SAS Analysis Examples Replication C6

* SAS Analysis Examples Replication for ASDA 2nd Edition
* Berglund April 2017
* Chapter 6

libname d "P:\ASDA 2\Data sets\nhanes 2011_2012";
ods listing;
ods graphics off;
options nodate nonumber ls=125 ps=68;
ods rtf style=minimal bodytitle;

data c6_nhanes;
set d.nhanes1112_sub_8aug2016;
run;
title "Example 6.1: Estimating the Proportion of the U.S. Adult Population with an Irregular Heart Beat. ";
* wald confidence limit is default;
proc surveyfreq data=c6_nhanes;
strata sdmvstra; cluster sdmvpsu; weight wtmec2yr;
tables age18p*irregular / deff row cl;
run;
* logit confidence limit;
proc surveyfreq data=c6_nhanes;
strata sdmvstra; cluster sdmvpsu; weight wtmec2yr;
tables age18p*irregular / deff row cl(logit);
run;
* means for proportion of 0/1 variable;
proc surveymeans data=c6_nhanes;
strata sdmvstra; cluster sdmvpsu; weight wtmec2yr;
domain age18p;
var irregular;
run;
title "Example 6.2: Estimating the Proportion of U.S. Adults by Race and Ethnicity using NHANES data. ";
proc surveyfreq data=c6_nhanes;
strata sdmvstra; cluster sdmvpsu; weight wtmec2yr;
tables age18p*ridreth1 / nowt nocellpercent row(deff cl);
run;
;
proc surveyfreq data=c6_nhanes;
strata sdmvstra; cluster sdmvpsu; weight wtmec2yr;
tables age18p*bp_cat / nowt nocellpercent row(deff cl);
run;
libname russia "P:\ASDA 2\Data sets\ESS6 Russia";
data c6_russia;
set russia.ess6_russia_20aug2016;
run;
title "Example 6.4: A Goodness of Fit Test for Proportions of Russians age 15+ by Marital Status."
;
proc surveyfreq data=c6_russia;
strata stratify; cluster psu; weight pspwght;
tables marcat / row lrchisq(secondorder) testp=(.5 .25 .25);
run;
title "Example 6.5: Pie Charts and Vertical Bar Charts of the Estimated Proportions of Russians age 15+ by Marital Status."
;
* Note PROC SGPLOT does not support weighted plots or pie charts so here we use a vertical bar with weight example from PROC FREQ instead;
ods graphics on;
proc freq data=c6_russia;
tables marcat / plots=freqplot (scale=percent);
weight pspwght;
run;
ods graphics off;
libname ncsr "P:\ASDA 2\Data sets\ncsr";
data c6_ncsr;
set ncsr.ncsr_sub_13nov2015;
run;
title "Example 6.6: Estimation of Total and Row Proportions for the Crosstabulation of Gender and Lifetime Major Depression Status (Source: NCS-R)."
;
proc surveyfreq data=c6_ncsr;
strata sestrat; cluster seclustr; weight ncsrwght;
tables sex*mde / deff chiq (secondorder);
run;
proc surveyfreq data=c6_ncsr;
strata sestrat; cluster seclustr; weight ncsrwght;
tables sex*mde / row(deff cl) chiq(secondorder);
run;
title " Example 6.7: Comparing the Proportions of U.S. Adult Men and Women with Lifetime Major Depression.";
* linear contrast of male v. female mde done with LSMEANS / DIFF option in PROC SURVEYREG;
proc surveyreg data=c6_ncsr;
strata sestrat; cluster seclustr; weight ncsrwtsh;
class sex;
model mde = sex / solution;
lsmeans sex /diff;
run;

/* Example 6.8: Testing the Independence of MDE and Gender in U.S. Adults Using the NCS-R data. */
proc surveyfreq data=c6_ncsr;
strata sestrat; cluster seclustr; weight ncsrwtsh;
tables sex*mde / chisq(secondorder);
run;
/* svy: tab sex mde, se ci deff;*/
data c6_ncsr1;
set c6_ncsr;
* create indicator for subpopulation of interest;
  age18_28=0; if 18<=age<=28 then age18_28=1;
run;

/* Example 6.9: Testing the Independence of Alcohol Dependence and Education Level in Young Adults (Ages 18-28) using the NCS-R data. */
proc surveyfreq data=c6_ncsr1;
strata sestrat; cluster seclustr; weight ncsrwtlg;
tables age18_28*ed4cat*ald / nocellpercent row chisq chisq(secondorder);
run;

/* Example 6.10: Simple Logistic Regression to Estimate the NCS-R Male/Female Odds Ratio for Lifetime Major Depressive Episode. */
proc surveylogistic data=c6_ncsr;
strata sestrat; cluster seclustr; weight ncsrwtsh;
model mde(event='1') = sexm;
run;
/* Example 6.11: Using the NCS-R Data to Estimate and Test the Association between Gender and Depression in the U.S. Adult Population when controlling for Age.*/
  * NOTE: this is done using SUDAAN in book as SAS does not provide a SURVEY procedure for this test
*/
/* Example 6.12: A Simple Log-linear Model to Test the Association between Lifetime Major Depression Episode and Sex.*/
  * NOTE: done in IVEware and R in book since SAS does not offer a SURVEY procedure for Log-Linear models;*/
ods rtf close;

The SURVEYFREQ Procedure

**Data Summary**

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**Table of age18p by irregular**

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<th>Design Effect</th>
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*Frequency Missing = 311*

**Table of age18p by irregular**

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*Frequency Missing = 311*

The SURVEYFREQ Procedure

Data Summary

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Table of age18p by irregular

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Logit confidence limits are computed for percents.

Frequency Missing = 311

Table of age18p by irregular

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<th>Row Percent</th>
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<th>95% Confidence Limits for Row Percent</th>
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Logit confidence limits are computed for percents.

Frequency Missing = 311

The SURVEYMEANS Procedure

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The SURVEYMEANS Procedure

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Example 6.2: Estimating the Proportion of U.S. Adults by Race and Ethnicity using NHANES data.

The SURVEYFREQ Procedure

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The SURVEYFREQ Procedure

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Table of age18p by bp_cat

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Frequency Missing = 2283
Example 6.4: A Goodness of Fit Test for Proportions of Russians age 15+ by Marital Status.

The SURVEYFREQ Procedure

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<p>| Marital Status: 1=Currently Married 2=Previously Married 3=Never Married |
|------------------|-----------------|</p>
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<th>Test Percent</th>
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Frequency Missing = 40

Rao-Scott Likelihood Ratio Test

| Likelihood Ratio Chi-Square | 6.5381 |
| Design Correction           | 1.9332 |
| First-Order Chi-Square      | 3.3821 |
| Second-Order Chi-Square     | 3.2472 |
| DF                           | 1.92   |
| Pr > ChiSq                   | 0.1856 |
| F Value                      | 1.6910 |
| Num DF                       | 1.92   |
| Den DF                       | 337.97 |
| Pr > F                       | 0.1871 |

Sample Size = 2444
Example 6.5: Pie Charts and Vertical Bar Charts of the Estimated Proportions of Russians age 15+ by Marital Status.

The FREQ Procedure

| Marital Status: 1=Currently Married 2=Previously Married 3=Never Married |
|---|---|---|---|
| marcat | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| 1 | 1235.957 | 50.39 | 1235.957 | 50.39 |
| 2 | 564.3472 | 23.01 | 1800.304 | 73.39 |
| 3 | 652.6725 | 26.61 | 2452.977 | 100.00 |
| Frequency Missing | 31.023132863 |  |  | |

Distribution of marcat

Marital Status: 1=Currently Married 2=Previously Married 3=Never Married
Example 6.6: Estimation of Total and Row Proportions for the Crosstabulation of Gender and Lifetime Major Depression Status (Source: NCS-R).

The SURVEYFREQ Procedure

Data Summary

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<td>Sum of Weights</td>
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Table of SEX by mde

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Rao-Scott Chi-Square Test

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<td>Second-Order Chi-Square</td>
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Sample Size = 9282
Example 6.6: Estimation of Total and Row Proportions for the Crosstabulation of Gender and Lifetime Major Depression Status (Source: NCS-R).

The SURVEYFREQ Procedure

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Table of SEX by mde

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Table of SEX by mde

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Rao-Scott Chi-Square Test

<table>
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<tr>
<th>Test</th>
<th>Value</th>
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<tr>
<td>Pearson Chi-Square</td>
<td>92.1499</td>
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<td><strong>Sample Size</strong></td>
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Example 6.7: Comparing the Proportions of U.S. Adult Men and Women with Lifetime Major Depression.

The SURVEYREG Procedure

Regression Analysis for Dependent Variable mde

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The denominator degrees of freedom for the F tests is 42.

The degrees of freedom for the t tests is 42.
Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.
### SEX Least Squares Means

| Sex     | Estimate | Standard Error | DF  | t Value | Pr > |t| |
|---------|----------|----------------|-----|---------|-------|---|
| 1       | 0.1508   | 0.007748       | 42  | 19.46   | <.0001|
| 2       | 0.2293   | 0.005648       | 42  | 40.60   | <.0001|

### Differences of SEX Least Squares Means

| Sex 1-Male | Sex 1-Male | Estimate | Standard Error | DF  | t Value | Pr > |t| |
|-----------|-----------|----------|----------------|-----|---------|-------|---|
| 1         | 2         | -0.07851 | 0.009552       | 42  | -8.22   | <.0001|
Example 6.8: Testing the Independence of MDE and Gender in U.S. Adults Using the NCS-R data.

The SURVEYFREQ Procedure

Data Summary

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<tr>
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<tbody>
<tr>
<td>Number of Strata</td>
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Table of SEX by mde

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<th>Weighted Frequency</th>
<th>Std Err of Wgt Freq</th>
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Rao-Scott Chi-Square Test

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Sample Size = 9282
Example 6.9: Testing the Independence of Alcohol Dependence and Education Level in Young Adults (Ages 18-28) using the NCS-R data.

The SURVEYFREQ Procedure

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Rao-Scott Chi-Square Test

| Pearson Chi-Square | 13.1918 |
| Design Correction  | 0.8128  |
| First-Order Chi-Square | 16.2305 |
| Second-Order Chi-Square | 12.1218 |
| DF                  | 2.24    |
| Pr > ChiSq          | 0.0031  |
| F Value             | 5.4102  |
| Num DF              | 2.24    |
Rao-Scott Chi-Square Test

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<th>Den DF</th>
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Sample Size = 5692

Table of ED4CAT by ald
Controlling for age18_28=1

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<th>Weighted Frequency</th>
<th>Std Err of Wgt Freq</th>
<th>Row Percent</th>
<th>Std Err of Row Percent</th>
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Rao-Scott Chi-Square Test

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<th>Pearson Chi-Square</th>
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Sample Size = 5692
Example 6.10: Simple Logistic Regression to Estimate the NCS-R Male/Female Odds Ratio for Lifetime Major Depressive Episode.

The SURVEYLOGISTIC Procedure

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<tr>
<th>Model Information</th>
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<tbody>
<tr>
<td><strong>Data Set</strong></td>
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<tr>
<td><strong>Response Variable</strong></td>
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<td><strong>Number of Response Levels</strong></td>
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<td><strong>Stratum Variable</strong></td>
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<tr>
<td><strong>Number of Strata</strong></td>
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<tr>
<td><strong>Cluster Variable</strong></td>
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<td><strong>Weight Variable</strong></td>
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<tr>
<td><strong>Model</strong></td>
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<tr>
<td><strong>Optimization Technique</strong></td>
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<tr>
<td><strong>Variance Adjustment</strong></td>
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<th>Variance Estimation</th>
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<td><strong>Method</strong></td>
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<tr>
<td><strong>Variance Adjustment</strong></td>
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<th>Response Profile</th>
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<td><strong>Ordered Value</strong></td>
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Probability modeled is mde=1.

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<td>Convergence criterion (GCONV=1E-8) satisfied.</td>
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<table>
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<tr>
<th>Model Fit Statistics</th>
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<tr>
<td>SC</td>
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<td>(\text{-2 Log L})</td>
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### Testing Global Null Hypothesis: BETA=0

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NOTE: First-order Rao-Scott design correction 1.2124 applied to the likelihood ratio test.

### Analysis of Maximum Likelihood Estimates

| Parameter | Estimate | Standard Error | t Value | Pr > |t| |
|-----------|----------|----------------|---------|------|---|
| Intercept | -1.2122  | 0.0320         | -37.93  | <.0001 |
| sexm      | -0.5160  | 0.0682         | -7.57   | <.0001 |

NOTE: The degrees of freedom for the t tests is 42.

### Odds Ratio Estimates

<table>
<thead>
<tr>
<th>Effect</th>
<th>Point Estimate</th>
<th>95% Confidence Limits</th>
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<td>0.520 0.685</td>
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NOTE: The degrees of freedom in computing the confidence limits is 42.

### Association of Predicted Probabilities and Observed Responses

| Percent Concordant | 31.3 | Somers' D | 0.135 |
| Percent Discordant | 17.8 | Gamma     | 0.275 |
| Percent Tied      | 50.9 | Tau-a     | 0.043 |
| Pairs             | 13631537 | c | 0.568 |