positives or false discoveries. When a single significance test is conducted, the error rate—the probability of false discoveries—is the p-value itself. When more

than one significance test is conducted, the probability of false discoveries and the number of false discoveries increases, i.e., the more tests that are conducted the greater the number of false discoveries.

This is known in statistical hypothesis testing as the multiple comparisons problem. Therefore, it is important to control the false discoveries when performing multiple independent tests to reach more accurate conclusions. Numerous techniques have been developed to control the false positive error rate associated with conducting multiple statistical tests (multiple comparisons) and there is no universally accepted approach for dealing with it.

The method that DMDC uses to control for false discoveries is known as the False Discovery Rate correction (FDR) developed by Benjamini and Hochberg (1995). FDR is defined as the expected percentage of erroneous rejections among all rejections. The goal is to control the false discovery rate which is the proportion of "discoveries" (significant results) that are actually false positives. The approach can be summarized as follows:

- Determine the number of comparisons (tests) of interest, call it m;
- Determine the tolerable False Discovery Rate (FDR Rate), call it α;
- Calculate the p-value for each statistical test;
- Sort the individual p-values from smallest to largest and rank them, call the rank k.
- For each ranked p-value calculate the FDR-adjusted alpha (threshold) which is defined as $(k * \propto)/m$
- Determine the cutoff delineating statistically significant results from non-significant results in the sorted file as follows: Look for the maximum rank (k) such that the ordered p-value is less than the FDR-adjusted alpha (i.e., look for the maximum k after which the p-value becomes greater than the threshold), call this maximum k the cutoff. Any comparison (p-value) with rank less than the cutoff is considered statistically significant.

DMDC computed the FDR thresholds (FDR adjusted alpha) separately for the two types of comparisons—current year and trends. For both types of tests, DMDC implemented FDR Multiple Comparison corrections to control the expected rate of false discoveries (Type I errors) at $\propto = 0.05$. For the current year estimates from the *2015 WGRR*, DMDC performed 59,724 separate statistical tests (e.g., testing whether the sexual assault rate among Army Reserve is the same as the sexual assault rate across all other components). Of the 59,724 current year statistical tests, 19,165 were statistically significant. In addition, DMDC performed another 180 separate statistical tests for trends to compare estimates from the *2015 WGRR* to the *2014 RMWS*. For trends, 27 of the 180 statistical tests were significant.

Location, Completion, and Response Rates

Location, completion, and response rates were calculated in accordance with the recommendations of the American Association for Public Opinion Research (AAPOR, 2015 Standard Definitions), which estimates the proportion of eligible respondents among cases of unknown eligibility.

The *location rate* (LR) uses AAPOR standard formula CON2 and is defined as

$$LR = \frac{(I+P)+(R+NC+O)}{(I+P)+(R+NC+O)+e(UO)} = \frac{\text{adjusted located sample}}{\text{adjusted eligible sample}} = \frac{N_L}{N_E}.$$

The *completion rate* (CR) uses AAPOR standard formula COMR and is defined as

$$CR = \frac{(I+P)}{(I+P)+(R+NC+O)} = \frac{\text{usable responses}}{\text{adjusted located sample}} = \frac{N_R}{N_L}.$$

The *response rate* (RR) uses AAPOR standard formula RR4 and is defined as

$$RR = \frac{(I+P)}{(I+P)+(R+NC+O)+e(UO)} = \frac{\text{usable responses}}{\text{adjusted eligible sample}} = \frac{N_R}{N_E}.$$

Where

I = Fully complete responses according to RR4 (> 80% complete)

P = Partially complete responses according to RR4 (50 – 80% complete)

R = Refusal and break-off according to RR4 (< 50% complete)

NC = Non-contact

O = Other

$e(UO)$ = Estimated eligibility of cases unknown

N_L = Adjusted located sample

N_E = Adjusted eligible sample

N_R = Usable responses

Table 9 shows the corresponding sample disposition codes associated with the response categories.

Table 9.
Disposition Codes for Response Rates

Response Category	SAMP_DC Values
Eligible Sample	4, 5, 8, 9, 10, 11
Located Sample	4, 5, 8, 9, 11
Usable Response	4
Not Returned	11
Eligibility Determined	2, 3, 4, 5, 8, 9
Self-Report Ineligible	2, 3

Ineligibility Rate

The ineligibility rate (IR) is defined as the following and needs to be calculated for both weighted and unweighted to be applied to Table 9:

IR = Self Report Ineligible/Eligibility Determined.

Estimated Ineligible Postal Non-Deliverable/Not Located Rate

The estimated ineligible postal non-deliverable or not located (IPNDR) is defined as:

IPNDR = (Eligible Sample - Located Sample) * IR.

Estimated Ineligible Nonresponse

The estimated ineligible nonresponse (EINR) is defined as:

EINR = (Not Returned) * IR.

Adjusted Location Rate

The adjusted location rate (ALR) is defined as:

ALR = (Located Sample - EINR)/(Eligible Sample - IPNDR - EINR).

Adjusted Completion Rate

The adjusted completion rate (ACR) is defined as:

ACR = (Eligible Response)/(Located Sample - EINR).

Adjusted Response Rate

The adjusted response rate (ARR) is defined as:

ARR = (Eligible Response)/(Eligible Sample - IPNDR - EINR).

Table 10 shows the weighted sample counts used to compute the overall response rates.

The final response rate is the product of the location rate and the completion rate. Table 11 shows both weighted and unweighted location, completion, and response rates for the *2015 WGRR*.

Finally, Table 12 shows weighted location, completion, and response rates for the full sample by the stratification variables. The final weighted response rate for the survey was 19.8 percent which rounds to 20.0 percent.

Table 10.
Comparison of the Final Weighted Respondents Relative to the Drawn Sample

Case Disposition Categories	Sample Counts		Weighted Estimates	
	Sample Size	Percent	Estimated Total	Percent
Drawn sample and population	**485,774**	**100%**	**817,007**	**100%**
Ineligible on master files	-10,630	2.2%	-16,904	2.1%
Self-reported ineligible	-1,541	0.3%	-2,677	0.3%
Total: Ineligible	-12,171	2.5%	-19,581	2.4%
Eligible sample	**473,603**	**97.5%**	**797,427**	**97.6%**
Not located (estimated ineligible)	-777	0.2%	-1,201	0.1%
Not located (estimated eligible)	-45,815	9.4%	-72,978	8.9%
Total not located	-46,592	9.6%	-74,179	9.1%
Located sample	**427,011**	**87.9%**	**723,248**	**88.5%**
Requested removal from survey mailings	-1,176	0.2%	-2,248	0.3%
Returned blank	-611	0.1%	-1,081	0.1%
Skipped key questions	-1,985	0.4%	-3,273	0.4%
Did not return a survey (estimated ineligible)	-5,603	1.2%	-9,072	1.1%
Did not return a survey (estimated eligible)	-330,509	68.0%	-551,463	67.5%
Total: Nonresponse	-339,884	70.0%	-567,137	69.4%
Eligible responses	**87,127**	**17.9%**	**156,111**	**19.1%**

Table 11.
Location, Completion, and Response Rates

Type of Rate	Computation	Unweighted	Weighted
Location	Adjusted located sample/Adjusted eligible sample	90.2%	90.7%
Completion	Usable responses/Adjusted located sample	20.7%	21.9%
Response	Usable responses/Adjusted eligible sample	18.6%	19.8%

Table 12.
Rates for Full Sample and Stratification Level of Variable

Domain Variable	Domain	Sample Size	Eligible Responses	Sum of Weights	Location Rate	Completion Rate	Response Rate
Sample	Full Sample	485,774	87,127	817,007	90.7%	21.9%	19.8%
Reserve Component (RORG_CD)	Army National Guard	186,481	25,172	348,599	89.7%	18.0%	16.1%
	US Army Reserve	121,036	18,674	197,698	90.3%	19.1%	17.2%
	US Navy Reserve	36,245	8,053	58,227	85.9%	28.1%	24.1%
	US Marine Corps Reserve	36,364	4,002	38,468	88.6%	13.7%	12.2%
	Air National Guard	61,695	19,195	104,818	96.0%	33.1%	31.8%
	US Air Force Reserve	43,953	12,031	69,197	94.5%	29.8%	28.2%
Gender (RSEX2)	Male	331,332	52,421	662,565	90.8%	21.0%	19.0%
	Female	154,442	34,706	154,442	90.4%	25.8%	23.3%
Paygrade Grouping (RPAYGRP9)	E1-E4	238,102	18,575	352,772	86.6%	9.0%	7.8%
	E5-E9	179,140	45,178	336,347	93.2%	28.4%	26.5%
	W1-W5	5,773	2,203	12,187	97.0%	40.6%	39.4%
	O1-O3	33,684	9,125	59,530	93.2%	29.0%	27.0%
	O4-O6	29,075	12,046	56,171	97.5%	44.4%	43.3%
Reserve Program (RPROG1)	TPU	414,431	57,902	666,695	89.7%	16.4%	14.7%
	AGR	33,432	13,773	76,747	93.9%	45.5%	42.7%
	MilTech	29,273	12,737	61,484	97.1%	44.6%	43.4%
	IMA	8,638	2,715	12,082	96.6%	34.5%	33.3%

Nonresponse Bias Analysis

Survey nonresponse has the potential to introduce bias in the estimates of key outcomes. To the extent that nonrespondents and respondents differ on observed characteristics, DMDC can use weights to adjust the sample so the weighted respondents match the full population on the most critical characteristics. This eliminates the portion of nonresponse bias (NRB) associated with those observed variables if these variables are strongly associated with the behaviors. When all NRB can be eliminated in this manner, the missingness is called *ignorable* or *missing at random* (Little & Rubin, 2002). The more observable demographic variables that were

incorporated into the weights, the more plausible it is to assume that the weights eliminate any NRB.

The objective of this research was to assess the extent of NRB for the estimated percentage of sexual assaults (henceforth this rate will be referred to as sexual assault) in the Reserve components. The purpose of the percentage of sexual assaults was to provide the policy offices and the Department with an overall estimate of Reserve component members who experienced sexual assault in the last 12 months. The level of nonresponse bias can vary for every question on the survey, but DMDC focused on the sexual assault rate because this tended to be one of the more central questions on the survey. Nonresponse bias occurs when survey respondents are systematically different from nonrespondents. Statistically, the bias in a respondent mean (e.g., sexual assault rate) is a function of the response rate and the relationship (covariance) between response propensities and the estimated statistics (i.e., sexual assault rate), and takes the following form:

$Bias\ (\bar{y}_r) = \frac{\sigma_{yp}}{\bar{p}} = \left(\frac{\rho_{yp}}{\bar{p}}\right)\sigma_y\sigma_p$, where σ_{yp} = covariance between y and response propensity, ρ

NRB can occur with high or low survey response rates, but the decrease in overall survey response rates within the Department as well as civilian studies in the past decade has resulted in a greater focus on potential NRB. DMDC investigated the presence of NRB using many different methods, and this report summarizes the following methods and results:

1. Compare known population values with weighted survey estimates,
2. Analyze item missing data for sexual assault questions,
3. Analysis of DMDC's survey of nonrespondents,
4. Evaluate the sensitivity of different post-survey adjustments (weighting methods) on survey estimates,

Summary of Findings

NRB is difficult to assess. Most authors recommend averaging across several different studies to measure NRB (Montaquila & Olson, 2012). DMDC has taken that approach here and conducted four studies to assess NRB in sexual assault estimates. **Based on these four studies, DMDC does not find evidence of significant NRB in sexual assault estimates from the *2015 WGRR*.**

We summarize the results from each study below:

1. **Compare known population values with weighted survey estimates** —DMDC compared weighted estimates of officially reported sexual assaults from the survey with actual reported sexual assaults to SAPRO. The survey estimates are higher than the official reports (but within the margins of error), and a possible conclusion is sexual assault victims are more likely to complete the *2015 WGRR*. However, this

finding would contradict earlier NRB studies on sexual assault where both DMDC and RAND concluded that sexual assault was underestimated (DMDC, 2013 and Morral, 2014) and should be taken with caution. From this analysis, DMDC concludes there is little evidence of NRB in sexual assault estimates from the *2015 WGRR*.

2. **Analyze item missing data for sexual assault questions**—Item missing data rates for the *2015 WGRR* sexual assault questions are similar to missing data rates from other DMDC surveys. In addition, there is no evidence that prior victims of sexual assault are completing the survey at different rates than members who have not been previously assaulted. From this analysis, DMDC concludes there is little evidence of NRB in sexual assault estimates from the *2015 WGRR*.

3. **Analysis of DMDC's survey of nonrespondents**—Estimates from the *2015 WGRR* nonresponse study (*2015 WGRR-N*) are comparable to production estimates. The estimates for three out of four matching questions are within one percentage point of each other, and none of the four differences is statistically significant. From this analysis, DMDC concludes there is little evidence of NRB in sexual assault estimates from the *2015 WGRR*.

4. **Evaluate the sensitivity of different post-survey adjustments (weighting methods) on survey estimates**—Analysis of estimates using two different weighting methods show both the weights and key survey estimates are robust to the choice of weighting methods. From this analysis, DMDC concludes there is little evidence of NRB in sexual assault estimates from the *2015 WGRR*.

Section 1: Compare Known Population Values with Weighted Survey Estimates

To assess total survey error, one common method is to compare a known parameter to a weighted estimate from the survey. If DMDC sampling, measurement, weighting, and analysis methods performed well, confidence interval of estimates should frequently contain the true parameters. In this investigation, DMDC examined the number of reported sexual assaults in the Reserve component. A similar type of analysis was performed by RAND for the *2014 RMWS* (Morral, 2016). It is important to point out that DMDC does not know the true number of sexual assaults in the US military. Many sexual assaults are not reported for many reasons including potential retaliation. However, reported sexual assaults to the US military can be compared. DMDC was able to compare the number of sexual assault reports filed by Reserve and National Guard members to weighted estimates from survey respondents to assess NRB (and overall total survey error).

The Sexual Assault Prevention and Response Office (SAPRO) provided DMDC with summary information of the number of reported sexual assaults (unrestricted and restricted) to either a Service Sexual Assault Response Coordinator (SARC) or the National Guard SARC. The report containing the summary information was collected in the Defense Sexual Assault Incident Database (DSAID). For a record to be entered into DSAID, the survivor needed to complete a Victim Reporting Preference Statement (DDForm 2910) that indicates whether the

survivor would like to make either a restricted or unrestricted report. The information is then captured in DSAID. DMDC's requested the number of sexual assaults reported from August 1, 2014 through October 31, 2015 (14 months of data). DMDC requested 14 months of data in order to mirror the 12 month time frame corresponding with the survey administration time in the following three time periods:

- August 1, 2014 through July 31, 2015
- September 1, 2014 through August 31, 2015
- October 1, 2014 through September 30, 2015

The *2015 WGRR* survey fielded from August 2015 through October 2015 and the summaries shown above would serve as a comparable 12 month period. The summary files contained information about the number of sexual assaults by Reserve component as well as if the report type was restricted or unrestricted. On the *2015 WGRR* survey, sexual assault survivors were asked follow-up questions to determine 1) if they filed a formal report of sexual assault, 2) type of report filed, and 3) to verify the sexual assault occurred within the last 12 months. The *2015 WGRR* survey questions regarding these behaviors are displayed in Table 13.

Table 13.
2015 WGRR Reporting Questions

***2015 WGRR* Reporting Questions**	
DoD provides two types of sexual assault reports. • Restricted reports allow people to get information, collect evidence, and receive medical treatment and counseling without starting an official investigation of the assault. • Unrestricted reports start an official investigation in addition to allowing the services available in restricted reporting. **179. Did you officially report this unwanted event to the military?** This could have been either a restricted or unrestricted report. ☒ Yes ☒ No	It can be difficult to remember the exact date when events occurred. In this study, it is important to know which events happened in the last 12 months, and which events happened earlier. **201. Thinking about when the event occurred, how certain are you that it occurred in the last 12 months?** If the event occurred over a long time, think about whether it ever happened after [X Date]. ☒ Definitely occurred AFTER [X Date] ☒ Not sure if it occurred BEFORE OR AFTER [X Date] ☒ Definitely occurred BEFORE [X Date]
DoD provides two types of sexual assault reports. • Restricted reports allow people to get information, collect evidence, and receive medical treatment and counseling without starting an official investigation of the assault. • Unrestricted reports start an official investigation in addition to allowing the services available in restricted reporting. **180. Did you make...** ☒ Only a restricted report? ☒ Only an unrestricted report? ☒ A restricted report that turned into an unrestricted report? ☒ Or were you not sure what type of report it was?	

The DSAID summary file provided by SAPRO contained an average of 836 restricted and unrestricted reports of sexual assault within the Reserve components during the 12 month periods. Table 14 contains a summary of the average 12 month reports, by component and type of report.

Table 14.
Summary of Sexual Assault Reports in DSAID by Component

Service/Component	Restricted	Unrestricted	Total
Army	151	451	**602**
National Guard	116	315	**431**
Reserve	35	136	**171**
Navy	14	29	**43**
Reserve	14	29	**43**
Marine Corps	3	19	**22**
Reserve	3	19	**22**
Air Force	59	109	**168**
National Guard	37	58	**95**
Reserve	22	51	**73**
Not Available	1	0	**1**
National Guard	1	0	**1**
Total	**228**	**608**	**836**

Note. There is one report that does not have enough information to determine the Service and is categorized in the table as not available

DMDC used three criteria from the survey to compare the information provided by respondents on the *2015 WGRR* to the summary of actual numbers reported in a 12 month period on DSAID. The three questions were:

- Answered "Yes" to reported the sexual assault (Q179),
- Answered "restricted" or "unrestricted" (Q180), and
- Answered confirms the sexual assault occurred in the past 12 months (Q201)

There were 169 respondents from the survey that indicated in Q179 they had reported a sexual assault. Of the 169 respondents, 119 indicated the sexual assault occurred in the last 12 months (Q201) and that they filed either a restricted or unrestricted report. The weighted estimate based on these 119 respondents is 1,013, compared with the 836 cases from DSAID. While the confidence interval from the survey estimate is within the number of DSAID cases, the survey has overestimated the known true value by a fairly large amount (21.2%). The survey estimates for restricted and unrestricted reports both similarly overestimate the true values. There were 40 responding members that indicated they filed a restricted report and 79 members that indicated they filed an unrestricted report. Table 15 shows a summary of the number of respondents, estimates from the survey, lower and upper 95-percent confidence bounds, and the actual number of reports from the DSAID database. Although the true number of reports falls within the confidence intervals in each case, the weighted estimate is consistently higher. Potential reasons for this difference could be that responding members are either mistakenly saying they filed a report (measurement error) or it is possible that members who filed a report respond at higher rates. Another potential reason for overestimating the number of DSAID cases was the survey question itself. For all paper surveys, the sexual assault measure time reference

was a static date (August 10, 2014). This is different from the web form that used a dynamic date. For example, someone filling out the paper survey could have responded as late in the fielding period as October 9, 2015, for these respondents the question could potentially be relevant for more than the intended 12 months. In all situations described, the actual number falls within the confidence interval and, this provides some evidence that estimates have less concern for NRB. RAND performed a similar analysis for the active duty survey in the *2014 RMWS* and found evidence that the true number reported was actually more than the estimate. This led RAND to conclude that sexual assault victims that report are less likely to respond to the survey.

Table 15.
Estimated vs. Actual Number of Reported Sexual Assaults

Type of Sexual Assaults	Number of Respondents that filed a Report?	Weighted Total Estimate from Survey	95% Confidence Interval Lower Bound of Estimate	95% Confidence Interval Upper Bound of Estimate	Number of Reports in DSAID
Restricted	40	254	176	332	228
Unrestricted	79	759	566	953	608
Total	**119**	**1,013**	**805**	**1,222**	**836**

Note. The number of reports in DSAID is the average of the three 12-month totals within DSAID (August 1, 2014 through July 31, 2015, September 1, 2014 through August 31, 2015, and October 1, 2014 through September 30, 2015).

Likelihood of Victims to Respond to Surveys

DMDC determined NRB could exist if sexual assault survivors that made either an unrestricted or restricted report were either more or less likely to complete the survey. If sexual assault survivors that made a formal report were more likely to complete the survey this could provide some evidence for overestimating questions related to having experienced a sexual assault. While DMDC can control for many factors, adjusting experiencing a sexual assault in the past 12 months was not possible. If sexual assault survivors that filed a report were more or less likely to fill out the survey, this could be evidence for over or under estimating questions related to sexual assault. This analysis, however, is limited since it includes only those sexual assault survivors that made an unrestricted report of an assault. If those sexual assault survivors that do not report an assault or make a restricted report have different response rate behaviors than those that make an unrestricted report, the analysis could be misleading. However, since DMDC does not have a list of all sexual assault survivors this subset of the total will be used.

The DSAID file provided by SAPRO contained 1,044 records of which 752 were unrestricted and 292 were restricted. The restricted reports did not contain names or social security numbers (SSN) and thus the potential for matching was the 752 records. After removing blank, invalid, and duplicate SSNs, there were 714 potential records to match to the sample. DMDC matched the 714 SSNs to the *2015 WGRR* sample of 485,774 and found that 578 matched. DMDC then determined the response rate for these matches and determined a sample weighted response rate of 19.6 percent was associated with the sexual assault survivors that

reported an incident. This estimate is not significantly different than the response rate of 19.9 percent overall. Based on this analysis, there is no evidence to conclude that sexual assault survivors who made an unrestricted report are more or less likely to respond to the survey.

Table 16.
Comparison of Response Rates from Reported Survivors to Full Sample

Full Sample		Sexual Assault Survivors that Reported	
Number in Sample	**Response Rate**	**Number in Sample**	**Response Rate**
485,774	19.9%	578	19.6%

Note. The estimates are based on the 752 unrestricted reports made

Summary of Comparison of Known Population Values with Weighted Survey Estimates

The purpose of this section of the NRB analysis is to determine whether there were any differences between population estimates made from the sample respondents compared to a source with trusted data (cases in the DSAID database). Differences between population estimates and known data would be an indication of possible total survey error caused in part by nonresponse. A second analysis compared response rates from sexual assault survivors who made an unrestricted report to response rates from all members of the survey. Differences in response rates would indicate sexual assault survivors potentially respond at different rates and since they cannot be controlled in the weighting, this would be a concern for NRB. In both cases, there were no reasons to draw any conclusions that NRB existed in the estimates related to sexual assault. The overall number of actual sexual assault survivors that made an unrestricted or restricted report fell within the confidence bound; this result was true for unrestricted and restricted reports as well. In addition, the response rates for sexual assault survivors that made an unrestricted report were no different than the overall sample. From this analysis DMDC concludes there is little or no evidence of NRB associated with the estimates of sexual assaults.

Section 2: Analyze Item Missing Data and Drop Offs for Sexual Assault Questions

In this section, DMDC analyzed item missing data for the six key *WGRR 1501* sexual assault (SA) behavior questions from all web returns to investigate whether respondents may refuse these sensitive questions at different rates. In addition, DMDC conducted an analysis to investigate if certain members quit the survey all together (i.e., drop-off) because of the sensitive and graphic sexual assault questions. If the decision to refuse to answer the question or drop-off is not random (i.e., those who avoid the SA questions have different sexual assault rates than complete respondents), then a source of NRB exists. DMDC cannot directly test this hypothesis because the sexual assault status for these item missing cases is unknown. However, DMDC indirectly assesses NRB by examining the missing data patterns and characteristics of members who drop-off from the survey.

Item Missing Data in Sexual Assault Behavior Questions

The six SA behavior questions are displayed in Table 17.

Table 17.
2015 WGRR Sexual Assault (SA) Questions

2015 WGRR Sexual Assault Questions **(SA1 through SA6)**[a]	
67. Since [X Date], did you have any unwanted experiences in which someone put his penis into your [anus or mouth] [vagina, anus, or mouth]? ☒ Yes ☒ No	**113. Since [X Date], did you have any unwanted experiences in which someone intentionally touched private areas of your body (either directly or through clothing)?** Private areas include buttocks, inner thigh, breasts, groin, anus, vagina, penis, or testicles. ☒ Yes ☒ No
81. Since [X Date], did you have any unwanted experiences in which someone put any object or any body part other than a penis into your [anus or mouth] [vagina, anus, or mouth]? The body part could include a finger, tongue, or testicles. ☒ Yes ☒ No	**129. Since [X Date], did you have any unwanted experiences in which someone made you touch private areas of their body or someone else's body (either directly or through clothing)?** This could involve the person putting their private areas on you. Private areas include buttocks, inner thigh, breasts, groin, anus, vagina, penis, or testicles. ☒ Yes ☒ No
97. Since [X Date], did anyone make you put any part of your body or any object into someone's mouth, vagina, or anus when you did not want to? A part of the body could include your [penis, testicles, tongue, or fingers] [tongue or fingers]. ☒ Yes ☒ No	**145. Since [X Date], did you have any unwanted experiences in which someone attempted to put a penis, an object, or any body part into your [anus or mouth] [vagina, anus, or mouth], but no penetration actually occurred?** ☒ Yes ☒ No

[a] The *2015 WGRR* incorporated dynamic text in the SA questions to reflect "12 months prior dates" based on when the respondent started the survey. In addition, dynamic text was also used based on the gender of the respondent. DMDC uses [ ] to indicate in questions and descriptions where dynamic text was used.

As described in Table 3 (Case Dispositions for Weighting), 485,774 sample members were selected for the *2015 WGRR*. Most sampled members did not respond to the survey (337,899 members, 69.5%); this is typical of other military surveys DMDC has conducted and these unit nonrespondents provide no information for this analysis. Unit nonrespondents include returning a blank survey, survey refusals, and other nonrespondents. DMDC keeps data on the reasons for refusals and inspection of the data revealed 101 (~0.0%) sample members identified the refusal reason as survey content was intrusive. Blank surveys (11 cases by web) are surveys that are returned with no answered questions; respondent's motives for failing to start the survey (and therefore answers to the SA questions) are unknown, but DMDC suspects some respondents have learned they can avoid future e-mail follow-ups by submitting a blank survey. There were 46,592 (9.6%) sampled members that were not located (i.e., e-mail bounce back or postal non-deliverable). In addition, 12,171 (2.5%) members were ineligible to complete the survey (i.e., no

longer a member of the Selected Reserve either determined by record ineligibles or survey or proxy responses). The remaining sample count of complete and incomplete (subsequently referred to as partial) survey respondents is 89,112 (18.3%).

Table 18 shows the breakdown of missingness for the complete eligible and partial web and paper respondents for the six SA questions for web and paper respondents. The Total Missing column indicates the number of missingness for each of the questions (ranging from 2.4% to 3.3%). The following columns indicate the number of missing complete respondents (MC) and missing partial respondents (MP). There are the same number of MP respondents (1,985) for each SA question because incomplete eligibles (SAMP_DC=5) failed to answer at least one sexual assault questions. MC respondents answered at least one sexual assault question (at least one question from SA1 through SA6) and were missing on one or more other sexual assault questions. In addition, this information is broken down by gender. The percentage of missing data for SA questions is slightly higher for females (about one percentage point for each SA question). Because women have higher sexual assault rates than men, it is possible that women skip the SA questions at higher rates because a sexual assault increased the likelihood that they avoid these questions. If this were true, it may cause some underreporting of sexual assault in the *2015 WGRR*. It is important to note that the missing data rates for the SA questions are similar to other base questions from the *2015 WGRR* survey. The average missing data percentage for base questions[2] prior to the sexual assault questions is 1.5 percent. The average missing data for base questions after the sexual assault question is 4.4 percent.

Questions SA4 and SA5 are likely less sensitive to potential respondents than the other four SA questions because they avoid the graphic description of body parts and only involve descriptions of touching. Generally, the missing data rates increase in a relatively linear way as respondents progress through the survey due to survey drop-offs. Table 18 shows that the missing completes increase from SA1 through SA3 but decrease at SA4 and SA5 (both 3.1%) before increasing again to SA6 (up to 3.3%). The lower missing data rates for the less sensitive questions may provide some evidence that the more graphic SA questions caused respondents to either skip questions or quit the survey.

[2] Base questions were defined as questions that were not embedded in any skip pattern

Table 18.
Breakdown of Sample Cases to Assess Item Missing Data for Sexual Assault Questions

Sexual Assault Question	Answered		Total Missing [a] (MC+MP)	Missing Complete (MC) (SAMP_DC=4)	Missing Partial (MP) (SAMP_DC=5)	Missing By Gender	
	Yes	No				Male (n=53,421)	Female (n=35,691)
SA1 (Q67)	343	86,593	2,176 (2.4%)	191	1,985	1,102 (2.1%)	1,074 (3.0%)
SA2 (Q81)	235	86,411	2,466 (2.8%)	481	1,985	1,275 (2.4%)	1,191 (3.3%)
SA3 (Q97)	98	86,122	2,892 (3.2%)	907	1,985	1,531 (2.9%)	1,361 (3.8%)
SA4 (Q113)	1,033	85,288	2,791 (3.1%)	806	1,985	1,467 (2.7%)	1,324 (3.7%)
SA5 (Q129)	286	86,038	2,788 (3.1%)	803	1,985	1,489 (2.8%)	1,299 (3.6%)
SA6 (Q145)	198	85,931	2,983 (3.3%)	998	1,985	1,587 (3.0%)	1,396 (3.9%)

[a] The Total Missing denominator is 89,112 members. For example, in the SA1 row, 343 victims (Yes) + 86,593 No's + 2,176 Total Missing equals 89,112.

DMDC explored the missing data patterns for "yes" and "no" answers to each SA question. Table 19 shows that the overwhelming majority of respondents who answer 'Yes' to an SA question complete all other SA questions (ranging from 95.0% to 98.0%). This analysis shows that SA survivors generally answer the full set of SA questions. Respondents that selected "No" for SA1-SA6 answer the full sexual assault set at even higher rates (ranging from 97.1% to 98.0%). One possibility is respondents that have experienced an SA behavior may be less likely to answer additional sensitive questions because it may provoke negative emotions. A second possibility is the survey is simply longer for the SA victims. For each "yes" to SA1-SA6, the respondent is presented the legal criterial item bank (11 to 13 item), until the legal requirement is met. For example, if a respondent answered "yes" to SA1, they see 11 legal criteria items. If the behavior met the legal criteria, and the respondent experienced additional behaviors (SA2-SA6), they are not presented the legal criteria item bank again. Table 19 shows limited evidence that some SA behaviors may be slightly underreported because SA survivors skip SA questions at a higher rate than non-survivors.

Table 19.
Missing Data Analysis for Answers to SA1-SA6

Sexual Assault Question	Answered "Yes" to at least one SA Question			Answered "No" to at least one SA Question		
	Answered "Yes" to Question	Completed all other SA questions	Percent completed all other SA questions	Answered "No" to Question	Completed all other SA questions	Percent completed all other SA questions
SA1 (Q67)	343	326	95.0%	86,593	84,043	97.1%
SA2 (Q81)	235	228	97.0%	86,411	84,141	97.4%
SA3 (Q97)	98	94	95.9%	86,112	84,275	97.9%
SA4 (Q113)	1,033	993	96.1%	85,288	83,376	97.8%
SA5 (Q129)	286	281	98.3%	86,038	84,088	97.7%
SA6 (Q145)	198	194	98.0%	85,931	84,175	98.0%

DMDC examined item missing data from the *2014 Status of Forces Survey of Reserve Component Members* (*2014 SOFR*) to compare with *2015 WGRR* missing data. Both surveys have the same target population of Reserve and National Guard members, but the *2014 SOFR* questions are less sensitive. Table 20 shows the average missing rate for *2014 SOFR* base questions Q1-Q71 is 3.4 percent. DMDC used base questions for this analysis because they are seen by all respondents (i.e., unaffected by skip patterns). There are a total of 49 base questions from Q1-Q71. The set Q1-Q71 are also similar in location within the questionnaire to the 18 base questions within the *2015 WGRR* (Q1-Q21). The average missing data rate for the *2015 WGRR* (Q1-Q21) is 1.5 percent, which is lower than the *2014 SOFR* base questions.

In addition, the analysis compares key questions on each survey with single item presentation that are not embedded in any skip logic. DMDC has observed from prior surveys across different questionnaire content that group items and questions within deep skip logic have higher rates of missing data. Therefore, if *2015 WGRR* has higher missing data rates, it may be due to question sensitivity. The most common questions of interest on *2014 SOFR* are Q40, Q42, and Q55. DMDC finds the less sensitive *2014 SOFR* questions have similar missing data rates to the sensitive *2015 WGRR* questions. For example, the *2014 SOFR* missing data rates for questions on satisfaction, retention, and stress were 1.6, 1.7, and 3.1 percent, respectively. The average *2015 WGRR* missing rate for SA questions was 2.9 percent, very similar to the *2014 SOFR* questions. If SA questions from *2015 WGRR* had substantially higher missing data rates than the *2014 SOFR*, it may provide evidence that the sensitive questions negatively impact respondents, and perhaps disproportionately SA victims. However, this analysis provides no evidence that this is occurring.

Table 20.
Comparison Between 2015 WGRR and 2014 SOFR on Missingness for Non-Sensitive Items

Survey	Question	Average Missing Data Rate
2014 SOFR	**Q1-Q71.** Base items - Average Missing rate	3.4%
2015 WGRR	**Q1-Q21.** Base items - Average Missing rate	1.5%
2014 SOFR	**Q40.** Overall, how satisfied are you with the military way of life?	1.6%
2014 SOFR	**Q42.** Suppose that you have to decide whether to continue to participate in the National Guard/Reserve. Assuming you could stay, how likely is it that you would choose to do so?	1.7%
2014 SOFR	**Q55.** Overall, how would you rate the current level of stress in your military life?	3.1%
2015 WGRR	**SA1-SA6** - Average Missing rate	2.9%

Drop-off Analysis for Sexual Assault Questions

As mentioned previously, partial respondents are members who started the survey but failed to answer at least one of the sexual assault questions. DMDC wanted to understand why the partial respondents did not complete the survey. Specifically, did partial respondents avoid answering any of the SA questions due to their sensitive nature, or did they quit the survey prior to the SA questions for another reason. To perform this analysis DMDC conducted a drop-off analysis.

The drop-off analysis shows the last question that a web survey respondent answered on the survey with a valid response. Drop-off analysis is limited strictly to web respondents because they cannot advance to see further questions without hitting the forward button, while paper can see all of the questions. For example, if a respondent answered Q1-10 and quit, the drop-off analysis would indicate the last question the respondent answered was Q10, and the first question they saw but did not answer was Q11. This drop-off analysis does not account for "standard item missing data," for instance when a respondent skips one question (accidentally or on purpose), but returns to answer further questions. For instance, if a member answered Q1-10, skipped to 12 and answered Q12-20, and then answered no further questions, the drop-off analysis would include the member in the count where Q20 was last answered.

Analysis of drop-offs for partial respondents is only considered for the 1,958 web respondents because it's impossible to determine which question a paper respondent was viewing when they quit the survey. Due to the complexity of the survey instrument and the defined sections that surround certain questions, DMDC grouped survey items based on their content for questions preceding SA1 (Q67). Four content modules were identified by DMDC as follows:

1. *Demographics*—Reserve component member status and gender. (Q1, Q2)

2. *Time Reference*—Important key events to provide frame of reference for respondents on the time frame of "12 months prior to taking the survey." (Q3-Q5)

3. *Gender-Related MEO Violations*—Experiences of MEO violations (gender discrimination and sexual harassment) in the 12 months prior to the survey. (Q6-Q21)

4. *The Gender-Related MEO Violation with Greatest Effect*—Circumstances pertaining to the experience of MEO violation(s) in the past 12 months that had the greatest impact on the respondent. (Q22-Q66)

Table 22 shows the drop-off analysis based on the content modules defined for the 1,958 partial web respondents. It is important to note that drop-offs are in the minority of all respondents who started the survey. For the modules identified, between 97.5 to 99.9 percent of members who saw those specific questions answered them. In addition, these rates are consistent across other DMDC surveys regardless of the nature of the content. The first three modules (Demographics, Time Reference and MEO Questions) are all base items and respondents see these questions in a linear order. As respondents progress through the survey the level of sensitive information increases. For instance, the Demographics module asks if a member was part of the Reserve component (Q1) and their gender (Q2). This information is not considered sensitive, and 99.9 percent of all of those who saw the question answered it. The first time reference question, "Do you currently live in the same house or building that you did [a year ago]?" (Q3) could be interpreted as a sensitive question by some, and makes up 8.3 percent of the drop-offs.

The gender-related MEO violation module is composed of sixteen questions asking the member about gender-related experiences in the military. These questions are sensitive, and include a question that could potentially be classified as a sexual assault, "Since [a year ago], did someone from work intentionally touch you in a sexual way when you did not want them to?" (Q16). While the vast majority of the respondents answered these questions (98.5% of all respondents who saw Q6 through Q21 answered them) this section also comprised the largest source of drop-offs on the entire survey. Another majority of drop-offs exited the survey in the MEO Violation with Greatest Effect module of questions (27.6% of drop-offs). The drop-off pattern was relatively consistent attrition throughout the MEO section, and no single question had an extreme spike in drop-offs.

The last module displayed in Table 22 is the first sexual assault question, SA1 (Q67). There are five distinct paths respondents can take to view the first sexual assault question (SA1) based on skip logic. DMDC determined that the total number of partial respondents who dropped off "most likely" while viewing the first sexual assault question (SA1) was 221 members (11.3 % of the drop-offs). This question was determined to cause the single largest number of drop-offs on the survey. However, it is important to note that while the 221 members are the largest number of drop-offs for an individual question, similar numbers of members dropped off at the Time Reference section (8.3% of the drop-offs) which has less sensitive questions. Interestingly, Table 20 shows that males tend to drop-off at much higher rates during the first five questions, but females started to drop-off at higher rates through the MEO section, but this effect did not carry through to the SA1 question. Because the SA1 question creates the

largest number of drop-offs, DMDC interprets this as being of some concern that the sensitive questions have higher rates of missing data; however, the missing data rates for all WGRR questions are still low.

Table 20.
2015 WGRR Drop-Off Analysis

Module	Definition	Number of Drop-offs	Number of Drop-offs By Gender		Percent of all Drop-offs (n=1,958)	Percent of Total who Answered web Question [b] (n=76,577)
			Male	Female		
Demographics (Q1-Q2)	Last question was Q1	65	42	23	3.3%	99.9%
Time Reference (Q3-Q5)	Last question was between Q2 to Q4	163	107	56	8.3%	99.7%
MEO Questions (Q6-Q21)	Last question was between Q5 to Q20	928	519	409	47.4%	98.5%
MEO Legal Criteria (Q22-52), MEO Violation with Greatest Effect (Q54-Q66)	Last question was between Q21 to Q64 and did not see Q67	540	151	389	27.6%	97.5%
Sexual Assault (Q67)	Last question was directly before Q67[a]	221	135	86	11.3%	97.5%
All other questions	Last question was between Q208 to Q236	41	25	16	1.9%	91.5%
Total		**1,958**	**979**	**979**	**100%**	

[a]Respondents take different paths to the Sexual Assault question depending on the answers to the MEO questions.
[b]Percent who completed last question in module

Summary of Item Missing Data and Drop-off for Sexual Assault

DMDC assessed the possible effects of item missing data on NRB through an analysis of item missing data across the six SA questions on the *2015 WGRR* as well as conducting an analysis of the members that decided to drop-off entirely from the survey. The item missing data rates on the *2015 WGRR* are comparable to SOFR surveys, and therefore it does not appear that the graphic and sensitive WGRR questions turn off large numbers of respondents. Most members who saw the sexual assault questions answered them (between 97.5-99.5%), but women were slightly more likely than men to skip the SA questions (~3% compared to ~2%). In addition, the pattern of drop-offs throughout the survey also does not show that members are offended by the sensitivity of the survey. DMDC assumes that some NRB is introduced because the largest single drop-off for partial respondents was directly preceding the SA1 question, and women skipped this question at higher rates than men. However, DMDC also believes that the impact is likely small as other non-sensitive questions have similar drop-off rates.

Section 3: Analysis of DMDC's Survey of Nonrespondents

If survey respondents and nonrespondents have different sexual assault propensities that cannot be accounted for during survey weighting, it would result in biased survey estimates of sexual assault. DMDC conducted a nonresponse study (*2015 WGRR-N*) based on a sample of nonrespondents from the original survey as another method to assess NRB. The *2015 WGRR-N* was a web questionnaire with only e-mail notifications (the *2015 WGRR* had postal notifications and paper form), and the questionnaire was much shorter than the *2015 WGRR*. One purpose of the survey was to evaluate NRB by comparing the responses from the follow-up survey to the original survey. In particular, there were four questions that were asked on both the *2015 WGRR* and *2015 WGRR-N* that could be used to assess NRB (see Table 21).

Table 21.
2015 WGRR-N Comparison Questions

***2015 WGRR-N* Comparison Questions**	
211. To what extent do/would you feel safe from being sexually assaulted at your home duty station? ☒ Very safe ☒ Safe ☒ Neither safe nor unsafe ☒ Unsafe ☒ Very unsafe	**223. Suppose that you have to decide whether to continue to participate in the National Guard/Reserve. Assuming you could stay, how likely is it you would choose to do so?** ☒ Very likely ☒ Likely ☒ Neither likely nor unlikely ☒ Unlikely ☒ Very unlikely
212. To what extent do/would you feel safe from being sexually assaulted during military operations, training, or exercises away from your home duty station? ☒ Very safe ☒ Safe ☒ Neither safe nor unsafe ☒ Unsafe ☒ Very unsafe	**224. In general, would you say your health is...** ☒ Excellent? ☒ Very good? ☒ Good? ☒ Fair? ☒ Poor?

If estimates from these matching questions were significantly different, this could be evidence of NRB in these questions (and potentially other correlated questions). As described earlier in the report, a sample of 485,774 was selected from the population of 817,007. There were 336,112 nonrespondents (SAMP_DC=11) from the *2015 WGRR* and a sample of 59,973 was selected for the *2015 WGRR-N* to assess both objectives described earlier. The sample was selected using the same sampling strata as the *2015 WGRR*, since there were enough nonrespondents per stratum, and the sampling tool was used to determine the sample allocation.

DMDC created sampling disposition codes using the criteria shown in Table 22. The table shows that 1,330 of the sample were considered to be complete eligible based on the criteria.

Table 22.
Sample Disposition Codes for 2015 WGRR-N

Sample Disposition Code (SAMP_DC)	**Sample Disposition Code Description**	**Number of Members**
2	Self Report Ineligibles: If the respondent answered "No" to Question 1 on the survey "Were you a member of a Reserve component on November 30, 2015?"	25
4	Complete Eligibles: If respondent was eligible and completed 50% or more of the questions.	1,330
5	Incomplete Eligibles: If respondent was eligible but failed to complete 50% or more of the questions	97
11	Nonrespondents: All others	58,521
Total		**59,973**

Table 23 shows population, sample size, respondents, and response rate by key domains (e.g., gender) for both the *2015 WGRR* and *2015 WGRR-N*. The weighted response rates for both surveys have similar patterns (although rates are much lower for the *2015 WGRR-N*). For example, Air National Guard and Air Force Reserve were the highest responders for both the *2015 WGRR* (31.1% and 27.4%) and *2015 WGRR-N* (6.4% and 4.6%). Warrant Officers responded at the highest rate for both surveys, although for *2015 WGRR-N* the number of respondents is relatively small (less than 30).

Table 23.
Comparison of 2015 WGRR Sample with Nonresponse Sample 2015 WGRR-N

Domain Variable	Domain	Population	*2015 WGRR*			*WGRR-N*		
			Sample Size	Eligible Responses	Weighted Response Rates	Sample Size	Eligible Responses	Weighted Response Rates
Sample	Full Sample	817,007	485,774	87,127	19.8%	59,973	1,330	2.2%
Reserve Component (RORG_CD)	Army National Guard	348,599	186,481	25,172	16.1%	13,608	153	1.1%
	US Army Reserve	197,698	121,036	18,674	17.2%	11,746	206	1.8%
	US Navy Reserve	58,227	36,245	8,053	24.1%	8,016	218	2.7%
	US Marine Corps Reserve	38,468	36,364	4,002	12.2%	13,852	56	0.4%
	Air National Guard	104,818	61,695	19,195	31.8%	6,085	392	6.4%
	US Air Force Reserve	69,197	43,953	12,031	28.2%	6,666	305	4.6%
Gender (RSEX2)	Male	662,565	331,332	52,421	19.0%	36,525	654	2.9%
	Female	154,442	154,442	34,706	23.3%	23,448	676	2.9%
Paygrade Grouping (RPAYGRP9)	E1–E4	352,772	238,102	18,575	7.8%	38,215	380	1.0%
	E5–E9	336,347	179,140	45,178	26.5%	16,074	644	4.0%
	W1–W5	12,187	5,773	2,203	39.4%	269	18	6.7%
	O1–O3	59,530	33,684	9,125	27.0%	3,005	135	4.5%
	O4–O6	56,171	29,075	12,046	43.3%	2,410	153	6.3%
Reserve Program (RPROG1)	TPU	666,695	414,431	57,902	14.7%	54,245	966	1.8%
	AGR	76,747	33,432	13,773	42.7%	2,692	164	6.1%
	MilTech	61,484	29,273	12,737	43.4%	1,737	151	8.7%
	IMA	12,082	8,638	2,715	33.3%	1,299	49	3.8%

Weighting the 2015 WGRR-N

Because some members were not eligible for the *2015 WGRR-N* sample, it is not a probability sample of all Reserve members and there is no method to create base weights. However, weights can be constructed that approximately represent the Reserve component population by direct post-stratification. DMDC weighted the *2015 WGRR-N* using the following process:

- Complete eligibles were placed into post-stratification cells based on a cross classification of gender (male/female), paygrade (E1–E4, E5–E9, W1–O3, O4–O6), and component (Army Reserve, Army National Guard, Navy Reserve, Marine Corps Reserve, Air Force Reserve, and Air National Guard).

- Population totals for these initial post-stratification cells were determined based on the total sampling population for the *2015 WGRR* survey.

- Post-stratification cells were combined if any had less than 20 complete eligibles and were collapsed only across Reserve component levels. The rationale for combining at the component level was that experiences of males who are E1–E4 are more likely to be more similar across component than any other potential collapsing. One example was that male/E1–E4 for Army Reserve, Army National Guard, and Marine Corps Reserve were combined for 44 complete eligible respondents. After collapsing, DMDC created 26 post-stratification cells[3].

- DMDC computed final weights by dividing the total population size by the number of complete eligibles within the collapsed strata (N_h/n_h).

Table 24 shows the estimates and corresponding margins of error for the four questions that overlapped between the two surveys. For example, for Retention, DMDC estimated that 78.0 percent of Selected Reserve members indicated they were likely or very likely to stay in the National Guard/Reserve from the *2015 WGRR* and 77.7 percent indicated this on the *2015 WGRR-N*. The margins of error for the *2015 WGRR* are small, whereas they are larger for the *WGRR-N* because of small number of respondents. Estimates for all questions are extremely close except the Health question, and the confidence intervals overlap even for the Health question.

Table 24.
Comparison of WGRR Survey with Nonresponse Study Control Questions

Question	Weighted Estimates	
	WGRR Survey (n=87,127)	**Nonresponse Survey (n=1,330)**
RETENTION: Assuming you could stay [in the National Guard/Reserve], how likely is it you would choose to do so? (% Saying Likely or Very Likely)	78.0%±1.0	77.7%±5.1
HEALTH: In general, would you say your health is…? (% Saying Good or Excellent)	77.0%±1.0	72.3%±5.2
SAFETY AT HOME: To what extent do/would you feel safe from being sexually assaulted at your home duty station? (% Saying Safe or Very Safe) – note flipped from TAB SHELL	96.0%±1.0	96.7%±1.5
SAFETY AWAY: To what extent do/would you feel safe from being sexually assaulted during military operations, training, or exercises away from - note flipped from TAB SHELL your home duty station?	94.0%±1.0	93.7%±2.4

The similar estimates from the *2015 WGRR* and nonresponse study fail to detect any evidence of NRB in production estimates for these four questions. DMDC further researched whether any inferences could be made about the sexual assault questions. Two of the four questions relate to safety at home and away related to sexual assault, so DMDC hypothesized a

[3] Details of the weighting and collapsing of post-strata are available upon request.

relationship with the sexual assault questions. To investigate this, DMDC examined correlations between the sexual assault questions and these four questions from the *2015 WGRR*. DMDC developed a sexual assault measure (SA_R_ADJ) based on answers to the six sexual assault questions and their corresponding legal definitions. There were 965 sexual assault survivors identified from the survey and 648 answered the safety at home question. Using the Phi-Coefficient (binary correlation) the unweighted estimated correlation was -0.1568 and the weighted correlation was -0.1791 (females unweighted was -0.15 and males was -0.14). The negative correlation was expected because SA victims should feel less safe. For safety away, the correlations were both negatively correlated and nearly identical (-0.14 and -0.17 unweighted and weighted).

Summary of Analysis of DMDC's survey of nonrespondents

The purpose of this NRB analysis was to compare estimates from four identical questions asked on the *2015 WGRR-N* and *2015 WGRR* to assess NRB. If estimates were substantively and statistically different, this would be evidence of NRB for these estimates in the *2015 WGRR*. Given the small number of respondents and larger margins of error (MOEs) in the *2015 WGRR-N,* the four estimates are very similar across the two studies. Estimates from the two surveys are within 1 percentage point of each other for three of the four questions (Health has a 4.7 percentage point difference) but the MOE is large for *2015 WGRR-N*, and all estimates have overlapping confidence intervals. This study fails to detect any evidence of NRB in production estimates for these four questions. Additionally, there is some indication that measures correlated with these questions may also have low levels of NRB. While the SA questions are correlated with two measures from the *WGRR-N,* the correlations are fairly small and DMDC advises against drawing conclusions for the SA questions.

Section 4: Evaluate the Sensitivity of Different Post-Survey Adjustments (Weighting Methods) on Survey Estimates

Production weights for the *2015 WGRR* were produced by Westat by first developing models that account for each member's propensity of experiencing unwanted sexual behaviors, and then using those estimated propensities throughout the weighting process. This method is consistent with RAND's approach for the *2014 RMWS*, but represents a change from how DMDC previously conducts survey weighting. DMDC independently developed a set of weights using our typical methods to assess the effects of different weighting approaches on survey estimates. This section uses the DMDC weights as a validity check to determine if large differences in the weights exist, and if these potential differences lead to more or less NRB in survey estimates.

DMDC Weighting Methodology

DMDC's standard weighting procedures have many similarities to the methods recently used by RAND and Westat. Both methods estimate response propensities and make weighting adjustments based on the inverse of those propensities. However, there are two key differences; first, RAND and Westat used machine learning programs called Generalized Boosted Models

(GBM) to estimate the propensities while DMDC uses logistic models with single classification trees (CHAID). Second, RAND and Westat first estimate propensities for several sexual assault characteristics, and then use those estimated propensities to predict survey response. DMDC skips this step and directly models survey eligibility and response propensities. DMDC weighted the *2015 WGRR* using three main steps:

- Step 1: Adjust weights for nonresponse based on eligibility as follows:
  - Transfer the weight of the 384,491 nonrespondents (SAMP_DC = 8, 9, 10, 11) to the 88,668 cases with known eligibility (SAMP_DC = 2, 3, 4, 5). CHAID (Chi-squared Automatic Interaction Detection), a decision tree technique based on Chi-square tests, was used to determine the best predictors for the logistic model. A logistic regression model was used to predict the probability of eligibility for the survey (known eligibility vs. unknown eligibility). Weighting adjustment factors for eligibility were computed as the inverse of the logistic model-predicted probabilities. The model was weighted using the sampling weight (base weight). Predictors in the eligibility model were the same variables used by Westat with the exception of the model-predicted probabilities for unwanted sexual behaviors.
- Step 2: Adjust weights for survey completion as follows:
  - Transfer the eligibility weight (created in Step 1) of the 1,985 incomplete survey responses (SAMP_DC = 5) to the 87,127 complete-eligible respondents (SAMP_DC = 4). Weighting adjustments for completion use the same methodology as Step 1 (CHAID and logistic model).
- Step 3: Create final weights
  - The weights were poststratified to match population totals and to reduce variance and bias unaccounted for by the previous weighting adjustments. DMDC calculated the final weight as the product of adjustment factors in Steps 1, 2 and 3. Poststratification cells were defined by the cross-classification of Service, gender, paygrade and reserve program. Many of the crossings were collapsed since the goal was to create poststratification cells with more than 30 respondents. Within each post-stratification cell, the non-response-adjusted weights for eligible respondents and self-reported ineligibles (SAMP_DC = 2, 3, 4) were adjusted to match population counts. There were 121 poststratification cells.

Comparison of Adjustment Stages and Final Weights

Table 25 compares the DMDC and Westat methods for each of the weight adjustments discussed in Steps 1 through 3: eligibility, completion, and poststratification. The comparison shows the univariate distribution of each weighting adjustment factor. The results indicate that some edge cases, such as the maximum or minimum adjustments, do differ in both the eligibility model and poststratification adjustments. The maximum cell in the DMDC method had a much

larger eligibility adjustment than the Westat method (239.00 to 45.41)[4]. In addition, the DMDC method also differs in the minimum poststratification adjustment (0.47 to 0.77). However, while these differences do exist for extreme cases, the table in aggregate is very similar even when considering the 99 percent and one percent quantile values in the univariate distribution. Furthermore, the mean value for each adjustment is nearly identical. Although the DMDC method carries slightly more variance, all adjustments outside of the tails seem to convey the same adjustments in both instances.

Table 25.
Comparison between DMDC and Westat Weighting Methods for Eligibility, Completion and Poststratification Adjustments

	DMDC Method (Adjustment Factors)			Westat Method (Adjustment Factors)		
Statistic	**Eligibility**	**Completion**	**Poststratification**	**Eligibility**	**Completion**	**Poststratification**
Mean	5.15	1.02	1.01	5.14	1.02	1.03
Standard Deviation	6.18	0.01	0.05	4.69	0.01	0.08
100% Max	239.00	1.19	1.37	45.41	1.18	1.36
99%	27.74	1.07	1.12	22.00	1.05	1.29
95%	17.44	1.04	1.08	16.00	1.04	1.14
90%	10.87	1.04	1.07	11.80	1.03	1.12
75% Q3	5.24	1.03	1.05	6.03	1.03	1.09
50% Median	2.98	1.02	1.02	3.13	1.02	1.02
25% Q1	2.12	1.01	0.98	2.21	1.02	0.96
10%	1.72	1.01	0.96	1.82	1.02	0.91
5%	1.55	1.01	0.94	1.67	1.02	0.89
1%	1.44	1.00	0.86	1.46	1.00	0.88
0% Min	1.20	1.00	0.47	1.09	1.00	0.77

Table 26 extends the comparison of DMDC and Westat methods by showing the distribution of final weights. The final weight takes into account all of the previous weighting adjustments. Again, DMDC sees somewhat erratic behavior at the tails for the maximum weight value, but are very close in most of the other quantiles. DMDC concludes that overall both methods produce similar distributions of weights.

[4] DMDC completed this set of weights for the purposes of comparing and contrasting with the Westat method. In a production method, DMDC would have adjusted the larger eligibility adjustment to be closer to Westat's value. The large cell was caused by an extremely large number of nonrespondents detected in a particular combination of input variables, and the large weight was only in that specific cell (as indicated by the 99% quantile).

Table 26.
Comparison between DMDC Method Final Weights and Westat Method Final Weights

	DMDC Method	Westat Method
Mean	9.1	9.1
Standard Deviation	11.3	8.8
100% Max	483.9	86.2
99%	51.1	43.8
95%	30.8	29.0
90%	18.7	19.2
75% Q3	10.1	11.5
50% Median	5.7	6.1
25% Q1	3.2	3.4
10%	2.0	2.1
5%	1.7	1.8
1%	1.4	1.5
0% Min	1.1	1.1

Comparison of Key Estimates

Finally, DMDC compared differences in weighted survey estimates based on the DMDC and Westat sets of weights. The final comparison between weighting method is based on the key survey estimates regarding sexual assault questions. Table 27 and Table 28 shows seven estimates associated with sexual assault and sexual harassment for females and males. For example, the estimates of any sexual assault occurring with females using DMDC standard methods was 3.5 percent and the estimate was 3.4 percent using the GBM weighting approach. All comparisons are nearly identical for both weighting approaches and the largest difference in the female estimate table is the Gender Discrimination results which differ by 0.2 percentage points.

Table 27.
Comparison of DMDC and Westat Key Survey Estimates (Female Only)

Question	Variable	DMDC Estimate	Westat Estimate
Sexual Quid Pro Quo	QPQ	1.4% ± 0.1%	1.4% ± 0.1%
Sexual Assault-Penetrative	SA_PEN	1.4% ± 0.1%	1.4% ± 0.1%
Sexual Assault-Any Type	SA_RATE	3.5% ± 0.2%	3.4% ± 0.1%
Sexual Assault-Attempted Touch	SA_TOUCH	1.9% ± 0.1%	1.8% ± 0.1%
Gender Discrimination	SDISC	11.1% ± 0.3%	10.9% ± 0.2%
Sexual Harassment	SEXHAR	18.5% ± 0.4%	18.6% ± 0.3%
Sexual Assault Rate–Adjusted for telescoping	SA_R_ADJ	3.2% ± 0.2%	3.2% ± 0.1%

Similarly the largest difference in the male estimates is the Sexual Harassment question, which also differs by 0.2 percentage points. Overall all of the other estimates are nearly identical. In addition, all of the confidence intervals for either weighting method overlap.

Table 28.
Comparison of DMDC and Westat Key Survey Estimates (Male Only)

Question	Variable	DMDC Estimate	Westat Estimate
Sexual Quid Pro Quo	QPQ	0.2% ± 0.03%	0.2% ± 0.03%
Sexual Assault-Penetrative	SA_PEN	0.2% ± 0.03%	0.2% ± 0.03%
Sexual Assault-Any Type	SA_RATE	0.6% ± 0.05%	0.7% ± 0.06%
Sexual Assault-Attempted Touch	SA_TOUCH	0.4% ± 0.04%	0.4% ± 0.04%
Gender Discrimination	SDISC	1.5% ± 0.07%	1.6% ± 0.07%
Sexual Harassment	SEXHAR	4.2% ± 0.15%	4.4% ± 0.14%
Sexual Assault Rate–Adjusted for telescoping	SA_R_ADJ	0.5% ± 0.05%	0.5% ± 0.05%

Summary of Evaluate the Sensitivity of Different Post-Survey Adjustments (Weighting Methods) on Survey Estimates

The DMDC and Westat weighting methods were conducted independently using different software (DMDC used SAS and SPSS; Westat used R and SAS) and methodology, but the overall results are strikingly similar across all of the intermediate weighting steps, the final weights, and a comparison of key estimates. In addition, all of the confidence intervals for either weighting method overlap. In conclusion we see very little potential for bias in the final weights and resulting estimates that these weights were used to produce.

References

American Association for Public Opinion Research. (2015). *Standard definitions: Final dispositions of case codes and outcome rates for surveys* (8th Ed.). AAPOR. Retrieved from https://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions2015_8theditionwithchanges_April2015_logo.pdf

Benjamini, Y. & Hochberg, Y. (1995). Controlling the false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society. Series B (Methodological), 57.* 289–300. Retrieved from http://www.jstor.org/stable/2346101

Chromy, J.R. (1987). Design optimization with multiple objectives. In *1987 proceedings of the Section on Survey Research Methods : papers presented at the Annual Meeting of the American Statistical Association, San Francisco, California, August 17–20, 1987* (pp. 194–199). Alexandria, VA: American Statistical Association. Retrieved from http://www.amstat.org/sections/srms/Proceedings/papers/1987_029.pdf

Dever, J.A., & Mason, R.E. (2003). DMDC sample planning tool (Version 2.1) [Computer program and software]. Arlington, VA: DMDC.

DMDC. (2013). *2012 Workplace and gender relations survey of active duty members: Nonresponse bias analysis report* (Report No. 2013-059). Alexandria, VA: Author.

DMDC. (2016a). *2015 Workplace and gender relations survey of reserve component members: Tabulation of responses* (Report No. 2016-003). Alexandria, VA: Author.

DMDC. (2016b). *2015 Workplace and gender relations survey of reserve component members: Administration, datasets, and codebook* (Report No. 2016-005). Alexandria, VA: Author.

Groves, R.M., & Couper, M.P. (1998). *Nonresponse in household interview survey*. New York: John Wiley & Sons, Inc. doi: 10.1002/9781118490082

Groves, R.M., & Peytcheva, E. (2008). The impact of nonresponse rates on nonresponse bias: A Meta-Analysis. *Public Opinion Quarterly, 72*, 167–189. doi:10.1093/poq/nfn011

Kish, L. (1965). Weighting problems. *Survey Sampling* (pp. 424–433). New York: John Wiley & Sons, Inc. doi:10.1002/sim.1513

Little, R.J., & Rubin, D.B. (2002). *Statistical analysis with missing data* (2nd ed.). New York: John Wiley & Sons, Inc. doi: 10.1002/9781119013563

Little, R.J., & Vartivarian, S. (2004). *Does weighting for nonresponse increase the variance of survey means? (Working Paper 35)*. Unpublished manuscript, Department of Biostatistics, University of Michigan, Ann Arbor, MI. Retrieved from http://biostats.bepress.com/umichbiostat/paper35/

Mason, R.E., Wheeless, S.C., George, B.J., Dever, J.A., Riemer, R.A., & Elig, T.W. (1995). Sample allocation for the status of the armed forces surveys. In *Proceedings of the Section on Survey Research Methods* (Vol. II, pp. 769–774). Alexandria, VA: American Statistical Association. Retrieved from http://www.amstat.org/sections/srms/Proceedings/papers/1995_133.pdf

Morral, A.R., Gore, K.L., & Schell, T.L. (Eds.). (2014). *Sexual assault and sexual harassment in the U.S. military: Volume 1. Design of the 2014 RAND military workplace study* (No. RR-870/1-OSD). Santa Monica, CA: RAND Corporation.

Morral, A.R., Gore, K.L., & Schell, T.L. (Eds.). (2015). *Sexual assault and sexual harassment in the U.S. military: Volume 2. Estimates for Department of Defense service members from the 2014 RAND military workplace study* (No. RR-870/2-OSD). Santa Monica, CA: RAND Corporation.

Morral, A.R., Gore, K.L., & Schell, T.L. (Eds.). (2015). *Sexual assault and sexual harassment in the U.S. military: Volume 4. Investigations of potential bias in estimates from the 2014 RAND military workplace study* (No. RR-870/2-OSD). Santa Monica, CA: RAND Corporation.

Ridgeway, G. (2009). Generalized boosted models: A guide to the GBM package (Version 2.11) [Computer software]. Retrieved from http://lib.stat.cmu.edu/R/CRAN/

Ridgeway, G. (2009). Toolkit for weighting and analysis of nonequivalent groups (Version 1.4-9.3) [Computer software]. Retrieved from http://lib.stat.cmu.edu/R/CRAN/

Appendix A.
Domain Based Sampling Size and Expected Response

Domain	Population	Approximate Sample Size[1]	Expected Responses	Percent Sampled
All Domains	817,007	486,119	131,959	59.5
National Guard	453,417	248,019	66,370	54.7
Army National Guard	348,599	186,500	41,676	53.5
Air National Guard	104,818	61,738	24,694	58.9
Reserve	363,590	237,424	65,589	65.3
US Army Reserve	197,698	120,991	32,651	61.2
US Navy Reserve	58,227	36,217	12,492	62.2
US Marine Corps Reserve	38,468	36,352	3,710	94.5
US Air Force Reserve	69,197	43,940	16,736	63.5
Enlisted	689,119	416,917	101,433	60.5
E1-E4	352,772	238,121	36,049	67.5
E1-E3	158,071	110,650	16,211	70.0
E4	194,701	127,529	19,838	65.5
E5-E9	336,347	179,273	65,384	53.3
E5-E7	307,320	164,724	59,639	53.6
E8-E9	29,027	14,339	5,745	49.4
Officers	127,888	68,548	30,526	53.6
O1-O3	59,524	33,691	12,908	56.6
O4-O6	56,171	29,097	15,077	51.8
W1-W5	12,193	5,779	2,541	47.4
TPU	666,703	414,689	96,828	62.2
AGR	76,746	33,461	16,606	43.6
IMA	12,048	8,614	3,709	71.5
Deployed Last 12 Months	33,507	18,697	5,596	55.8
Not Deployed Last 12 Months	783,500	466,966	126,363	59.6
Non-Hispanic White	549,466	313,196	85,082	57.0
Total Minority	267,541	172,564	46,877	64.5
Non-Hispanic Black	129,665	85,838	24,939	66.2
Hispanic	88,750	55,824	13,347	62.9
Females	154,442	154,442	71,370	100.0
Females*Enlisted	130,132	130,132	56,289	100.0
Females*E1-E4	71,779	71,779	22,670	100.0
Females*E5-E9	58,353	58,353	33,619	100.0
Females*Officers	24,310	24,310	15,081	100.0
Females*O1-O3	13,165	13,165	7,164	100.0
Females*O4-O6	9,784	9,784	6,983	100.0
Females*TPU	125,127	125,127	52,575	100.0
Females*AGR	15,725	15,725	9,868	100.0
Females*IMA	3,145	3,145	1,906	100.0
Females*Non-Hispanic White	84,666	84,666	40,699	100.0
Females* Minority	69,776	69,776	30,671	100.0
Females*National Guard	76,588	76,588	34,282	100.0
Females*Army National Guard	55,983	55,983	22,194	100.0
Females*Army National Guard*Enlisted	50,044	50,044	18,680	100.0

Domain	Population	Approximate Sample Size[1]	Expected Responses	Percent Sampled
Females*Army National Guard*Officers	5,939	5,939	3,514	100.0
Females*Air National Guard	20,605	20,605	12,088	100.0
Females*Air National Guard*Enlisted	17,784	17,784	10,336	100.0
Females*Air National Guard*Officers	2,821	2,821	1,752	100.0
Females*Reserve	77,854	77,854	37,088	100.0
Females*US Army Reserve	45,138	45,138	19,938	100.0
Females*US Army Reserve*Enlisted	36,365	36,365	14,561	100.0
Females*US Army Reserve*Officers	8,773	8,773	5,377	100.0
Females*US Navy Reserve	12,839	12,839	6,693	100.0
Females*US Navy Reserve*Enlisted	10,105	10,105	4,732	100.0
Females*US Navy Reserve* Officers	2,734	2,734	1,961	100.0
Females*US Marine Corps Reserve	1,614	1,614	521	100.0
Females*US Marine Corps Reserve*Enlisted	1,309	1,309	376	100.0
Females*US Marine Corps Reserve*Officers	305	305	145	100.0
Females*US Air Force Reserve	18,263	18,263	9,936	100.0
Females*US Air Force Reserve*Enlisted	14,525	14,525	7,604	100.0
Females*US Air Force Reserve*Officers	3,738	3,738	2,332	100.0
Males	662,565	331,283	60,589	50.0
Males*Enlisted	558,987	287,319	45,144	51.4
Males*E1-E4	280,993	166,348	13,379	59.2
Males*E5-E9	277,994	120,649	31,765	43.4
Males*Officers	103,578	44,228	15,445	42.7
Males*O1-O3	46,359	20,537	5,744	44.3
Males*O4-O6	46,387	19,297	8,094	41.6
Males*TPU	541,576	289,202	44,253	53.4
Males*AGR	61,021	17,696	6,738	29.0
Males*IMA	8,903	5,475	1,803	61.5
Males*Non-Hispanic White	464,800	228,682	44,383	49.2
Males*Total Minority	197,765	102,838	16,206	52.0
Males*National Guard	376,829	171,457	32,088	45.5
Males*Army National Guard	292,616	130,507	19,482	44.6
Males*Army National Guard*Enlisted	253,791	117,251	15,201	46.2
Males*Army National Guard*Officers	38,825	13,317	4,281	34.3
Males*Air National Guard	84,213	41,096	12,606	48.8
Males*Air National Guard*Enlisted	72,107	34,611	10,296	48.0
Males*Air National Guard*Officers	12,106	6,477	2,310	53.5
Males*Reserve	285,736	159,726	28,501	55.9
Males*US Army Reserve	152,560	75,822	12,713	49.7
Males*US Army Reserve*Enlisted	125,700	65,615	9,140	52.2
Males*US Army Reserve*Officers	26,860	10,314	3,573	38.4
Males*US Navy Reserve	45,388	23,420	5,799	51.6
Males*US Navy Reserve*Enlisted	33,601	18,313	3,579	54.5
Males*US Navy Reserve* Officers	11,787	5,104	2,220	43.3
Males*US Marine Corps Reserve	36,854	34,753	3,189	94.3

Domain	Population	Approximate Sample Size[1]	Expected Responses	Percent Sampled
Males* US Marine Corps Reserve*Enlisted	32,894	30,789	1,909	93.6
Males*US Marine Corps Reserve*Officers	3,960	3,960	1,280	100.0
Males*US Air Force Reserve	50,934	25,671	6,800	50.4
Males*US Air Force Reserve*Enlisted	40,894	20,611	5,019	50.4
Males*US Air Force Reserve*Officers	10,040	5,060	1,781	50.4

[1]This is an approximate sample size that comes from the sampling tool since not all domains are explicitly defined by the stratum definitions. For example, since IMAs are not used as a stratifier, the actual number of IMAs is not known until the sample is actually selected

Appendix B.
Categorical Variables Used for the Eligibility and Completion Adjustments

Variable Name	Categories
Demographic Factors	
Family Status	Married With Child(ren); Married Without Child(ren); Single With Child(ren); Single Without Child(ren); Unknown
Education	No College or DK; Some College; 4-year Degree; Grad / Professional Degree
Race/Ethnic Category	Hispanic; Non-Hispanic Black; Non-minority; Other Race; Unknown
US Citizenship Origin Code	Born outside the US, GU, PR, or VI to at least one citizen parent; Born within the US, GU, PR or VI; Unknown or NA; US citizen by naturalization; US citizen, parent became a citizen by naturalization
US Citizenship Status Code	Born outside the US, GU, PR, or VI to at least one citizen parent; Born within the US, GU, PR or VI; Non US citizen or national; Unknown or NA
Military Career Factors	
Military Accession Program	Air National Guard Academy of Military Sciences; Aviation Cadet program; Aviation training program other than OCS, AOCS, OTS, or PLC; Direct appointment authority, Commissioned Off, all other; Direct appointment authority, Commissioned Off, professional; Direct appointment authority, commissioned warrant officer; Induction; National Guard state OCS; OCS, AOCS, OTS, or PLC; Other; ROTC/NROTC non-scholarship program; ROTC/NROTC scholarship program; S; US Air Force Academy; US Coast Guard Academy; US Merchant Marine Academy; US Military Academy; US Naval Academy; Unknown or Not Applicable; Vol enlist - Rsv Comp for Reg DEP - 10 USC 12103/10 USC 513; Voluntary enlistment - Rsv Comp, Sec 511, ref(b). Excl DEP; Voluntary enlistment in a Regular Component; Voluntary enlistment in a Regular component under the NCSp; Warrant Officer Aviation Training Program
Active Duty Status	Not on Active Duty; On Active Duty
Active Duty and Special Operations Status	Active; Active Special Operations; Unknown
Active Guard & Reserve, or Full Time National Guard Duty Statue ID	AGR: 10 USC 10211; AGR: 10USC 12310; AGR: 32; AGR: Other; Military Technician; Unknown or NA
Combat Occupation Flag	N; Y
Current Deployment Status	Currently Deployed; Never deployed; Not currently deployed
Deployment Flag in the Last 12 months	Deployed in the last 12 months or currently deployed; Never deployed (as of March 2015); Not deployed in the last 12 months
Deployment Flag in the Last 24 months	Deployed in the last 24 months or currently deployed; Never deployed (as of March 2015); Not deployed in the last 24 months
Eligibility Status as of August 2015	Eligible, Ineligible
Paygrade	E01; E02; E03; E04; E05; E06; E07; E08; E09; W01; W02; W03; W04; W05; O01; O02; O03; O04; O05; O06
Primary Regular Component Service Indicator	Yes; No; Unknown or NA;
Reserve Category Programs	AGR/TAR; IMA; Military Technicians; TPU; Unknown
Reserve Organization Code	Air Force Reserve; Air National Guard; Army National Guard; Army Reserve; Marine Corps Reserve; Navy Reserve
Reserve Category Group Code	Active Guard/Reserve (AGR); Military Technician (MILTECH); Selected Reserve (not including AGR or MILTECH)
Reserve Subcategory Code	Active Guard Reserve; Awaiting Second Part of IADT; Drilling Unit

Variable Name	Categories
	Member; FT members performing AD on FTNGD for >180, but exempt from; Individual Mobilization Augmentees (IMA); On Initial Active Duty For Training (IADT); Person awaiting IADT; SEL RES-Other Training Program; Simultaneous Membership Program (SMP)
Reserve Category Code	Selected Reserve - Trained in Units; Selected Reserve - Trained individuals (non-unit); Selected Reserve - Training Pipeline
Reserve Component Category Code	Unknown or NA; Inactive National Guard, RAPIDS entry; Inactive National Guard, individual; Ready Reserve training, individual in officer training program; Ready Reserve training, individual in Health Professional Scholarship program; Reserve Officer Training Corps (ROTC); Individual Ready Reserve, RAPIDS entry; Individual Ready Reserve, trained; Individual Ready Reserve, awaiting IADT, not authorized to perform IDT; Selected Reserve, Unknown Cat.; Selected Reserve, trained individual in unit, 48 or more IDT periods; Selected Reserve, trained individual in unit, Active Guard or Reserve; Full-Time Members (Special Category): Trained Selected Reserve members who are performing AD for more than 180 days in a fiscal year, but who are exempted from counting against the AD strengths; Selected Reserve, trained individual not in unit, Individual Mobilization Augmentee; Selected Reserve, individual in training pipeline, on IADT; Selected Reserve, individual in training pipeline, awaiting IADT, authorized to perform IDT; Selected Reserve, individual in training pipeline, awaiting second part of IADT; Selected Reserve, individual in training pipeline, Simultaneous Membership Program; Selected Reserve, individual in training pipeline, other training program; Standby Reserve (Y9); Standby Reserve, individual on Active Status list; Standby Reserve, individual on Inactive Status List, 20 or more years Reserve service and less than 30% disability; Standby Reserve, individual on Inactive Status List, other; Reserve Category Unknown
Military Environment Factors	
Assigned UIC Change of Station Flag as of March 2014	N; Y
Assigned UIC Change of Station Flag as of August 2015	N; Y
Duty UIC Change of Station Flag as of March 2014	N; Y
Duty UIC Change of Station Flag as of August 2015	N; Y
Survey Fielding Factors	
First Letter Returned as PND	N; Y
Invalid Army E-mail Address Flag	@Army.mil address; Not @Army.mil Address
E-mail Address Purchase Flag	Do Not Purchase e-mail; Purchase E-mail
E-mail Address Flag	At least one e-mail address; No e-mail address
Home Address Flag	Address available; No Home Address
Change in Mailing Address since Sample Frame Development	N; Y
Mail Address Flag	N; Y
Number of E-mail Addresses	No e-mail address; One e-mail address; Two e-mail addresses

Appendix C.
Distribution of Weights and Adjustment Factors by Eligibility Status for Female

Eligibility Status	Statistic	Sampling Weight	Eligibility Status Adjusted Weight	Complete Eligible Response Adjusted Weight	Final Weight With Nonresponse and Raking Factors	Eligibility Status Factor	Complete Eligible Response Factor	Raking Factor
Eligible Respondents	N	34,706	34,706	34,706	34,706	34,706	34,706	34,706
	MIN	1.00	1.14	1.17	1.18	1.14	1.01	0.77
	MAX	1.00	38.18	39.19	41.23	38.18	1.07	1.21
	MEAN	1.00	4.04	4.16	4.34	4.04	1.03	1.03
	STD	0.00	3.24	3.34	3.64	3.24	0.01	0.06
	CV	0.00	0.80	0.80	0.84	0.80	0.01	0.06
Eligible, Incomplete Response	N	987	987	987	987	987	987	987
	MIN	1.00	1.18	0.00	0.00	1.18	0.00	
	MAX	1.00	27.27	0.00	0.00	27.27	0.00	
	MEAN	1.00	4.23	0.00	0.00	4.23	0.00	
	STD	0.00	3.42	0.00	0.00	3.42	0.00	
	CV	0.00	0.81			0.81		
Self/Proxy Ineligibles	N	523	523	523	523	523	523	523
	MIN	1.00	1.43	1.43	1.48	1.43	1.00	0.77
	MAX	1.00	43.06	43.06	44.83	43.06	1.00	1.18
	MEAN	1.00	6.60	6.60	6.99	6.60	1.00	1.04
	STD	0.00	5.51	5.51	5.99	5.51	0.00	0.06
	CV	0.00	0.84	0.84	0.86	0.84	0.00	0.05
Nonrespondents	N	115,035	115,035	115,035	115,035	115,035	115,035	115,035
	MIN	1.00	0.00	0.00	0.00	0.00		
	MAX	1.00	0.00	0.00	0.00	0.00		
	MEAN	1.00	0.00	0.00	0.00	0.00		
	STD	0.00	0.00	0.00	0.00	0.00		
	CV	0.00						
Record Ineligibles	N	3,191	3,191	3,191	3,191	3,191	3,191	3,191
	MIN	1.00	1.00	1.00	0.00			
	MAX	1.00	1.00	1.00	0.00			
	MEAN	1.00	1.00	1.00	0.00			
	STD	0.00	0.00	0.00	0.00			
	CV	0.00	0.00	0.00				

Appendix D.
Distribution of Weights and Adjustment Factors by Eligibility Status for Male

Eligibility Status	Statistic	Sampling Weight	Eligibility Status Adjusted Weight	Complete Eligible Response Adjusted Weight	Final Weight With Nonresponse and Raking Factors	Eligibility Status Factor	Complete Eligible Response Factor	Raking Factor
Eligible Respondents	N	52,421	52,421	52,421	52,421	52,421	52,421	52,421
	MIN	1.00	1.19	1.21	1.58	1.07	1.02	0.87
	MAX	5.69	121.51	125.96	135.92	64.72	1.12	1.35
	MEAN	2.32	11.53	11.77	12.24	5.72	1.02	1.03
	STD	0.91	9.03	9.26	9.98	5.26	0.00	0.09
	CV	0.39	0.78	0.79	0.81	0.92	0.00	0.09
Eligible, Incomplete Response	N	998	998	998	998	998	998	998
	MIN	1.00	1.79	0.00	0.00	1.32	0.00	
	MAX	5.69	57.32	0.00	0.00	30.53	0.00	
	MEAN	2.29	12.69	0.00	0.00	6.38	0.00	
	STD	0.93	9.57	0.00	0.00	5.59	0.00	
	CV	0.41	0.75			0.88		
Self/Proxy Ineligibles	N	1,018	1,018	1,018	1,018	1,018	1,018	1,018
	MIN	1.00	2.53	2.53	3.08	1.40	1.00	0.88
	MAX	5.69	114.73	114.73	123.58	64.72	1.00	1.34
	MEAN	2.12	19.41	19.41	20.45	10.33	1.00	1.05
	STD	0.75	15.88	15.88	16.95	9.22	0.00	0.09
	CV	0.35	0.82	0.82	0.83	0.89	0.00	0.09
Nonrespondents	N	269,456	269,456	269,456	269,456	269,456	269,456	269,456
	MIN	1.00	0.00	0.00	0.00	0.00		
	MAX	5.69	0.00	0.00	0.00	0.00		
	MEAN	1.94	0.00	0.00	0.00	0.00		
	STD	0.59	0.00	0.00	0.00	0.00		
	CV	0.30						
Record Ineligibles	N	7,439	7,439	7,439	7,439	7,439	7,439	7,439
	MIN	1.00	1.00	1.00	0.00			
	MAX	5.69	5.69	5.69	0.00			
	MEAN	1.84	1.84	1.84	0.00			
	STD	0.52	0.52	0.52	0.00			
	CV	0.28	0.28	0.28				

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14. ABSTRACT

This report describes the statistical methodologies for the 2015 Workplace and Gender Relations Survey of Reserve Component Members (2015 WGRR). The first section describes the sample design and selection of the sample. The second section describes weighting and variance estimation, as well as a comparison to the 2014 RAND Military Workplace Study. The third section describes the statistical tests used for the 2015 WGRR. The fourth section describes the calculation of location, completion, and response rates for the full sample and population subgroups. The final section contains the nonresponse bias (NRB) analysis.

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