

RATIO Example #5

SUDAAN Statements and Results Illustrated

- REPWGT
- WEIGHT
- ADJFAY option
- NUMER
- DENOM

Input Data Set(s): DESCRPTT.XPT

Example

Obtain RATIO estimates and variances using multiply imputed data from NHANES III.

Specifically, use RATIO to estimate the mean body weight among respondents who consider their health 'fair' or 'poor', by poverty status.

Solution

This example uses the NHANES III Multiply Imputed Data Set, which is available on the NCHS website. In the following example, we illustrate how to program SUDAAN for a multiply imputed dataset when the multiply imputed variables are stored as separate variables on the same datafile.

A temporary dataset called *DESCRPTT.XPT* was created from the NHANES III Multiply Imputed Dataset, which contained the necessary weight and variance estimation variables as well as the following newly constructed variables:

POVERTY1—POVERTY5

Created from the multiply imputed variables DMPPIRMI and is equal to:

- 1 – If respondent is at or below poverty
- 2 – If respondent is above poverty

WEIGHT1—WEIGHT5

Created from the multiply imputed variables WEIGHTMI and is equal to:

- 1 – WEIGHTMI, if the respondent indicated their health was “Fair” or “Poor” based on the corresponding HEALTH variable (below)
- 0 – Otherwise

HEALTH1—HEALTH5

Created from the multiply imputed variables HABLMI and is equal to:

- 1 – if the respondent indicated their health was “Fair” or “Poor”
- 0 – Otherwise

For each of the variables above, five multiply imputed versions of the variable are available on the NHANES III dataset. In this example, variances are computed using the BRR method with Fay’s Adjustment.

In the first call to PROC RATIO, the mean body weight among respondents who consider their health ‘fair’ or ‘poor’ is computed by poverty status (*Exhibit 1*).

This example was run in SAS-Callable SUDAAN, and the programming code is presented in *Exhibit 1*. Note that the basic SUDAAN code is the same for both Standalone and SAS-Callable versions.

Exhibit 1. SAS-Callable SUDAAN Code: First RATIO Run

```
libname in xport "\\rtints29\sudaan\data\nhanes3\descrptT.xpt";
options linesize=95 pagesize=60 nocenter;

data descrptT; set in.descrptT;

proc format;
  value pov 1="1=At or Below Poverty"
           2="2=Above Poverty";

PROC RATIO DATA=descrptT filetype=sas DESIGN=BRR;
  WEIGHT WTPFQX6;
  REPWGT WTPQRP1-WTPQRP52 / ADJFAY=2.0408;

  MI_VAR POVERTY1 POVERTY2 POVERTY3 POVERTY4 POVERTY5;
  MI_VAR WEIGHT1 WEIGHT2 WEIGHT3 WEIGHT4 WEIGHT5;
  MI_VAR HEALTH1 HEALTH2 HEALTH3 HEALTH4 HEALTH5;

  CLASS POVERTY1;
  NUMER WEIGHT1;
  DENOM HEALTH1;

  SETENV LABWIDTH=25 decwidth=2 colwidth=6;
  PRINT NSUM WSUM RHAT SERHAT="SE" LOWRHAT UPRHAT / STYLE=NCHS NSUMFMT=F6.0
        WSUMFMT=F9.0 SERHATFMT=F5.2;
  RFORMAT POVERTY1 pov.;
  RTITLE "MEAN WEIGHT AMONG ADULTS WHO INDICATED THEIR HEALTH IS 'FAIR' OR 'POOR'"
        "BY POVERTY STATUS";
  RFOOTNOTE "NHANES-III MULTIPLY IMPUTED DATA, ADULTS (20+)";
```

The NUMER (weight) and DENOM (health) variables have been defined in such a way that they will estimate the average weight among people who report their health as “fair” or “poor”.

Exhibit 2. First Page of SUDAAN Output (SAS *.lst file)

```

                S U D A A N
      Software for the Statistical Analysis of Correlated Data
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                Release 11.0.0

DESIGN SUMMARY: Variances will be computed using the Balanced Repeated Replication (BRR) Method
Sample Weight: WTPFQX6
Replicate Sample Weights:
      WTPQRP1  WTPQRP2  WTPQRP3  WTPQRP4  WTPQRP5  WTPQRP6  WTPQRP7  WTPQRP8
      WTPQRP9  WTPQRP10 WTPQRP11 WTPQRP12 WTPQRP13 WTPQRP14 WTPQRP15 WTPQRP16
      WTPQRP17 WTPQRP18 WTPQRP19 WTPQRP20 WTPQRP21 WTPQRP22 WTPQRP23 WTPQRP24
      WTPQRP25 WTPQRP26 WTPQRP27 WTPQRP28 WTPQRP29 WTPQRP30 WTPQRP31 WTPQRP32
      WTPQRP33 WTPQRP34 WTPQRP35 WTPQRP36 WTPQRP37 WTPQRP38 WTPQRP39 WTPQRP40
      WTPQRP41 WTPQRP42 WTPQRP43 WTPQRP44 WTPQRP45 WTPQRP46 WTPQRP47 WTPQRP48
      WTPQRP49 WTPQRP50 WTPQRP51 WTPQRP52
Multiplier Associated with Replicate Weights: 2.0408

Processing data for set 1 of imputed variables:

Number of observations read      : 18825      Weighted count :177180670
Denominator degrees of freedom :      52

Processing data for set 2 of imputed variables:

Number of observations read      : 18825      Weighted count :177180670
Denominator degrees of freedom :      52

Processing data for set 3 of imputed variables:

Number of observations read      : 18825      Weighted count :177180670
Denominator degrees of freedom :      52

Processing data for set 4 of imputed variables:

Number of observations read      : 18825      Weighted count :177180670
Denominator degrees of freedom :      52

Processing data for set 5 of imputed variables:

Number of observations read      : 18825      Weighted count :177180670
Denominator degrees of freedom :      52
```

A separate summary of file counts is provided for each imputation (*Exhibit 2*). There are 18,825 observations on each imputed dataset, with 52 denominator degrees of freedom.

Exhibit 3. Frequencies for CLASS Variable POVERTY1

```

Frequencies and Values for CLASS Variables
Results for Summary Over All Imputations
-----
POVERTY1           Frequency           Value
-----
Ordered
  Position:
    1           4446.800      1=At or Below Poverty
Ordered
  Position:
    2           14378.200     2=Above Poverty
-----

```

Exhibit 4. RATIO Results: Estimates Within Poverty Status

```

Variance Estimation Method: BRR Using Multiply Imputed Data

MEAN WEIGHT AMONG ADULTS WHO INDICATED THEIR HEALTH IS 'FAIR' OR 'POOR'
BY POVERTY STATUS

Results for Summary Over All Imputations
by: Variable, POVERTY1.
-----
Variable                                     Lower   Upper
  POVERTY1                                     95%    95%
                                     Sample  Weighted  Ratio
                                     Size    Size      Est.      SE
-----
WEIGHT1/HEALTH1
  Total           18825   177180670  167.67   1.16   165.34   170.01
  1=At or Below Poverty   4447   23269645  163.39   1.97   159.43   167.35
  2=Above Poverty       14378  153911025  169.34   1.22   166.89   171.79
-----
NHANES-III MULTIPLY IMPUTED DATA, ADULTS (20+)

```

Exhibit 4 displays the overall ratio estimates and associated standard errors and 95% confidence limits. This page shows that the average weight among the people with fair/poor health at or below poverty is 163.39 pounds (95% confidence limits of 159-167 lbs), and the average weight among people with fair/poor health in the above poverty group is 169.34 pounds (95% confidence limits of 167-172 lbs).

NOTE: The BY_MI option on the PRINT statement would have produced estimates for each imputation as well as overall.

In the next call to RATIO (*Exhibit 5*), we estimate the difference in ratios between adults at or below poverty vs. those above poverty.

Exhibit 5. SAS-Callable SUDAAN Code: Second Call to RATIO

```
PROC RATIO DATA=descriptT FILETYPE=sas DESIGN=BRR NOMARG;
  WEIGHT WTPFQX6;
  REPWGT WTPQRP1-WTPQRP52 / ADJFAY=2.0408;

  MI_VAR POVERTY1 POVERTY2 POVERTY3 POVERTY4 POVERTY5;
  MI_VAR WEIGHT1 WEIGHT2 WEIGHT3 WEIGHT4 WEIGHT5;
  MI_VAR HEALTH1 HEALTH2 HEALTH3 HEALTH4 HEALTH5;

  CLASS POVERTY1;
  NUMER WEIGHT1;
  DENOM HEALTH1;
  CONTRAST POVERTY1=(1 -1) / name="Below vs. Above Poverty";

  SETENV LABWIDTH=30 colwidth=6 decwidth=2;
  PRINT RHAT="Difference" SERHAT="SE" T_RHAT="T-Stat" P_RHAT="P-value" /
  STYLE=NCHS rhatfmt=f10.2 serhatfmt=f6.2 p_rhatfmt=f7.4;
  RTITLE "MEAN WEIGHT AMONG ADULTS WHO INDICATED THEIR HEALTH IS 'FAIR' OR 'POOR'"
  "Comparison of Adults Across Poverty Status";
  RFOOTNOTE "NHANES-III MULTIPLY IMPUTED DATA, ADULTS (20+)";
```

Exhibit 6. First Page of SUDAAN Output (SAS *.lst file)

```

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  WTPQRP17 WTPQRP18 WTPQRP19 WTPQRP20 WTPQRP21 WTPQRP22 WTPQRP23 WTPQRP24
  WTPQRP25 WTPQRP26 WTPQRP27 WTPQRP28 WTPQRP29 WTPQRP30 WTPQRP31 WTPQRP32
  WTPQRP33 WTPQRP34 WTPQRP35 WTPQRP36 WTPQRP37 WTPQRP38 WTPQRP39 WTPQRP40
  WTPQRP41 WTPQRP42 WTPQRP43 WTPQRP44 WTPQRP45 WTPQRP46 WTPQRP47 WTPQRP48
  WTPQRP49 WTPQRP50 WTPQRP51 WTPQRP52
Multiplier Associated with Replicate Weights: 2.0408

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Denominator degrees of freedom :      52

Processing data for set 3 of imputed variables:

Number of observations read      : 18825      Weighted count :177180670
Denominator degrees of freedom :      52

Processing data for set 4 of imputed variables:

Number of observations read      : 18825      Weighted count :177180670
Denominator degrees of freedom :      52

Processing data for set 5 of imputed variables:

Number of observations read      : 18825      Weighted count :177180670
Denominator degrees of freedom :      52

```

Exhibit 7. Frequencies for CLASS Variable POVERTY1

```

Frequencies and Values for CLASS Variables
Results for Summary Over All Imputations
-----
POVERTY1           Frequency      Value
-----
Ordered
  Position:
  1                4446.800        1
Ordered
  Position:
  2                14378.200       2
-----

```

Exhibit 8. RATIO Results: CONTRAST Across Poverty Status

Variance Estimation Method: BRR Using Multiply Imputed Data

MEAN WEIGHT AMONG ADULTS WHO INDICATED THEIR HEALTH IS 'FAIR' OR 'POOR'
Comparison of Adults Across Poverty Status

Results for Summary Over All Imputations

by: Variable, SUDAAN Reserved Variable One, Contrast.

for: Variable = WEIGHT1/HEALTH1.

SUDAAN Reserved Variable One					
Contrast	Difference	SE	T-Stat	P-value	

1					
Below vs. Above Poverty	-5.95	2.01	-2.96	0.0047	

NHANES-III MULTIPLY IMPUTED DATA, ADULTS (20+)

The overall contrast is displayed in *Exhibit 8*. The weighted mean body weight among respondents who consider their health to be 'fair' or 'poor' is significantly smaller (by almost 6 pounds) in adults at or below the poverty line than those above poverty.