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2014 Service Academy Gender Relations Survey

Statistical Methodology Report



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2014 SERVICE ACADEMY
GENDER RELATIONS SURVEY:
STATISTICAL METHODOLOGY REPORT

Dr. Fawzi Al Nassir, Jeffrey Schneider, David McGrath, and Eric Falk

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Logistics for the survey were arranged by Mike DiNicolantonio, SRA International, Inc. DMDC-RSSC is grateful to Laureen Barone and MAJ Missy Rosol (U.S. Military Academy); CDR Lyn Hammer and LT Ashley Gudknecht (U.S. Naval Academy); Amanda Lords and Lt Col Jeffrey DeMuth (U.S. Air Force Academy); and Shannon Norenberg (U.S. Coast Guard Academy).

DMDC-RSSC's Survey Design, Analysis, and Operations Branch, under the guidance of Dr. Elizabeth P. Van Winkle, Deputy Branch Chief, is responsible for the development of questionnaires in the survey program. The lead survey design analysts were Dr. Lindsay Rock, Senior Scientist, and Dr. Paul Cook, SRA International, Inc.

DMDC-RSSC's Statistical Methods Branch, under the guidance of Mr. David McGrath, Branch Chief, is responsible for developing the sampling and weighting methods used in the survey program and survey database construction and archiving. Dr. Fawzi Al Nassir, SRA International, Inc., supervised the sampling and weighting processes supported by senior statistician, Owen Hung, SRA International, Inc. Data Recognition Corporation (DRC) performed data processing and editing. Owen Hung, Jeffrey Schneider and Fawzi Al Nassir wrote this methodology report.

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2014 SERVICE ACADEMY GENDER RELATIONS SURVEY: STATISTICAL METHODOLOGY REPORT

Introduction

The *2014 Service Academy Gender Relations Survey (2014 SAGR)* is designed to track sexual assault and sexual harassment issues at the Service Academies. U.S. Code 10, as amended by Section 532 of the John Warner National Defense Authorization Act for Fiscal Year 2007, codified an assessment cycle at the Academies that consists of alternating surveys and focus groups. This requirement applies to the U.S. Military Academy (USMA), U.S. Naval Academy (USNA), and U.S. Air Force Academy (USAFA). Previous assessments in this series were also survey based, with the first conducted in 2004 by the Department of Defense (DoD) Inspector General (IG). Responsibility for subsequent assessments was transferred to DMDC-RSSC which conducted surveys in 2005, 2006, 2008, 2010 and 2012; focus groups were conducted in 2007, 2009, 2011, and 2013 by DMDC-RSSC.

The U.S. Coast Guard Academy (USCGA), the only Federal Military Academy within the Department of Homeland Security (DHS), is not required to participate in the assessments codified by U.S. Code 10. However, USCGA officials requested that they be included, beginning in 2008, in order to evaluate and improve their programs addressing sexual assault and sexual harassment. USCGA was surveyed under the authority of U.S. Code 14 Section 1.

This report describes sampling and weighting methodologies for the *2014 Service Academy Gender Relations Survey (2014 SAGR)*, which fielded April 7, 2014 through April 25, 2014.

In the five SAGR surveys conducted by DMDC-RSSC between 2005 and 2012, male cadets were sampled while a census of all females was selected. For the *2014 SAGR* survey, a decision was made to census both males and females in all academies.

The first section describes the design and selection of the sample. The second section describes weighting and variance estimation. The final section describes the calculation of response rates, location rates, and completion rates for the full sample and for population subgroups. Information about administration of the survey is found in the *2014 Service Academy Gender Relations Survey: Tabulations of Responses* (DMDC, 2014).

Sample Design and Selection

Target Population

The *2014 SAGR* was designed to represent all students at the following Service Academies:

- U.S. Military Academy (USMA)
- U.S. Naval Academy (USNA)

- U.S. Air Force Academy (USAFA)
- U.S. Coast Guard Academy (USCGA)

Sampling Frame

The sampling frame consisted of 13,756 students drawn from the student rosters provided to DMDC-RSSC by each academy for class years 2014, 2015, 2016, and 2017. The sampling frame excludes foreign nationals and students who left the academy.

Sample Design

The 2014 SAGR was a census of males and females, i.e., all eligible students were selected. This design differs from prior administrations of the SAGR surveys where DMDC-RSSC selected a census of all females but sampled the males. For 2014 SAGR, the final sample (population) of 13,756 consisted of 10,902 male students and 2,854 female students. Table 1 shows the distribution of students by service academy, gender and class year.

Table 1.
Sample (Population) Size by Service Academy, Gender, and Class Year

Stratification Variable	Total	USMA	USNA	USAFA	USCGA
Total	13,756	4,587	4,448	3,845	876
Gender					
Male	10,902	3,870	3,486	2,967	579
Female	2,854	717	962	878	297
Graduating Class					
Class of 2014	3,482	1,162	1,088	1,011	221
Class of 2015	3,299	1,115	1,077	872	235
Class of 2016	3,311	1,119	1,127	860	205
Class of 2017	3,664	1,191	1,156	1,102	215

Table 2 shows total eligible responses by service academy, gender, and class year.

Table 2.
Eligible Response by Service Academy, Gender and Class Year

Stratification Variable	Total	USMA	USNA	USAFA	USCGA
Total	10,905	3,764	3,440	2,895	806
Gender					
Male	8,339	3,100	2,594	2,126	519
Female	2,566	644	846	769	287
Graduating Class					
Class of 2014	2,604	957	742	714	191
Class of 2015	2,543	883	823	618	219
Class of 2016	2,680	921	925	648	186
Class of 2017	3,078	1,003	950	915	210

Weighting

Analytical weights for the 2014 SAGR were created to account for varying response rates among population subgroups (service academy, gender, and class year). Sampling weights defined as the inverse of the selection probabilities took the value of one (1) because the survey was a census and then adjusted for nonresponse. DMDC-RSSC formed 32 nonresponse adjustment cells using the cross classification of service academy (4) gender (2) and class year (4). Adjustment factors ranged from 1.013 to 2.102.

Disposition codes

First, final disposition codes were assigned for weighting based on eligibility for the survey and completion of the return. Execution of the weighting process and computation of response rates both depend on this classification.

Final disposition codes were determined and DMDC-RSSC calculated weights for the number of complete and eligible respondents, which requires the respondent to complete 50% of items and answer the critical questions. Critical questions are defined by any item in question 12 and by answering question 21 in the 2014 SAGR questionnaire (Appendix). Final disposition codes for the 2014 SAGR are shown in Table 3.

Table 3.
Disposition Codes

Disposition code	Information Source	Conditions	Breakdown
Eligible, complete response	Survey Return	Survey returned with critical items completed and at least 50% of items completed	9,264
Eligible, incomplete response	Survey Return	Survey returned with critical items not completed or at least 50% of items not completed	1,641
Survey Not returned	Difference between Master Student Roster and Survey Returns	Student checked in but failed to turn in a survey.	2,527
Student Not located	Not able to locate the student.	Student failed to check in.	324

Treatment of Missing Data

In any survey, some respondents skip questions or leave some questions blank. In 2014 SAGR there are critical questions that must be answered (i.e., answering 50% or more of the questions asked of all participants, at least one subitem in Q12a-s, and a valid response to the unwanted sexual contact item (Q21) for the survey to be considered “completed.” But when a respondent skips a question a decision is required on how to handle the blank question. In past SAGR surveys the decision was to set responses to “No” if the respondent chose not to mark an item. This applied to the questions on stalking, sexual harassment and its component behaviors, sexist behavior, and prior experiences of unwanted sexual contact. In 2014 SAGR the decision was made to treat skipped items as missing rather than recode to “No.” Analysis has shown that the impact of this methodological change is minimal. However, caution should be taken in the interpretation of results in 2014 SAGR compared to previous survey years. Prior-year survey results continue to be based on the previous rule.

An exception to leaving data missing is required because weights are computed within cells defined by service academy, gender, and class year. Because the survey is administered anonymously, DMDC-RSSC needs to impute a student’s class year if they chose not to answer question 3 below.

3. What is your Class year?

☐ 2014

☐ 2015

☐ 2016

☐ 2017

☐ 2018

DMDC-RSSC imputes the class year proportional to the service academy frame, broken out by gender and class year. Table 4 shows the breakdown of the imputations of the 12 students with missing class year by service academy, gender, and class year.

Table 4.
Imputation of Unknown Class Year by Service Academy, Gender, and Class Year

Gender/Class Year	Total	USMA	USNA	USAFA	USCGA
Total	12	4	6	2	0
Male	11	4	6	1	0
2014	4	1	2	1	0
2015	3	1	2	0	0
2016	2	1	1	0	0
2017	2	1	1	0	0
Female	1	0	0	1	0
2014	0	0	0	0	0
2015	1	0	0	1	0
2016	0	0	0	0	0
2017	0	0	0	0	0

Complete Eligible Cases for Weighting

After imputation of class year, the complete eligible cases for weighting were calculated by adding the number of complete eligible cases with known class year with the number of complete eligible cases with unknown class year. Table 5 shows the total number of eligible cases for weighting by service academy, gender, and class year.

Table 5.***Complete Eligible Cases for Weighting by Service Academy, Gender, and Class Year***

Gender/Class Year	Total	USMA	USNA	USAFA	USCGA
Total	9,264	3,237	2,813	2,512	702
Male	6,881	2,620	2,044	1,801	416
2014	1,607	664	413	432	98
2015	1,631	602	526	384	119
2016	1,690	652	535	407	96
2017	1,953	702	570	578	103
Female	2,383	617	769	711	286
2014	569	167	156	179	67
2015	534	146	159	152	77
2016	596	141	233	155	67
2017	684	163	221	225	75

Nonresponse Adjustments

The sampling weights for 2014 SAGR took the value of one (1) because it was a census. The sample weights were adjusted for nonresponse in two steps within 32 cells formed by the cross classification of academy, gender, and class year in two steps:

- Step 1: Adjust weights for nonresponse as follows:
 - Transfer the weight of the 2,851 nonrespondents from the last two rows of Table 3 to the survey respondents (both complete and incompletes). To create the adjustment factor, RSSC formed a ratio of the frame count divided by the survey respondents (both complete and incompletes) within each of the 32 cells.
- Step 2: Adjust weights for survey completion as follows:
 - Transfer the weight of the 1,641 incomplete survey responses to the 9,264 complete-eligible respondents (see Table 3 for counts).
 - To create the completion adjustment factor, RSSC formed a ratio of the complete eligible respondents (both complete and incompletes) divided by the complete respondents within each of the 32 cells.
 - RSSC calculated the final weight as the product of adjustment factors (ratios) in Steps 1 and 2.

The final weight for eligible respondents indicates the number of students that a complete respondent represents at the academy with the same gender and class year. For example, a male

respondent graduating in 2014 at the USMA represents 1.447 male students in the 2014 USMA class year. The final weights by academy, gender, and class year are shown in Table 6.

Table 6.
Final Weights by Service Academy, Gender, and Class Year

Gender / Class Year	USMA	USNA	USAFA	USCGA
Male				
2014	1.447	2.102	1.778	1.531
2015	1.566	1.656	1.781	1.311
2016	1.460	1.593	1.644	1.396
2017	1.444	1.570	1.464	1.350
Female				
2014	1.204	1.410	1.358	1.060
2015	1.178	1.296	1.237	1.026
2016	1.184	1.180	1.232	1.060
2017	1.086	1.181	1.138	1.013

Statistical Tests—Multiple Comparisons

When statistically comparing groups (e.g., USMA USC rate from 2012 SAGR vs. USMA USC rate from 2014 SAGR), a statistical hypothesis whether there are no differences (null hypothesis) versus there are differences (alternative hypothesis) is tested. DMDC-RSSC uses Two-Independent Samples t-test for all of 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 (conclude that estimates are significantly different), it is possible that 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 that 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 interest in conducting more than one comparison, i.e., conducting multiple comparisons. For example, 1) testing whether satisfaction among Army is the same as satisfaction of all other services, and 2) testing whether satisfaction among Navy is the same as satisfaction of all other services 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 actually true for all, 10 of the tests would be expected to be significant at the p-value < 0.05 level due to chance. These 10 tests would have incorrectly been concluded as 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 just the p-value itself. When more than one significance test is conducted, the probability of false discoveries increases. That is, the error rate will increase as the number of independent tests conducted increases, i.e., the more tests that are conducted the greater the number of false discoveries.

This problem is known in the statistical literature 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 testing (multiple comparisons). It should be noted that there is no universally accepted approach for dealing with the problem of multiple comparisons.

The method used by DMDC-RSSC to control for false discoveries is known as 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 idea 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 $\frac{k * \alpha}{m}$

Determine the cutoff that delineates 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-RSSC computed the FDR thresholds (FDR adjusted alpha) separately for the two types of comparisons—current year and trends. For both types of tests, DMDC-RSSC implemented FDR Multiple Comparison corrections to control the expected rate of false discoveries (Type I errors) at $\alpha = 0.05$. For the current year estimates from the *2014 SAGR*, RSSC performed 31,281 separate statistical tests (e.g., racial/ethnic discrimination rates for male versus female). Of the 31,281 current year statistical tests, 13,018 were statistically significant. In addition, DMDC-RSSC performed another 39,603 separate statistical tests to compare estimates from the *2014 SAGR* to the *2012 SAGR* (i.e., trends). For trends, 17,676 of the 39,603 statistical tests were significant.

Treatment of Respondent Errors

DMDC-RSSC conducts analyses of respondents' marking of the surveys and scanning in order to verify that responses are properly recorded. This includes visual review of actual survey booklets as well as analyses of responses looking for any indicators of obvious response errors (including analysis of response patterns indicating a respondent might not have taken the survey seriously). During this process, DMDC-RSSC analysts noted a potential problem resulting from the layout of the survey booklet. In Q22 (see Appendix) respondents were asked to indicate the frequency with which they experienced an unwanted sexual contact behavior in order of "One," "More than one," and "Did not experience." In Q25 (see Appendix) respondents are presented the same behavioral list and asked to indicate, in order, "Did not do this" and "Did this." Analysis revealed that in 13 instances a respondent marked the mirror image of Q22 responses in Q25. This was flagged as a concern for review by DMDC-RSSC suggesting that these respondents failed to note the different responses requested in Q25 and simply marked the same pattern as in Q22. While this appeared to be an obvious reversal of marking, DMDC-RSSC made the decision to set those responses to "did not specify" in Q25 rather than recode to match Q22.

Response Rates

Location, completion, and response rates were calculated in accordance with RR6 (AAPOR, 2011) from the standard definition published by the American Association for Public Opinion Research (AAPOR).

Location, completion, and response rates were computed for the 2014 SAGR as follows:

The location rate (LR) is defined as

$$LR = \frac{\text{located sample}}{\text{eligible sample}}$$

The completion rate (CR) is defined as

$$CR = \frac{\text{complete eligible responses}}{\text{located sample}}$$

The response rate (RR) is defined as

$$RR = \frac{\text{complete eligible responses}}{\text{eligible sample}}$$

Table 7 shows the calculations of the response rates. The final response rate is the product of the location rate and the completion rate. The counts include the cases with unknown class year. Table 8 shows response rates by academy, gender, and class. Note that because the sample design was a census, all students have a sampling weight of 1, and therefore unweighted and weighted response rates are the same.

Table 7.
Location, Completion, and Response Rates

Type of Rate	Description	Calculation	Rate
Location (LR)	Located sample / Eligible sample	13,432 / 13,756	97.6%
Completion (CR)	Complete eligible responses / Located sample	9,264 / 13,432	69.0%
Response (RR)	Complete eligible responses / Eligible sample	9,264 / 13,756	67.3%

Table 8.
Weighted Response Rates by Service Academy, Gender and Class Year

Gender/Class Year	Total	USMA	USNA	USAFA	USCGA
Total	67%	71%	63%	65%	80%
Male	63%	68%	59%	61%	72%
2014	59%	69%	49%	56%	65%
2015	61%	64%	60%	56%	76%
2016	65%	68%	63%	61%	72%
2017	67%	69%	64%	68%	74%
Female	83%	86%	80%	81%	96%
2014	77%	83%	71%	74%	94%
2015	83%	85%	77%	82%	97%
2016	85%	84%	85%	81%	94%
2017	89%	92%	85%	88%	99%

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Appendix

12. In this question you are asked about sex/gender-related talk and/or behavior that was unwanted, uninvited, and in which you did not participate willingly.

Since June 2013, how often have you been in situations involving persons assigned to your Academy, including students and military/uniformed/civilian personnel, where one or more of these individuals (of either gender)... *Mark one answer for each item.*

	5 Very often	4 Often	3 Sometimes	2 Once or twice	1 Never
a. Repeatedly told sexual stories or jokes that were offensive to you?	☒	☒	☒	☒	☒
b. Referred to people of your gender in insulting or offensive terms?	☒	☒	☒	☒	☒
c. Made unwelcome attempts to draw you into a discussion of sexual matters (e.g., attempted to discuss or comment on your sex life)?	☒	☒	☒	☒	☒
d. Treated you "differently" because of your gender (e.g., mistreated, slighted, or ignored you)?	☒	☒	☒	☒	☒
e. Made offensive remarks about your appearance, body, or sexual activities?	☒	☒	☒	☒	☒
f. Made gestures or used body language of a sexual nature that embarrassed or offended you?	☒	☒	☒	☒	☒
g. Made offensive sexist remarks (e.g., suggesting that people of your gender are not suited for the kind of work you do)?	☒	☒	☒	☒	☒
h. Made unwanted attempts to establish a romantic sexual relationship with you despite your efforts to discourage it?	☒	☒	☒	☒	☒
i. Put you down or was condescending to you because of your gender?	☒	☒	☒	☒	☒
j. Continued to ask you for dates, drinks, dinner, etc., even though you said "No?"	☒	☒	☒	☒	☒

	5 Very often	4 Often	3 Sometimes	2 Once or twice	1 Never
k. Made you feel like you were being bribed with some sort of reward or special treatment to engage in sexual behavior?.....	☒	☒	☒	☒	☒
l. Made you feel threatened with some sort of retaliation for not being sexually cooperative?	☒	☒	☒	☒	☒
m. Touched you in a way that made you feel uncomfortable?.....	☒	☒	☒	☒	☒
n. Intentionally cornered you or leaned over you in a sexual way?.....	☒	☒	☒	☒	☒
o. Treated you badly for refusing to have sex?	☒	☒	☒	☒	☒
p. Implied better leadership positions or better treatment if you were sexually cooperative?	☒	☒	☒	☒	☒
q. Displayed images that made you feel uncomfortable (e.g., pornography, gender disparaging cartoons, images on a computer screen/TV)?	☒	☒	☒	☒	☒
r. Directed verbal insults against you as part of hazing or initiation rites?	☒	☒	☒	☒	☒
s. Other unwanted gender-related behavior?	☒	☒	☒	☒	☒

21. Since June 2013, have you experienced any of the following intentional sexual contacts that were against your will or which occurred when you did not or could not consent in which someone...

- Sexually touched you (e.g., intentional touching of genitalia, breasts, or buttocks) or made you sexually touch them?
- Attempted to make you have sexual intercourse, but was not successful?
- Made you have sexual intercourse?
- Attempted to make you perform or receive oral sex, anal sex, or penetration by a finger or object, but was not successful?
- Made you perform or receive oral sex, anal sex, or penetration by a finger or object?

2 ☐ Yes

1 ☐ No

22. [Ask if Q21 = "Yes"] Since June 2013, how many separate incidents of each behavior did you experience? *Mark the number of incidents for each behavior.*

	3 Did not experience	2 More than one	1 One
a. <u>Sexually touched you</u> (e.g., intentional touching of genitalia, breasts, or buttocks) or made you sexually touch them.....	☐	☐	☐
b. <u>Attempted</u> to make you have sexual intercourse, but was not successful.....	☐	☐	☐
c. <u>Made you</u> have sexual intercourse.....	☐	☐	☐
d. <u>Attempted</u> to make you perform or receive oral sex, anal sex, or penetration by a finger or object, but was not successful	☐	☐	☐
e. <u>Made you</u> perform or receive oral sex, anal sex, or penetration by a finger or object.....	☐	☐	☐
f. Other	☐	☐	☐

25. [Ask if Q21 = "Yes"] If you experienced situation(s) or behaviors in Question 21 since June 2013, tell us about the one situation that had the greatest effect on you.

What did the person(s) do during this situation? *Mark one answer for each behavior.*

	2 Did this	1 Did not do this
a. <u>Sexually touched you</u> (e.g., intentional touching, of genitalia, breasts, or buttocks) or made you sexually touch them.....	☐	☐
b. <u>Attempted</u> to make you have sexual intercourse, but was not successful.....	☐	☐
c. <u>Made you</u> have sexual intercourse.....	☐	☐

		2 Did this	
1 Did not do this			
d.	<u>Attempted</u> to make you perform or receive oral sex, anal sex, or penetration by a finger or object, but was not successful.....	☐	☐
e.	<u>Made you</u> perform or receive oral sex, anal sex, or penetration by a finger or object.....	☐	☐
f.	<u>Other</u>	☐	☐

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