WTADJUST Example #1

SUDAAN Statements and Results Illustrated

- MODEL
- WTMIN
- WTMAX
- LOWERBD
- UPPERBD

Input Data Set(s):

Example

Consider a cross-over clinical trial with multivariate failure time data. Compute the Kaplan-Meier survival probability curve corresponding to time to onset of angina pectoris, at each level of a treatment variable.

Solution

This first example will illustrate the steps one would follow to compute a nonresponse and post-stratification adjustment as outlined in ***Exhibit 1***. This example illustrates some of the issues one will likely encounter, and appropriate steps that can be taken to address these issues. The data used in this example was simply made up for illustration purposes. The data is provided in ***Exhibit -2***. The output in this example was generated using the SAS-callable version of SUDAAN.

Exhibit 1.Data Used in Example 25-1

***Note**: Columns in this table correspond to the following variables:*
RECID STRATA PSU WEIGHT REGION RACE GENDER RESP

1	1	1	547.367	3	1	1	0
2	1	1	641.627	1	3	2	1
3	1	1	334.425	2	1	1	1
4	1	1	576.866	3	3	1	1
5	1	1	323.511	3	1	1	1
6	1	2	721.484	1	2	2	0
7	1	2	907.065	1	1	2	0
8	1	2	311.857	4	1	1	1
9	1	2	542.047	2	1	1	1
10	1	2	124.058	3	2	2	1
11	1	3	378.278	1	2	2	0
12	1	3	615.482	4	1	2	1
13	1	3	826.421	2	1	1	0
14	1	3	158.303	2	2	1	0
15	1	3	919.214	4	1	2	1
16	1	4	430.470	3	2	1	1
17	1	4	530.435	3	1	1	0
18	1	4	948.933	1	2	1	1
19	1	4	624.669	3	3	1	1
20	1	4	40.462	2	3	1	1
21	1	5	596.253	3	2	2	1
22	1	5	710.354	4	2	1	1
23	1	5	736.125	2	1	1	1
24	1	5	790.170	2	1	1	0
25	1	5	195.365	2	2	1	1
26	1	6	968.293	4	1	1	1
27	1	6	474.761	3	2	1	1
28	1	6	123.314	1	2	2	1
29	1	6	440.795	2	2	1	1
30	1	6	652.588	2	2	1	0
31	1	7	530.553	2	3	1	1
32	1	7	38.363	4	2	1	1
33	1	7	644.548	1	2	1	1
34	1	7	688.580	2	2	1	1
35	1	7	216.099	2	3	1	1
36	1	8	247.271	4	2	1	0
37	1	8	285.854	1	3	1	1
38	1	8	427.089	3	3	2	1
39	1	8	685.203	1	2	1	1
40	1	8	562.860	2	1	1	0
41	1	9	321.406	2	2	1	0
42	1	9	666.614	4	3	1	1

Exhibit 1. Data Used in Example 25-1-cont.

43	1	9	847.272	3	3	1	1
44	1	9	54.650	3	2	1	1
45	1	9	322.489	3	2	2	1
46	1	10	61.224	3	3	1	1
47	1	10	56.668	2	3	1	1
48	1	10	156.439	2	1	2	1
49	1	10	161.508	3	1	2	1
50	1	10	706.373	3	1	1	1
51	2	1	533.774	3	1	2	1
52	2	1	994.048	4	1	1	1
53	2	1	318.337	4	3	1	1
54	2	1	196.141	2	3	2	1
55	2	1	189.621	1	1	1	1
56	2	2	195.760	2	2	1	1
57	2	2	284.219	1	1	2	1
58	2	2	541.775	2	3	1	1
59	2	2	546.433	1	2	1	1
60	2	2	625.903	3	1	2	1
61	2	3	45.891	1	3	1	1
62	2	3	823.273	4	2	1	1
63	2	3	408.580	4	3	2	0
64	2	3	679.872	4	1	1	1
65	2	3	464.190	3	1	1	1
66	2	4	137.276	2	1	1	1
67	2	4	246.551	4	1	1	0
68	2	4	882.629	1	3	2	0
69	2	4	975.141	4	3	1	1
70	2	4	583.528	2	1	2	0
71	2	5	173.885	2	1	2	1
72	2	5	181.193	3	1	2	1
73	2	5	451.681	2	1	1	1
74	2	5	870.904	3	3	1	1
75	2	5	687.876	4	2	1	1
76	2	6	227.181	2	1	2	0
77	2	6	174.842	2	1	1	1
78	2	6	708.690	3	3	1	1
79	2	6	344.427	4	2	1	1
80	2	6	905.900	1	3	1	0
81	2	7	819.350	2	1	2	1
82	2	7	891.378	1	1	2	1
83	2	7	502.499	1	3	1	0
84	2	7	12.966	2	1	1	1
85	2	7	741.554	2	2	2	1
86	2	8	132.689	4	2	2	1
87	2	8	814.070	3	2	1	1
88	2	8	894.039	2	1	2	1
89	2	8	612.167	1	3	1	1
90	2	8	852.543	3	1	2	1
91	2	9	367.410	3	2	2	1
92	2	9	600.245	3	1	1	0
93	2	9	17.427	2	1	2	1
94	2	9	735.304	2	2	1	0
95	2	9	964.505	4	2	1	1
96	2	10	600.618	2	3	2	0
97	2	10	53.424	3	3	1	1
98	2	10	624.420	3	1	2	1
99	2	10	209.215	1	1	2	1
100	2	10	306.595	4	1	1	1

Exhibit 2. Post-Stratification Totals for Example 25-1

Independent Variables and Effects		Post-Stratification Controls
Intercept		1,00,000
Census Region	Northeast	21,000
	South	28,000
	Midwest	27,000
	West	24,000
Race	White	42,000
	Black	30,500
	Other	27,500
Gender	Male	65,000
	Female	35,000
Race, Gender	White, Male	23,000
	White, Female	19,000
	Black, Male	23,000
	Black, Female	7,500
	Other, Male	19,000
	Other, Female	8,500

To begin, we simply use a DATA statement in SAS to read the data into a working dataset (***Exhibit 3***). Attributes are defined for the variables that will be used in the modeling process. We assume that this data was collected from a study in which the primary sampling units (PSUs) were randomly selected, with replacement, within the stratum defined by the variable STRATA. We also assume that the WEIGHT on this file represents the inverse of the probability of selecting each person.

After the data are read into a working dataset called ONE, it is sorted by STRATA and PSU for efficiency reasons. Recall that SUDAAN requires the dataset to be sorted by the NEST variables, unless the NOTSORTED option is specified on the PROC statement.

Exhibit 3. SAS Code

```
proc format;
value race 1="White"
           2="Black"
           3="Other";

value gend 1="Male"
           2="Female";

value reg  1="Northeast"
           2="South"
           3="Midwest"
           4="West";

value resp 1="Resp"
           0="Nonresp";
run;


Data One;
Input recid strata psu weight region race gender resp;
Attrib region label="Census Region"            format=reg.;
Attrib race   label="Race"                     format=race.;
Attrib gender label="Gender"                   format=gend.;
Attrib resp   label="0/1 Respondent Indicator" format=resp.;
CARDS;
  1 1  1  547.367 3 1 1 0
  2 1  1  641.627 1 3 2 1
  3 1  1  334.425 2 1 1 1
  4 1  1  576.866 3 3 1 1
  5 1  1  323.511 3 1 1 1
.
.
.
 95 2  9  964.505 4 2 1 1
 96 2 10  600.618 2 3 2 0
 97 2 10   53.424 3 3 1 1
 98 2 10  624.420 3 1 2 1
 99 2 10  209.215 1 1 2 1
100 2 10  306.595 4 1 1 1
;
run;

Proc Sort Data=One;
By strata psu;
Run;
```

Before a nonresponse adjustment is requested, we first use SUDAAN's CROSSTAB procedure to examine response rates and to compute weighted totals (***Exhibit 4***). These totals will be needed for verification purposes, after the WTADJUST procedure is implemented. In general, it is always a good idea to check weight sums before and after each weight adjustment is applied. (This is Step 1 in the recommended steps of ***Exhibit 1***.)

Exhibit 4. CROSSTAB Code

```
PROC CROSSTAB DATA=one DESIGN=WR;
WEIGHT   weight;
NEST     strata psu;
CLASS    region race gender resp;
TABLES   resp*(region race gender) resp*race*gender;
SETENV   COLWIDTH=15;
PRINT    NSUM WSUM COLPER /
         FILETYPE=RTF FILENAME="Example_12_1_OUT1.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10 STYLE=NCHS
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
RTITLE "Example 15-1";
run;
```

In this CROSSTAB procedure, we request that the output be sent to a file called Example_12_1_OUT1.rtf. This output will be in rich text format.

An excerpt from the SAS .LST file is provided in ***Exhibit 5***, below.

Exhibit 5. Excerpt from .LST file

```
                              S U D A A N
           Software for the Statistical Analysis of Correlated Data
          Copyright      Research Triangle Institute      August 2008
                                 Release 10.0


DESIGN SUMMARY: Variances will be computed using the Taylor Linearization
Method, Assuming a With Replacement (WR) Design
    Sample Weight: WEIGHT
    Stratification Variables(s): STRATA
    Primary Sampling Unit: PSU


Number of observations read    :    100    Weighted count :    49024
Denominator degrees of freedom :     18
```

And the RTF file Example_12_1_OUT1.rtf file contains the following tables (***Exhibit 6***):

Exhibit 6. Example_12_1_OUT1.rtf

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Time: 09:49:51 Table: 1

Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Census Region.

0/1 Respondent Indicator	Census Region	Sample Size	Weighted Size	Col Percent
Total	Total	100	49023.99	100.00
	Northeast	19	10406.26	100.00
	South	33	13752.63	100.00
	Midwest	28	13505.76	100.00
	West	20	11359.34	100.00
Nonresp	Total	22	12336.68	25.16
	Northeast	6	4297.86	41.30
	South	10	5458.38	39.69
	Midwest	3	1678.05	12.42
	West	3	902.40	7.94
Resp	Total	78	36687.31	74.84
	Northeast	13	6108.40	58.70
	South	23	8294.25	60.31
	Midwest	25	11827.71	87.58
	West	17	10456.94	92.06

Exhibit 6. Example_12_1_OUT1.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	100	49023.99	100.00
	White	42	21115.53	100.00
	Black	32	15310.77	100.00
	Other	26	12597.69	100.00
Nonresp	Total	22	12336.68	25.16
	White	10	5821.82	27.57
	Black	7	3214.63	21.00
	Other	5	3300.23	26.20
Resp	Total	78	36687.31	74.84
	White	32	15293.71	72.43
	Black	25	12096.13	79.00
	Other	21	9297.47	73.80

Exhibit 6. Example_12_1_OUT1.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Gender.

0/1 Respondent Indicator	Gender	Sample Size	Weighted Size	Col Percent
Total	Total	100	49023.99	100.00
	Male	66	32682.02	100.00
	Female	34	16341.98	100.00
Nonresp	Total	22	12336.68	25.16
	Male	14	7627.32	23.34
	Female	8	4709.36	28.82
Resp	Total	78	36687.31	74.84
	Male	52	25054.70	76.66
	Female	26	11632.61	71.18

Exhibit 6. Example_12_1_OUT1.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race, Gender.

for: 0/1 Respondent Indicator = Total.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	100	49023.99	100.00
	Male	66	32682.02	100.00
	Female	34	16341.98	100.00
White	Total	42	21115.53	43.07
	Male	23	11437.77	35.00
	Female	19	9677.76	59.22
Black	Total	32	15310.77	31.23
	Male	23	11803.24	36.12
	Female	9	3507.53	21.46
Other	Total	26	12597.69	25.70
	Male	20	9441.01	28.89
	Female	6	3156.68	19.32

Exhibit 6. Example_12_1_OUT1.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race, Gender.

for: 0/1 Respondent Indicator = Nonresp.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	22	12336.68	100.00
	Male	14	7627.32	100.00
	Female	8	4709.36	100.00
White	Total	10	5821.82	47.19
	Male	7	4104.05	53.81
	Female	3	1717.77	36.48
Black	Total	7	3214.63	26.06
	Male	5	2114.87	27.73
	Female	2	1099.76	23.35
Other	Total	5	3300.23	26.75
	Male	2	1408.40	18.47
	Female	3	1891.83	40.17

Exhibit 6. Example_12_1_OUT1.rtf-cont.

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Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race, Gender.

for: 0/1 Respondent Indicator = Resp.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	78	36687.31	100.00
	Male	52	25054.70	100.00
	Female	26	11632.61	100.00
White	Total	32	15293.71	41.69
	Male	16	7333.72	29.27
	Female	16	7959.99	68.43
Black	Total	25	12096.13	32.97
	Male	18	9688.37	38.67
	Female	7	2407.77	20.70
Other	Total	21	9297.47	25.34
	Male	18	8032.61	32.06
	Female	3	1264.86	10.87

We seek to create nonresponse adjustments that will force the reweighted respondent totals to equal the weighted sample totals, across the levels of REGION, RACE, GENDER and the interaction of RACE with GENDER. These weighted sample totals are displayed in ***Exhibit 6***, above, under the "Weighted Size' column, along the rows corresponding to 0/1 Respondent Indicator = Total. Note that the column percents in the first three pages of the output in ***Exhibit 6***, along the "Resp" rows, represent the weighted response rates. For example, the weighted response rate in the Northeast Census Region is 58.70% (see page 1 of ***Exhibit 6***).

The following WTADJUST procedure was initially run with this data (Step 2 in ***Exhibit 1***). Similar to the previous run, all output was requested in rich text format (RTF). In this case, the output was sent to a file called Example_12_1_OUT2.rtf.

Exhibit 7. WTADJUST Procedure

```
PROC WTADJUST DATA=one DESIGN=WR ADJUST=NONRESPONSE;
WEIGHT   weight;
NEST     strata psu;
CLASS    region race gender;
MODEL    resp=region race gender race*gender;
SETENV   COLWIDTH=15;
PRINT    BETA SEBETA P_BETA / BETAFMT=F10.3 SEBETAFMT=F10.3
         FILETYPE=RTF FILENAME="Example_12_1_OUT2.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    UNWTDRR WTDRR /
         FILETYPE=RTF FILENAME="Example_12_1_OUT2.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    INITWTMN INITWTMX NTRIMMED /
         FILETYPE=RTF FILENAME="Example_12_1_OUT2.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    MARGADJ ADJMIN ADJMAX /
         FILETYPE=RTF FILENAME="Example_12_1_OUT2.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    UWEORIG UWETRIM UWEFINAL /
         FILETYPE=RTF FILENAME="Example_12_1_OUT2.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    / TESTS=DEFAULT
         FILETYPE=RTF FILENAME="Example_12_1_OUT2.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
RTITLE "Example 15-1";
run;
```

Notice in ***Exhibit 7*** that there are six PRINT statements all pointing to the same file (Example_12_1_OUT2.RTF). This is permissible with both TEXT and RTF style output. When this occurs within the same procedure call, SUDAAN will append the tables corresponding to each print statement within the file. Note that if Example_12_1_OUT2.rtf was specified in a second SUDAAN procedure within the same job, then the output generated from the first procedure would be overwritten. SUDAAN will only append tables to a file when the FILENAME appears on multiple PRINT statements within the same PROC.

Exhibit 8 shows the output file, Example_12_1_OUT2.rtf.

Exhibit 8. Example_12_1_OUT2.RTF

Date: 05-29-2008 SUDAAN Page: 1
Time: 09:49:52 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Beta Coeff.	SE Beta	P-value T-Test B=0
Intercept		0.395	0.727	0.5937
Census Region	Northeast	0.613	0.333	0.0820
	South	0.530	0.243	0.0428
	Midwest	0.074	0.204	0.7223
	West	0.000	0.000	.
Race	White	-0.818	0.680	0.2444
	Black	-0.538	0.789	0.5042
	Other	0.000	0.000	.
Gender	Male	-0.786	0.732	0.2968
	Female	0.000	0.000	.
Race, Gender	White, Male	1.189	0.749	0.1301
	White, Female	0.000	0.000	.
	Black, Male	0.500	0.859	0.5674
	Black, Female	0.000	0.000	.
	Other, Male	0.000	0.000	.
	Other, Female	0.000	0.000	.

Exhibit 8. Example_12_1_OUT2.RTF-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Unweighted Response Rate (Percent)	Weighted Response Rate (Percent)
Intercept		78.00	74.84
Census Region	Northeast	68.42	58.70
	South	69.70	60.31
	Midwest	89.29	87.58
	West	85.00	92.06
Race	White	76.19	72.43
	Black	78.13	79.00
	Other	80.77	73.80
Gender	Male	78.79	76.66
	Female	76.47	71.18
Race, Gender	White, Male	69.57	64.12
	White, Female	84.21	82.25
	Black, Male	78.26	82.08
	Black, Female	77.78	68.65
	Other, Male	90.00	85.08
	Other, Female	50.00	40.07

Exhibit 8. Example_12_1_OUT2.RTF-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Minimum Initial Weight Among Respondents	Maximum Initial Weight Among Respondents	Number of Trimmed Weights
Intercept		12.97	994.05	0
Census Region	Northeast	45.89	948.93	0
	South	12.97	894.04	0
	Midwest	53.42	870.90	0
	West	38.36	994.05	0
Race	White	12.97	994.05	0
	Black	38.36	964.51	0
	Other	40.46	975.14	0
Gender	Male	12.97	994.05	0
	Female	17.43	919.21	0
Race, Gender	White, Male	12.97	994.05	0
	White, Female	17.43	919.21	0
	Black, Male	38.36	964.51	0
	Black, Female	123.31	741.55	0
	Other, Male	40.46	975.14	0
	Other, Female	196.14	641.63	0

Exhibit 8. Example_12_1_OUT2.RTF-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Marginal Weight Adjustment	Minimum Adjustment Factor Among Respondents	Maximum Adjustment Factor Among Respondents
Intercept		1.3363	0.9696	2.8405
Census Region	Northeast	1.7036	1.5338	2.8405
	South	1.6581	1.4416	2.6699
	Midwest	1.1419	1.0247	1.8977
	West	1.0863	0.9696	1.3159
Race	White	1.3807	0.9738	2.0815
	Black	1.2658	0.9696	1.8997
	Other	1.3550	0.9971	2.8405
Gender	Male	1.3044	0.9696	2.0815
	Female	1.4048	0.9738	2.8405
Race, Gender	White, Male	1.5596	1.3159	2.0815
	White, Female	1.2158	0.9738	1.5403
	Black, Male	1.2183	0.9696	1.5338
	Black, Female	1.4568	1.2010	1.8997
	Other, Male	1.1753	0.9971	1.5771
	Other, Female	2.4957	1.8977	2.8405

Exhibit 8. Example_12_1_OUT2.RTF-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Original Unequal Weighting Effect	Trimmed Unequal Weighting Effect	Final Unequal Weighting Effect
Intercept		1.3840	1.3840	1.4121
Census Region	Northeast	1.3673	1.3673	1.4113
	South	1.5669	1.5669	1.5503
	Midwest	1.2953	1.2953	1.2776
	West	1.2473	1.2473	1.2758
Race	White	1.3895	1.3895	1.3855
	Black	1.3334	1.3334	1.3801
	Other	1.4388	1.4388	1.4906
Gender	Male	1.3698	1.3698	1.3603
	Female	1.4115	1.4115	1.5158
Race, Gender	White, Male	1.3790	1.3790	1.3213
	White, Female	1.3941	1.3941	1.4522
	Black, Male	1.2678	1.2678	1.3082
	Black, Female	1.4400	1.4400	1.6022
	Other, Male	1.4757	1.4757	1.4161
	Other, Female	1.1862	1.1862	1.2803

Exhibit 8. Example_12_1_OUT2.RTF-cont.

Date: 05-29-2008 SUDAAN Page: 6
Time: 09:49:52 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Contrast.

Contrast	Degrees of Freedom	Wald F	P-value Wald F
OVERALL MODEL	9	7.20	0.0002
MODEL MINUS INTERCEPT	8	1.99	0.1074
INTERCEPT	.	.	.
REGION	3	3.02	0.0570
RACE	.	.	.
GENDER	.	.	.
RACE * GENDER	2	2.54	0.1065

Page 2 of ***Exhibit 8***, above, shows that the weighted response rate varies from 40% (Other, Female) to about 92% (West) across the levels of the categorical variables. Page 5 of ***Exhibit 12-1-8*** shows that the unequal weighting effect is the same (1.3840) both before and after weight trimming. This latter observation is not surprising, since we did not request that the weights be trimmed yet.

Page 6 of ***Exhibit 8*** shows that the race by gender interaction term is not significant in this model. In some applications, one may want to reduce the number of explanatory variables in the model, for example, by removing the nonsignificant covariates. Reducing the number of explanatory variables will tend to reduce the unequal weighting effect, thereby possibly reducing the variance of subsequent estimates generated with the final adjusted weight. In other applications, one may want to force certain variables in the adjustment process, primarily to reduce bias in estimates generated with the final adjusted weight. In this example, we keep the main effects of region, race and gender in the model, as well as the interaction of race and gender, regardless of their statistical significance.

In general, the next step in a weight adjustment process is to establish weight truncation bounds, if desired. Any weight larger than a specified maximum weight, or smaller than a specified minimum weight, will be trimmed or padded to meet the appropriate bound. In this example, we impose a minimum weight threshold of 20 and a maximum weight threshold of 980. There are various ways of establishing appropriate bounds – some of these are discussed in the ***Section 15.3.1*** of the **SUDAAN 10 Language Manual**. In this particular case, these bounds are arbitrary.

The WTADJUST code, including WTMIN and WTMAX, is displayed in ***Exhibit 9***, and the resulting output is displayed in ***Exhibit 10***.

Exhibit 9. WTADJUST Procedure

```
PROC WTADJUST DATA=one DESIGN=WR ADJUST=NONRESPONSE;
WEIGHT   weight;
NEST     strata psu;
IDVAR    recid resp region race gender;
CLASS    region race gender;
WTMIN    20;
WTMAX    980;
MODEL    resp=region race gender race*gender;
SETENV   COLWIDTH=15;
PRINT    INITWTMN INITWTMX NTRIMMED /
         FILETYPE=RTF FILENAME="Example_12_1_OUT3.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    MARGADJ ADJMIN ADJMAX /
         FILETYPE=RTF FILENAME="Example_12_1_OUT3.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    UWEORIG UWETRIM UWEFINAL /
         FILETYPE=RTF FILENAME="Example_12_1_OUT3.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
RTITLE "Example 15-1";
run;
```

Exhibit 10. Example_12_1_OUT3.rtf

Date: 05-29-2008 SUDAAN Page: 1
Time: 09:49:52 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Minimum Initial Weight Among Respondents	Maximum Initial Weight Among Respondents	Number of Trimmed Weights
Intercept		12.97	994.05	3
Census Region	Northeast	45.89	948.93	0
	South	12.97	894.04	2
	Midwest	53.42	870.90	0
	West	38.36	994.05	1
Race	White	12.97	994.05	3
	Black	38.36	964.51	0
	Other	40.46	975.14	0
Gender	Male	12.97	994.05	2
	Female	17.43	919.21	1
Race, Gender	White, Male	12.97	994.05	2
	White, Female	17.43	919.21	1
	Black, Male	38.36	964.51	0
	Black, Female	123.31	741.55	0
	Other, Male	40.46	975.14	0
	Other, Female	196.14	641.63	0

Exhibit 10. Example_12_1_OUT3.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Marginal Weight Adjustment	Minimum Adjustment Factor Among Respondents	Maximum Adjustment Factor Among Respondents
Intercept		1.3364	0.9709	2.8412
Census Region	Northeast	1.7036	1.5335	2.8412
	South	1.6562	1.4393	2.6667
	Midwest	1.1419	1.0244	1.8980
	West	1.0878	0.9709	1.3185
Race	White	1.3811	0.9751	2.0825
	Black	1.2658	0.9709	1.9007
	Other	1.3550	0.9986	2.8412
Gender	Male	1.3048	0.9709	2.0825
	Female	1.4045	0.9751	2.8412
Race, Gender	White, Male	1.5611	1.3185	2.0825
	White, Female	1.2154	0.9751	1.5401
	Black, Male	1.2183	0.9709	1.5335
	Black, Female	1.4568	1.2034	1.9007
	Other, Male	1.1753	0.9986	1.5772
	Other, Female	2.4957	1.8980	2.8412

Exhibit 10. Example_12_1_OUT3.rtf-cont.

Date: 05-29-2008 SUDAAN Page: 3
Time: 09:49:52 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Original Unequal Weighting Effect	Trimmed Unequal Weighting Effect	Final Unequal Weighting Effect
Intercept		1.3840	1.3828	1.4106
Census Region	Northeast	1.3673	1.3673	1.4113
	South	1.5669	1.5634	1.5466
	Midwest	1.2953	1.2953	1.2776
	West	1.2473	1.2464	1.2738
Race	White	1.3895	1.3866	1.3822
	Black	1.3334	1.3334	1.3798
	Other	1.4388	1.4388	1.4909
Gender	Male	1.3698	1.3683	1.3584
	Female	1.4115	1.4109	1.5149
Race, Gender	White, Male	1.3790	1.3734	1.3167
	White, Female	1.3941	1.3932	1.4508
	Black, Male	1.2678	1.2678	1.3081
	Black, Female	1.4400	1.4400	1.6010
	Other, Male	1.4757	1.4757	1.4162
	Other, Female	1.1862	1.1862	1.2808

Notice that page 1 of ***Exhibit 10*** indicates that three weights were trimmed, and page 3 indicates that the overall unequal weighting effect was reduced slightly from 1.3840 to 1.3828.

Next, we turn out attention to setting appropriate bounds on the weight adjustment procedure. Page 2 of ***Exhibit 10*** indicates that the minimum nonresponse adjustment observed over the entire respondent sample is .9709 (see line for Intercept). In general, for nonresponse applications, we would prefer the nonresponse adjustment to be one or greater so that every respondent represents themselves in the final estimate, as well as some portion of the nonrespondents. ***Exhibit 10*** also indicates that the maximum nonresponse adjustment over the entire respondent sample is 2.8412. Again, in general, our objective is to minimize this as much as possible, in order to reduce the unequal weighting effect. Note that in many applications, reducing the upper bound can actually increase the unequal weighting, so monitoring the unequal weighting effect during this process is relatively important.

The Marginal Weight Adjustment in ***Exhibit 10*** provides some guidance on feasible values for the upper and lower bounds on the nonresponse adjustment. Upper and lower bounds can be set for the whole sample, or for subgroups of the sample. If you are interested in establishing one upper and one lower bound that would apply to the entire sample, then the lower bound must be set to something smaller than

the smallest number that appears in this column (1.0878), and the upper bound must be set to something greater than the largest number that appears in this column (2.4957).

Suppose we had ignored the Marginal Weight Adjustment and set the lower bound to 1.00 and the upper bound to 1.80. ***Exhibit 11*** presents the code for this example. ***Exhibit 12*** and ***Exhibit 13*** presents the associated output.

Exhibit 11. WTADJUST Procedure

```
PROC WTADJUST DATA=one DESIGN=WR ADJUST=NONRESPONSE;
WEIGHT   weight;
NEST     strata psu;
IDVAR    recid resp region race gender;
CLASS    region race gender;
WTMIN    20;
WTMAX    980;
LOWERBD  1.00;
UPPERBD  1.80;
MODEL    resp=region race gender race*gender;
SETENV   COLWIDTH=15;
PRINT    BETA SEBETA P_BETA / BETAFMT=F10.3 SEBETAFMT=F10.3
         FILETYPE=RTF FILENAME="Example_12_1_OUT4.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    INITWTMN INITWTMX NTRIMMED /
         FILETYPE=RTF FILENAME="Example_12_1_OUT4.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    MARGADJ ADJMIN ADJMAX /
         FILETYPE=RTF FILENAME="Example_12_1_OUT4.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    UWEORIG UWETRIM UWEFINAL /
         FILETYPE=RTF FILENAME="Example_12_1_OUT4.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
RTITLE "Example 15-1";
run;
```

Exhibit 12. Excerpt from the .LST file

```
                                    S U D A A N
           Software for the Statistical Analysis of Correlated Data
          Copyright      Research Triangle Institute      August 2008
                                Release 10.0


DESIGN SUMMARY: Variances will be computed using the Taylor Linearization
Method, Assuming a With Replacement (WR) Design
    Sample Weight: WEIGHT
    Stratification Variables(s): STRATA
    Primary Sampling Unit: PSU


Number of zero responses     :    22
Number of non-zero responses :    78

Warning: Parameters have not converged in 10 iterations

Number of observations read       :    100    Weighted count:    49024
Observations used in the analysis :    100    Weighted count:    49024
Denominator degrees of freedom    :     18


Maximum number of estimable parameters for the model is  9

File ONE contains   20 Clusters
  20 clusters were used to fit the model
Maximum cluster size is   5 records
Minimum cluster size is   5 records


Sample and Population Counts for Response Variable RESP
Based on observations used in the analysis
0:  Sample Count       22    Population Count     12337
1:  Sample Count       78    Population Count     36687
```

Exhibit 13. Example_12_1_OUT4.rtf

Date: 05-29-2008 SUDAAN Page: 1
Time: 09:49:53 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Beta Coeff.	SE Beta	P-value T-Test B=0
Intercept		42388.905	**********	1.0000
Census Region	Northeast	-11160.221	**********	1.0000
	South	-*********	**********	0.8284
	Midwest	-*********	**********	0.0064
	West	-*********	0.000	.
Race	White	-*********	**********	0.8284
	Black	-41.097	**********	1.0000
	Other	**********	0.000	.
Gender	Male	-30956.434	**********	1.0000
	Female	**********	0.000	.
Race, Gender	White, Male	**********	**********	0.3200
	White, Female	-*********	0.000	.
	Black, Male	21.562	**********	1.0000
	Black, Female	-*********	0.000	.
	Other, Male	-*********	0.000	.
	Other, Female	0.000	0.000	.

Exhibit 13. Example_12_1_OUT4.rtf-cont.

Date: 05-29-2008 SUDAAN Page: 2
Time: 09:49:53 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Minimum Initial Weight Among Respondents	Maximum Initial Weight Among Respondents	Number of Trimmed Weights
Intercept		12.97	994.05	3
Census Region	Northeast	45.89	948.93	0
	South	12.97	894.04	2
	Midwest	53.42	870.90	0
	West	38.36	994.05	1
Race	White	12.97	994.05	3
	Black	38.36	964.51	0
	Other	40.46	975.14	0
Gender	Male	12.97	994.05	2
	Female	17.43	919.21	1
Race, Gender	White, Male	12.97	994.05	2
	White, Female	17.43	919.21	1
	Black, Male	38.36	964.51	0
	Black, Female	123.31	741.55	0
	Other, Male	40.46	975.14	0
	Other, Female	196.14	641.63	0

Exhibit 13. Example_12_1_OUT4.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Marginal Weight Adjustment	Minimum Adjustment Factor Among Respondents	Maximum Adjustment Factor Among Respondents
Intercept		1.3364	1.0000	1.8000
Census Region	Northeast	1.7036	1.0000	1.8000
	South	1.6562	1.8000	1.8000
	Midwest	1.1419	1.0000	1.8000
	West	1.0878	1.0000	1.8000
Race	White	1.3811	1.0000	1.8000
	Black	1.2658	1.0000	1.8000
	Other	1.3550	1.0000	1.8000
Gender	Male	1.3048	1.0000	1.8000
	Female	1.4045	1.0000	1.8000
Race, Gender	White, Male	1.5611	1.8000	1.8000
	White, Female	1.2154	1.0000	1.8000
	Black, Male	1.2183	1.0000	1.8000
	Black, Female	1.4568	1.0000	1.8000
	Other, Male	1.1753	1.0000	1.8000
	Other, Female	2.4957	1.8000	1.8000

Exhibit 13. Example_12_1_OUT4.rtf-cont.

Date: 05-29-2008 SUDAAN Page: 4
Time: 09:49:53 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Original Unequal Weighting Effect	Trimmed Unequal Weighting Effect	Final Unequal Weighting Effect
Intercept		1.3840	1.3828	1.4320
Census Region	Northeast	1.3673	1.3673	1.3658
	South	1.5669	1.5634	1.5634
	Midwest	1.2953	1.2953	1.2923
	West	1.2473	1.2464	1.3707
Race	White	1.3895	1.3866	1.4691
	Black	1.3334	1.3334	1.3215
	Other	1.4388	1.4388	1.4083
Gender	Male	1.3698	1.3683	1.4078
	Female	1.4115	1.4109	1.4825
Race, Gender	White, Male	1.3790	1.3734	1.3734
	White, Female	1.3941	1.3932	1.5475
	Black, Male	1.2678	1.2678	1.2533
	Black, Female	1.4400	1.4400	1.4978
	Other, Male	1.4757	1.4757	1.4419
	Other, Female	1.1862	1.1862	1.1862

There are two pieces of information in this output that provide some indication that the model did not work correctly. First, in the .LST file (***Exhibit 12***), we see the message:

```
Warning: Parameters have not converged in 10 iterations
```

Second, the estimated beta coefficients in ***Exhibit 13*** are "*****", which indicate that they are too large or too small to print. These messages indicate that the model did not converge and that the betas are going to infinity (or negative infinity).

The above weight adjustment was re-run with a more appropriate upper bound on the nonresponse adjustment. In the following run, we chose an upper bound of 2.50, which is just greater than the maximum marginal weight adjustment of 2.4957.

Exhibit 14. WTADJUST Procedure

```
PROC WTADJUST DATA=one DESIGN=WR ADJUST=NONRESPONSE;
WEIGHT   weight;
NEST     strata psu;
IDVAR    recid resp region race gender;
CLASS    region race gender;
WTMIN    20;
WTMAX    980;
LOWERBD  1.00;
UPPERBD  2.50;
MODEL    resp=region race gender race*gender;
SETENV   COLWIDTH=15;
PRINT    BETA SEBETA P_BETA / BETAFMT=F10.3 SEBETAFMT=F10.3
         FILETYPE=RTF FILENAME="Example_12_1_OUT5.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    INITWTMN INITWTMX NTRIMMED /
         FILETYPE=RTF FILENAME="Example_12_1_OUT5.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    MARGADJ ADJMIN ADJMAX /
         FILETYPE=RTF FILENAME="Example_12_1_OUT5.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    UWEORIG UWETRIM UWEFINAL /
         FILETYPE=RTF FILENAME="Example_12_1_OUT5.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
OUTPUT / PREDICTED=ALL FILENAME=outsud FILETYPE=SAS REPLACE;
RTITLE "Example 15-1";
run;
```

Exhibit 15. Example_12_1_OUT5.rtf

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Beta Coeff.	SE Beta	P-value T-Test B=0
Intercept		1.492	75.926	0.9845
Census Region	Northeast	0.939	0.513	0.0837
	South	0.745	0.385	0.0692
	Midwest	0.098	0.689	0.8887
	West	0.000	0.000	.
Race	White	-2.217	75.922	0.9770
	Black	-1.788	75.689	0.9814
	Other	0.000	0.000	.
Gender	Male	-2.174	75.991	0.9775
	Female	0.000	0.000	.
Race, Gender	White, Male	2.764	76.048	0.9714
	White, Female	0.000	0.000	.
	Black, Male	1.698	75.573	0.9823
	Black, Female	0.000	0.000	.
	Other, Male	0.000	0.000	.
	Other, Female	0.000	0.000	.

Exhibit 15. Example_12_1_OUT5.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Minimum Initial Weight Among Respondents	Maximum Initial Weight Among Respondents	Number of Trimmed Weights
Intercept		12.97	994.05	3
Census Region	Northeast	45.89	948.93	0
	South	12.97	894.04	2
	Midwest	53.42	870.90	0
	West	38.36	994.05	1
Race	White	12.97	994.05	3
	Black	38.36	964.51	0
	Other	40.46	975.14	0
Gender	Male	12.97	994.05	2
	Female	17.43	919.21	1
Race, Gender	White, Male	12.97	994.05	2
	White, Female	17.43	919.21	1
	Black, Male	38.36	964.51	0
	Black, Female	123.31	741.55	0
	Other, Male	40.46	975.14	0
	Other, Female	196.14	641.63	0

Exhibit 15. Example_12_1_OUT5.rtf-cont.

Date: 05-29-2008 SUDAAN Page: 3
Time: 09:49:53 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Marginal Weight Adjustment	Minimum Adjustment Factor Among Respondents	Maximum Adjustment Factor Among Respondents
Intercept		1.3364	1.0223	2.4995
Census Region	Northeast	1.7036	1.5327	2.4995
	South	1.6562	1.3113	2.4990
	Midwest	1.1419	1.0322	2.4884
	West	1.0878	1.0223	1.2212
Race	White	1.3811	1.0265	2.2950
	Black	1.2658	1.0223	2.1592
	Other	1.3550	1.0312	2.4995
Gender	Male	1.3048	1.0223	2.2950
	Female	1.4045	1.0265	2.4995
Race, Gender	White, Male	1.5611	1.2212	2.2950
	White, Female	1.2154	1.0265	1.5948
	Black, Male	1.2183	1.0223	1.5327
	Black, Female	1.4568	1.1278	2.1592
	Other, Male	1.1753	1.0312	1.6554
	Other, Female	2.4957	2.4884	2.4995

Exhibit 15. Example_12_1_OUT5.rtf-cont.

Date: 05-29-2008 SUDAAN Page: 4
Time: 09:49:53 Table: 1

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Nonresponse Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Original Unequal Weighting Effect	Trimmed Unequal Weighting Effect	Final Unequal Weighting Effect
Intercept		1.3840	1.3828	1.4072
Census Region	Northeast	1.3673	1.3673	1.3592
	South	1.5669	1.5634	1.5852
	Midwest	1.2953	1.2953	1.2973
	West	1.2473	1.2464	1.2564
Race	White	1.3895	1.3866	1.3810
	Black	1.3334	1.3334	1.4007
	Other	1.4388	1.4388	1.4533
Gender	Male	1.3698	1.3683	1.3632
	Female	1.4115	1.4109	1.4953
Race, Gender	White, Male	1.3790	1.3734	1.3220
	White, Female	1.3941	1.3932	1.4408
	Black, Male	1.2678	1.2678	1.3116
	Black, Female	1.4400	1.4400	1.6973
	Other, Male	1.4757	1.4757	1.4219
	Other, Female	1.1862	1.1862	1.1867

This run of WTADJUST ran successfully. The minimum observed weight adjustment is 1.0223, and the maximum observed weight adjustment is 2.4995 (see page 3 of ***Exhibit 15***). Page 4 of ***Exhibit 15*** indicates that the overall unequal weighting effect changed from 1.3840, to 1.3828 after weight trimming, to 1.4072 after the nonresponse adjustment was applied. Note that the unequal weighting effect before the bounds were imposed on the adjustment was 1.4106 (see ***Exhibit 10***), so the unequal weighting effect was reduced slightly by setting LOWERBD to 1.00 and UPPERBD to 2.50.

Notice in this example that an OUTPUT statement was included in ***Exhibit 14***. The data set OUTSUD will contain one record for every record on the input dataset. This dataset will contain several variables including the final weight trimming adjustment (stored in the variable TRIMFACTOR), the final nonresponse adjustment (stored in the variable ADJFACTOR) and the final nonresponse adjusted weight (stored in the variable WTFINAL). ***Exhibit 15*** in the **SUDAAN 10 Language Manual** provides information on the variables that will be on the PREDICTED=ALL dataset.

As mentioned earlier in this example, as well as in the recommended steps outlined in ***Exhibit 1***, it is always a good idea to check the weight sums both before and after any weight adjustment is applied. Here, we check the weight sums by running a CROSSTAB with the final adjusted weight WTFINAL.

Exhibit 16. CROSSTAB Procedure

```
PROC CROSSTAB DATA=outsud DESIGN=WR;
WEIGHT   wtfinal;
NEST     strata psu;
CLASS    region race gender resp;
TABLES   resp*(region race gender) resp*race*gender;
SETENV   COLWIDTH=15;
PRINT    NSUM WSUM COLPER /
         FILETYPE=RTF FILENAME="Example_12_1_OUT6.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10 STYLE=NCHS
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
RTITLE "Example 15-1";
run;
```

Exhibit 17. Example_12_1_OUT6.rtf

Date: 05-29-2008 SUDAAN Page: 1
Time: 09:49:54 Table: 1

Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Census Region.

0/1 Respondent Indicator	Census Region	Sample Size	Weighted Size	Col Percent
Total	Total	78	49023.99	100.00
	Northeast	13	10406.26	100.00
	South	23	13752.63	100.00
	Midwest	25	13505.76	100.00
	West	17	11359.34	100.00
Resp	Total	78	49023.99	100.00
	Northeast	13	10406.26	100.00
	South	23	13752.63	100.00
	Midwest	25	13505.76	100.00
	West	17	11359.34	100.00

Exhibit 17. Example_12_1_OUT6.rtf-cont.

Date: 05-29-2008 SUDAAN Page: 2
Time: 09:49:54 Table: 2

Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	78	49023.99	100.00
	White	32	21115.53	100.00
	Black	25	15310.77	100.00
	Other	21	12597.69	100.00
Resp	Total	78	49023.99	100.00
	White	32	21115.53	100.00
	Black	25	15310.77	100.00
	Other	21	12597.69	100.00

Exhibit 17. Example_12_1_OUT6.rtf-cont.

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Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Gender.

0/1 Respondent Indicator	Gender	Sample Size	Weighted Size	Col Percent
Total	Total	78	49023.99	100.00
	Male	52	32682.02	100.00
	Female	26	16341.98	100.00
Resp	Total	78	49023.99	100.00
	Male	52	32682.02	100.00
	Female	26	16341.98	100.00

Exhibit 17. Example_12_1_OUT6.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race, Gender.

for: 0/1 Respondent Indicator = Total.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	78	49023.99	100.00
	Male	52	32682.02	100.00
	Female	26	16341.98	100.00
White	Total	32	21115.53	43.07
	Male	16	11437.77	35.00
	Female	16	9677.76	59.22
Black	Total	25	15310.77	31.23
	Male	18	11803.24	36.12
	Female	7	3507.53	21.46
Other	Total	21	12597.69	25.70
	Male	18	9441.01	28.89
	Female	3	3156.68	19.32

Exhibit 17. Example_12_1_OUT6.rtf-cont.

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Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race, Gender.

for: 0/1 Respondent Indicator = Resp.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	78	49023.99	100.00
	Male	52	32682.02	100.00
	Female	26	16341.98	100.00
White	Total	32	21115.53	43.07
	Male	16	11437.77	35.00
	Female	16	9677.76	59.22
Black	Total	25	15310.77	31.23
	Male	18	11803.24	36.12
	Female	7	3507.53	21.46
Other	Total	21	12597.69	25.70
	Male	18	9441.01	28.89
	Female	3	3156.68	19.32

Only the respondents appear in ***Exhibit 17*** because only the respondents have a value for WTFINAL that is greater than zero. Note how the "Weighted Size" of the respondents in ***Exhibit 17*** matches the "Weighted Size" of the total sample in ***Exhibit-6***. This is the check we seek to make with this run of the CROSSTAB procedure.

The final step in this example is to create a post-stratification adjustment. In general, the steps recommended for creating a post-stratification adjustment are the same as those one would follow to perform the nonresponse adjustment. These steps were presented in ***Exhibit 1***.

For brevity, we will simply run the requested post-stratification once and then check the final weighted totals. The control totals we want the final weights to sum to are provided in ***Exhibit 13***.

Exhibit 18 presents the WTADJUST call for the desired post-stratification adjustment. The totals in the POSTWT statement were taken from ***Exhibit 13***. Note that control totals should be listed in the same order as the betas will be printed in the subsequent output of WTADJUST. Also note that the control total corresponding to the reference level of each categorical variable must be provided in WTADJUST.

The DATA statement that creates the variable WTNONADJ from WTFINAL is included because WTFINAL will be on the output file OUTPOST, and an error will occur in SUDAAN if this same variable name is used as a weight variable on the WEIGHT statement.

Exhibit 18. WTADJUST Procedure

```
Data outsud2;
set outsud;
wtnonadj=wtfinal;  /*Nonresponse Adjusted Sample Weight*/
run;


/*Doing a post-stratification*/
PROC WTADJUST DATA=outsud2 DESIGN=WR ADJUST=POST;
WEIGHT   wtnonadj;
NEST     strata psu;
IDVAR    recid resp region race gender;
CLASS    region race gender;
MODEL    resp=region race gender race*gender;
POSTWT   100000
         21000 28000 27000 24000
         42000 30500 27500
         65000 35000
         23000 19000 23000 7500 19000 8500;
SETENV   COLWIDTH=15;
PRINT    BETA SEBETA P_BETA / BETAFMT=F10.3 SEBETAFMT=F10.3
         FILETYPE=RTF FILENAME="Example_12_1_OUT7.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    UNWTDRR WTDRR /
         FILETYPE=RTF FILENAME="Example_12_1_OUT7.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    INITWTMN INITWTMX NTRIMMED /
         FILETYPE=RTF FILENAME="Example_12_1_OUT7.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    MARGADJ ADJMIN ADJMAX /
         FILETYPE=RTF FILENAME="Example_12_1_OUT7.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    UWEORIG UWETRIM UWEFINAL /
         FILETYPE=RTF FILENAME="Example_12_1_OUT7.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
PRINT    / TESTS=DEFAULT
         FILETYPE=RTF FILENAME="Example_12_1_OUT7.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
OUTPUT / PREDICTED=ALL FILENAME=outpost FILETYPE=SAS REPLACE;
RTITLE "Example 15-1";
run;
```

Exhibit 19. Example_12_1_OUT7.rtf

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Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Post-stratification Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Beta Coeff.	SE Beta	P-value T-Test B=0
Intercept		1.089	0.617	0.0945
Census Region	Northeast	-0.106	0.418	0.8028
	South	-0.062	0.402	0.8789
	Midwest	-0.103	0.345	0.7691
	West	0.000	0.000	.
Race	White	-0.340	0.698	0.6322
	Black	-0.247	0.779	0.7550
	Other	0.000	0.000	.
Gender	Male	-0.317	0.604	0.6061
	Female	0.000	0.000	.
Race, Gender	White, Male	0.315	0.883	0.7254
	White, Female	0.000	0.000	.
	Black, Male	0.207	0.780	0.7941
	Black, Female	0.000	0.000	.
	Other, Male	0.000	0.000	.
	Other, Female	0.000	0.000	.

Exhibit 19. Example_12_1_OUT7.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Post-stratification Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Unweighted Response Rate (Percent)	Weighted Response Rate (Percent)
Intercept		100.00	100.00
Census Region	Northeast	100.00	100.00
	South	100.00	100.00
	Midwest	100.00	100.00
	West	100.00	100.00
Race	White	100.00	100.00
	Black	100.00	100.00
	Other	100.00	100.00
Gender	Male	100.00	100.00
	Female	100.00	100.00
Race, Gender	White, Male	100.00	100.00
	White, Female	100.00	100.00
	Black, Male	100.00	100.00
	Black, Female	100.00	100.00
	Other, Male	100.00	100.00
	Other, Female	100.00	100.00

Exhibit 19. Example_12_1_OUT7.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Post-stratification Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Minimum Initial Weight Among Respondents	Maximum Initial Weight Among Respondents	Number of Trimmed Weights
Intercept		27.14	1603.77	0
Census Region	Northeast	75.97	1603.77	0
	South	27.14	1564.54	0
	Midwest	55.83	1062.76	0
	West	39.22	1196.77	0
Race	White	27.14	1564.54	0
	Black	39.22	1454.42	0
	Other	55.83	1603.77	0
Gender	Male	39.22	1564.54	0
	Female	27.14	1603.77	0
Race, Gender	White, Male	42.51	1564.54	0
	White, Female	27.14	1421.53	0
	Black, Male	39.22	1454.42	0
	Black, Female	146.26	1428.98	0
	Other, Male	55.83	1013.39	0
	Other, Female	490.16	1603.77	0

Exhibit 19. Example_12_1_OUT7.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Post-stratification Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Marginal Weight Adjustment	Minimum Adjustment Factor Among Respondents	Maximum Adjustment Factor Among Respondents
Intercept		2.0398	1.8690	2.7909
Census Region	Northeast	2.0180	1.8690	2.6714
	South	2.0360	1.9527	2.7909
	Midwest	1.9991	1.8748	2.6796
	West	2.1128	2.0779	2.3205
Race	White	1.9891	1.8985	2.1148
	Black	1.9921	1.8690	2.3205
	Other	2.1829	1.9455	2.7909
Gender	Male	1.9889	1.8690	2.1630
	Female	2.1417	1.9022	2.7909
Race, Gender	White, Male	2.0109	1.8985	2.1107
	White, Female	1.9633	1.9022	2.1148
	Black, Male	1.9486	1.8690	2.0779
	Black, Female	2.1383	2.0872	2.3205
	Other, Male	2.0125	1.9455	2.1630
	Other, Female	2.6927	2.6714	2.7909

Exhibit 19. Example_12_1_OUT7.rtf-cont.

Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Post-stratification Adjustment
Example 15-1
by: Independent Variables and Effects.

Independent Variables and Effects		Original Unequal Weighting Effect	Trimmed Unequal Weighting Effect	Final Unequal Weighting Effect
Intercept		1.4072	1.4072	1.4476
Census Region	Northeast	1.3592	1.3592	1.4640
	South	1.5852	1.5852	1.5847
	Midwest	1.2973	1.2973	1.3519
	West	1.2564	1.2564	1.2542
Race	White	1.3810	1.3810	1.3897
	Black	1.4007	1.4007	1.3997
	Other	1.4533	1.4533	1.5802
Gender	Male	1.3632	1.3632	1.3638
	Female	1.4953	1.4953	1.5872
Race, Gender	White, Male	1.3220	1.3220	1.3313
	White, Female	1.4408	1.4408	1.4445
	Black, Male	1.3116	1.3116	1.3007
	Black, Female	1.6973	1.6973	1.7242
	Other, Male	1.4219	1.4219	1.4245
	Other, Female	1.1867	1.1867	1.1766

Exhibit 19. Example_12_1_OUT7.rtf-cont.

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Variance Estimation Method: Taylor Series (WR)
Response variable RESP: 0/1 Respondent Indicator
Post-stratification Adjustment
Example 15-1
by: Contrast.

Contrast	Degrees of Freedom	Wald F	P-value Wald F
OVERALL MODEL	9	15.24	0.0000
MODEL MINUS INTERCEPT	8	0.10	0.9986
INTERCEPT	.	.	.
REGION	3	0.03	0.9917
RACE	.	.	.
GENDER	.	.	.
RACE * GENDER	2	0.06	0.9385

Exhibit 19 shows that the unweighted and weighted response rates are 100%. This is the default value for all post-stratification adjustments. The output also indicates that the minimum post-stratification adjustment is 1.8690 and the maximum is 2.7909 (see page 4 of ***Exhibit 19***). Additionally, the overall unequal weighting effect changed from 1.4072 to 1.4476 after the post-stratification adjustment was applied (see page 5 of ***Exhibit 19***).

Exhibit 20 and ***Exhibit 21*** show the code and output from the final CROSSTAB run. This was run to verify the final weight sums.

Exhibit 20. CROSSTAB Procedure

```
PROC CROSSTAB DATA=outpost DESIGN=WR;
WEIGHT   wtfinal;
NEST     strata psu;
CLASS    region race gender resp;
TABLES   resp*(region race gender) resp*race*gender;
SETENV   COLWIDTH=15;
PRINT    NSUM WSUM COLPER /
         FILETYPE=RTF FILENAME="Example_12_1_OUT8.rtf" REPLACE
         FONTNAME="Arial"  FONTSIZE=10 STYLE=NCHS
         TOPINCH=1 LEFTINCH=1 RIGHTINCH=2.5 BOTTOMINCH=2.5;
RTITLE "Example 15-1";
run;
```

Exhibit 21. Example_12_1_OUT8.rtf

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Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Census Region.

0/1 Respondent Indicator	Census Region	Sample Size	Weighted Size	Col Percent
Total	Total	78	100000.00	100.00
	Northeast	13	21000.00	100.00
	South	23	28000.00	100.00
	Midwest	25	27000.00	100.00
	West	17	24000.00	100.00
Resp	Total	78	100000.00	100.00
	Northeast	13	21000.00	100.00
	South	23	28000.00	100.00
	Midwest	25	27000.00	100.00
	West	17	24000.00	100.00

Exhibit 21. Example_12_1_OUT8.rtf-cont.

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Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	78	100000.00	100.00
	White	32	42000.00	100.00
	Black	25	30500.00	100.00
	Other	21	27500.00	100.00
Resp	Total	78	100000.00	100.00
	White	32	42000.00	100.00
	Black	25	30500.00	100.00
	Other	21	27500.00	100.00

Exhibit 21. Example_12_1_OUT8.rtf-cont.

Date: 05-29-2008 SUDAAN Page: 3
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Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Gender.

0/1 Respondent Indicator	Gender	Sample Size	Weighted Size	Col Percent
Total	Total	78	100000.00	100.00
	Male	52	65000.00	100.00
	Female	26	35000.00	100.00
Resp	Total	78	100000.00	100.00
	Male	52	65000.00	100.00
	Female	26	35000.00	100.00

Exhibit 21. Example_12_1_OUT8.rtf-cont.

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Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race, Gender.

for: 0/1 Respondent Indicator = Total.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	78	100000.00	100.00
	Male	52	65000.00	100.00
	Female	26	35000.00	100.00
White	Total	32	42000.00	42.00
	Male	16	23000.00	35.38
	Female	16	19000.00	54.29
Black	Total	25	30500.00	30.50
	Male	18	23000.00	35.38
	Female	7	7500.00	21.43
Other	Total	21	27500.00	27.50
	Male	18	19000.00	29.23
	Female	3	8500.00	24.29

Exhibit 21. Example_12_1_OUT8.rtf-cont.

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Variance Estimation Method: Taylor Series (WR)
Example 15-1
by: 0/1 Respondent Indicator, Race, Gender.

for: 0/1 Respondent Indicator = Resp.

0/1 Respondent Indicator	Race	Sample Size	Weighted Size	Col Percent
Total	Total	78	100000.00	100.00
	Male	52	65000.00	100.00
	Female	26	35000.00	100.00
White	Total	32	42000.00	42.00
	Male	16	23000.00	35.38
	Female	16	19000.00	54.29
Black	Total	25	30500.00	30.50
	Male	18	23000.00	35.38
	Female	7	7500.00	21.43
Other	Total	21	27500.00	27.50
	Male	18	19000.00	29.23
	Female	3	8500.00	24.29

As desired, the "Weighted Size" in ***Exhibit 21*** matches the control totals presented in ***Exhibit 2***.