Analytical Plan for Association between leadership commitment and professional development at NASA (2020): sex-adjusted stratified analysis

DOCUMENT: SAP-2022-008-GJ-v02

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2022-02-02

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Document version

Version	Alterations
01	Initial version
02	Measure of effect added to the analysis, methods for inferential analyses were updated.

1 ABBREVIATIONS

- CI: confidence interval
- FEVS: Federal Employee Viewpoint Survey
- OPM: U.S. Office of Personnel Management
- OR: odds ratio

2 CONTEXT

The Federal Employee Viewpoint Survey (FEVS) addressed leadership commitment, professional development, and telework satisfaction while accounting for gender (OPM, 2020). This analysis addresses a subset of the FEVS survey reflecting NASA employees.

2.1 Objectives

Quantify the association between leadership commitment and employee professional development at NASA from the 2020 Federal Employee Viewpoint Survey.

2.2 Hypotheses

There is a statistically significant correlation between leadership commitment, and professional development among NASAs employees in a telework environment after accounting for gender (men and women).

2.3 Study design

Case-control to assess prevalence from a complex-designed survey, where sampling weights where used to account for sampling uncertainty.

3 DATA

3.1 Raw data

Raw data was collected as a census of the eligible population (OPM, 2020), and statistical weighting was applied at the data collection to adjust for non-responses in in the census attempt. These survey weights (variable `postwt`) allow for the estimation of the association under study in the source population. The raw data was filtered to reflect only NASA survey respondents (where agency code equals `NN`).

The raw data is expected to reflect a total employee population at NASA at 16809 employees but after cleaning procedures the observations in the analytical data represents a total of 15283 NASA employees. Survey questions measured responses in a 5-point Likert scale between 1 (strongly disagree) and 5 (strongly agree). Some questions offered the option to choose "X" (Don't know) as the answer. These unknown answers were considered non-answers and treated as missing values (see section 5.1.4).

3.2 Analytical dataset

All variables in the analytical set were labeled according to the raw data provided and values were labeled according to the data dictionary for the preparation of production-quality results tables and figures.

This analysis will focus on two questions from the FEVS survey, where the main interest is employee satisfaction (q1 – I am given a real opportunity to improve my skills in my organization) as the dependent variable and leadership commitment (q21 – Supervisors in my work unit support employee development) as the independent variable. As per the data cleaning process, the dependent variable was renamed to `dv` and the independent variable was renamed to `iv` in the analytical dataset. Additionally, to calculate the OR the responses were categorized as binary responses, where agreement was aggregated from the "agree" and "strongly agree" responses, in variables `dv2` and `iv2`.

After the cleaning process 7 variables were included in the analysis with 9633 observations. Table 1 shows the structure of the analytical dataset.

Table 1 *Analytical dataset structure after variable selection and cleaning.*

id	dsex	dv	iv	dv2	iv2	postwt
1						

2						
3						
…						
9633						

The analytical dataset will be included in the private version of the report, and will be omitted from the public version of the report.

4 STUDY VARIABLES

4.1 Primary and secondary outcomes

Specification of outcome measures (Zarin, 2011):

1. (Domain) Employee professional development
2. (Specific measurement) Survey question
3. (Specific metric) End value
4. (Method of aggregation) Odds of participants that agree or strongly agree with survey question

Primary outcome

Odds of participants' that perceive opportunities of employee professional development at NASA from the 2020 Federal Employee Viewpoint Survey.

4.2 Covariates

The association will be stratified by the sex of survey respondents.

5 STATISTICAL METHODS

5.1 Statistical analyses

5.1.1 Descriptive analyses

The epidemiological profile of the study participants will be described. Demographic (sex, age and BMI) will be described as mean (SD) or as counts and proportions (%), as appropriate. The distributions of participants' characteristics will be summarized in tables and visualized in exploratory plots.

5.1.2 Inferential analyses

All comparisons between groups will be performed as univariate analyses. Differences in distribution of categorical variables will be assessed with the chi-square test with the adjustment of design effect for weighted survey data. The OR will be used as a measure of effect of the independent variable on the dependent variable.

The stratification by sex will be used to assess if the effect changes across male and female strata. As a rule of thumb, a minimum change of 20% in the OR will be considered before concluding that there is an interaction between sex and the independent variable. The homogeneity of the OR across strata will be assessed with the Cochran-Mantel-Haenszel test.

5.1.3 Statistical modeling

N/A

5.1.4 Missing data

No missing data imputation will be performed. All evaluations will be performed as complete case analyses.

5.2 Significance and Confidence Intervals

All analyses will be performed using the significance level of 5%. All significance hypothesis tests and confidence intervals computed will be two-tailed.

5.3 Study size and Power

N/A

5.4 Statistical packages

This analysis will be performed using statistical software R version 4.1.2.

6 OBSERVATIONS AND LIMITATIONS

N/A

7 REFERENCES

- **SAR-2022-008-GJ-v01** – Association between leadership commitment and professional development at NASA (2020): sex-adjusted stratified analysis
- OPM (2020). 2020 Federal Employee Viewpoint Survey – Technical report (https://www.opm.gov/fevs/reports/technical-reports/).

- Zarin DA, et al. The ClinicalTrials.gov results database — update and key issues. N Engl J Med 2011;364:852-60 (https://doi.org/10.1056/NEJMsa1012065).
- Gamble C, et al. Guidelines for the Content of Statistical Analysis Plans in Clinical Trials. JAMA. 2017;318(23):2337–2343 (https://doi.org/10.1001/jama.2017.18556).

8 APPENDIX

This document was elaborated following recommendations on the structure for Statistical Analysis Plans (Gamble, 2017) for better transparency and clarity.

8.1 Availability

Both this analytical plan and the corresponding analysis report (**SAR-2022-008-GJ-v01**) can be downloaded in the following address:

https://philsf-biostat.github.io/SAR-2022-008-GJ/