

GENERAL NOTES ABOUT ANALYSIS EXAMPLES REPLICATION

These examples are intended to provide guidance on how to use the commands/procedures for analysis of complex sample survey data and assume all data management and other preliminary work is done. The relevant syntax for the procedure of interest is shown first along with the associated output for that procedure(s). In some examples, there may be more than one block of syntax and in this case all syntax is first presented followed by the output produced.

In some software packages certain procedures or options are not available but we have made every attempt to demonstrate how to match the output produced by Stata 10+ in the textbook. Check the ASDA website for updates to the various software tools we cover.

GENERAL NOTES ON LINEAR REGRESSION AND PROC SURVEYREG

PROC SURVEYREG is the general purpose tool for survey data linear regression. This procedure is a multi-purpose tool that can do correct subpopulation analyses and offers a number of output options such as design effects (DEFF), class statement for categorical predictors, and a contrast statement for custom hypothesis testing of parameters. Other features are the ability to create output data sets of residuals and predicted values for model diagnostic plots and analyses. We demonstrate how to save key statistics and then plot these using PROC GPLOT. In addition, PROC SURVEYREG does not include a full complement of regression diagnostic plots like PROC REG provides, therefore some of the model diagnostic plots are run in PROC REG while the SE's are calculated by PROC SURVEYREG to take the complex sample into account. PROC GLM is also used in the chapter for non-survey corrected linear regression, mainly due to its ability to use the class statement for categorical predictors with ease. The results are identical to PROC REG but PROC GLM offers more flexibility overall.

```

title "Analysis Example 7.5: Bivariate Testing of Predictors: Race: NHANES Data " ;
proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmec2yr ;
class ridreth1 ;
format ridreth1 ridreth1f. ;
domain age18p ;
model bpxdi1_1 = ridreth1 / solution deff ;
run ;

```

Analysis Example 7.5: Bivariate Testing of Predictors: Race: NHANES Data

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	6618
Sum of Weights	226136591
Weighted Mean of bpxdi1_1	68.52109
Weighted Sum of bpxdi1_1	1.54951E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.006163
Root MSE	13.0279
Denominator DF	15

Class Level Information

Class Variable	Label	Levels
RIDRETH1	1=mex 2=oth hisp 3=white 4=black 5=other	5

Class Level Information

Class Variable	Values
RIDRETH1	1:Other 2:Black 3:White 4:Other Hispanic 5:Mexican

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	13.61	<.0001
Intercept	1	21714.0	<.0001
RIDRETH1	4	13.61	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	65.6496474	0.43207608	151.94	<.0001	0.63
RIDRETH1 1:Other	1.2820698	1.05005459	1.22	0.2409	1.46
RIDRETH1 2:Black	3.5640485	0.61313013	5.81	<.0001	0.72
RIDRETH1 3:White	3.2796030	0.56116687	5.84	<.0001	0.94
RIDRETH1 4:Other Hispanic	1.9860107	0.86427619	2.30	0.0364	0.73
RIDRETH1 5:Mexican	0.0000000	0.00000000	.	.	.

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis Example 7.5: Bivariate Testing of Predictors: Race: NHANES Data

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	6618
Number of Observations in Domain	2037
Number of Observations Not in Domain	4581
Sum of Weights in Domain	36123897
Weighted Mean of bpxdi1_1	57.52591
Weighted Sum of bpxdi1_1	2078060072

Fit Statistics

R-square	0.004186
Root MSE	11.2069
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	2.02	0.1425
Intercept	1	11157.7	<.0001
RIDRETH1	4	2.02	0.1425

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	56.2219371	0.72724360	77.31	<.0001	3.29
RIDRETH1 1:Other	-0.3619364	1.41462675	-0.26	0.8015	4.96
RIDRETH1 2:Black	1.4831777	0.72799178	2.04	0.0597	1.78
RIDRETH1 3:White	1.6741645	0.83511801	2.00	0.0634	3.65
RIDRETH1 4:Other Hispanic	1.9873914	1.16757873	1.70	0.1094	2.24
RIDRETH1 5:Mexican	0.0000000	0.00000000	.	.	.

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis Example 7.5: Bivariate Testing of Predictors: Race: NHANES Data

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	6618
Number of Observations in Domain	4581
Number of Observations Not in Domain	2037
Sum of Weights in Domain	190012694
Weighted Mean of bpxdi1_1	70.61142
Weighted Sum of bpxdi1_1	1.34171E10

Fit Statistics

R-square	0.004513
Root MSE	12.2967
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	7.78	0.0013
Intercept	1	18762.7	<.0001
RIDRETH1	4	7.78	0.0013

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	68.2995837	0.41259510	165.54	<.0001	0.60
RIDRETH1 1:Other	1.7847083	1.03012347	1.73	0.1037	1.47
RIDRETH1 2:Black	3.7278044	0.75352760	4.95	0.0002	1.14
RIDRETH1 3:White	2.4275786	0.55446611	4.38	0.0005	0.97
RIDRETH1 4:Other Hispanic	1.5923607	1.10915666	1.44	0.1716	1.28
RIDRETH1 5:Mexican	0.0000000	0.00000000	.	.	.

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

```

proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmec2yr ;
class marcat ;
format marcat marcatf. ;
domain age18p ;
model bpxdi1_1 = marcat / solution deff ;
run ;

```

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	5526
Sum of Weights	205384307
Weighted Mean of bpxdi1_1	69.86812
Weighted Sum of bpxdi1_1	1.43498E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.04705
Root MSE	12.1732
Denominator DF	15

Class Level Information

Class Variable	Label	Levels	Values
marcat	1=married 2=prev married 3=never married	3	1:Never Married 2:Previously Married 3:Married

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	2	148.65	<.0001
Intercept	1	40377.9	<.0001
marcat	2	148.65	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	71.3860199	0.46614374	153.14	<.0001	4.86
marcat 1:Never Married	-6.3777502	0.44171930	-14.44	<.0001	1.23
marcat 2:Previously Married	-0.0619829	0.67883407	-0.09	0.9285	2.21
marcat 3:Married	0.0000000	0.00000000	.	.	.

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	948
Number of Observations Not in Domain	4578
Sum of Weights in Domain	15536185
Weighted Mean of bpxdi1_1	60.79484
Weighted Sum of bpxdi1_1	944519855

Fit Statistics

R-square	0.01077
Root MSE	10.4833
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	2	18.81	<.0001
Intercept	1	1146.87	<.0001
marcat	2	18.81	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	66.9627077	5.21902957	12.83	<.0001	13.96
marcat 1:Never Married	-6.2925813	5.17760039	-1.22	0.2430	13.60
marcat 2:Previously Married	7.0369939	5.56253089	1.27	0.2251	4.89
marcat 3:Married	0.0000000	0.00000000	.	.	.

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	4578
Number of Observations Not in Domain	948
Sum of Weights in Domain	189848122
Weighted Mean of bpxdi1_1	70.61063
Weighted Sum of bpxdi1_1	1.34053E10

Fit Statistics

R-square	0.01819
Root MSE	12.2100
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	2	40.14	<.0001
Intercept	1	44983.1	<.0001
marcat	2	40.14	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	71.3917122	0.46762672	152.67	<.0001	5.26
marcat 1:Never Married	-4.3861655	0.57315845	-7.65	<.0001	1.68
marcat 2:Previously Married	-0.0733106	0.68125989	-0.11	0.9157	2.39
marcat 3:Married	0.0000000	0.00000000	.	.	.

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

```

proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmecl2yr ;
domain age18p ;
model bpxdi1_1 = female / solution deff ;
run ;

```

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	6618
Sum of Weights	226136591
Weighted Mean of bpxdi1_1	68.52109
Weighted Sum of bpxdi1_1	1.54951E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.006594
Root MSE	13.0221
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	1	46.23	<.0001
Intercept	1	28772.3	<.0001
female	1	46.23	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	69.6044559	0.41034582	169.62	<.0001	3.22
female	-2.1220423	0.31211411	-6.80	<.0001	0.95

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	6618
Number of Observations in Domain	2037
Number of Observations Not in Domain	4581
Sum of Weights in Domain	36123897
Weighted Mean of bpxdi1_1	57.52591
Weighted Sum of bpxdi1_1	2078060072

Fit Statistics

R-square	0.002415
Root MSE	11.2143
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	1	2.44	0.1391
Intercept	1	5909.03	<.0001
female	1	2.44	0.1391

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	56.9745965	0.74117896	76.87	<.0001	14.46
female	1.1034049	0.70631802	1.56	0.1391	6.56

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	6618
Number of Observations in Domain	4581
Number of Observations Not in Domain	2037
Sum of Weights in Domain	190012694
Weighted Mean of bpxdi1_1	70.61142
Weighted Sum of bpxdi1_1	1.34171E10

Fit Statistics

R-square	0.01332
Root MSE	12.2394
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	1	56.42	<.0001
Intercept	1	29363.6	<.0001
female	1	56.42	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	72.0693526	0.42057710	171.36	<.0001	3.81
female	-2.8442054	0.37865083	-7.51	<.0001	1.58

NOTE: The denominator degrees of freedom for the t tests is 15.

```

proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmec2yr ;
domain age18p ;
model bpxdi1_1 = agec / solution deff ;
run ;

```

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	6618
Sum of Weights	226136591
Weighted Mean of bpxdi1_1	68.52109
Weighted Sum of bpxdi1_1	1.54951E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.07967
Root MSE	12.5340
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	1	95.13	<.0001
Intercept	1	25110.2	<.0001
agec	1	95.13	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	69.5045977	0.43862044	158.46	<.0001	7.57
agec	0.1848693	0.01895374	9.75	<.0001	6.02

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	6618
Number of Observations in Domain	2037
Number of Observations Not in Domain	4581
Sum of Weights in Domain	36123897
Weighted Mean of bpxdi1_1	57.52591
Weighted Sum of bpxdi1_1	2078060072

Fit Statistics

R-square	0.07773
Root MSE	10.7827
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	1	184.00	<.0001
Intercept	1	1483.74	<.0001
agec	1	184.00	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	93.7265363	2.43323515	38.52	<.0001	2.50
agec	1.0994441	0.08105163	13.56	<.0001	3.03

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis Example 7.5: Bivariate Testing of Predictors: NHANES Data

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	6618
Number of Observations in Domain	4581
Number of Observations Not in Domain	2037
Sum of Weights in Domain	190012694
Weighted Mean of bpxdi1_1	70.61142
Weighted Sum of bpxdi1_1	1.34171E10

Fit Statistics

R-square	0.006472
Root MSE	12.2818
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	1	7.69	0.0142
Intercept	1	40774.3	<.0001
agec	1	7.69	0.0142

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	70.6155237	0.34970906	201.93	<.0001	5.37
agec	0.0572750	0.02064803	2.77	0.0142	5.60

NOTE: The denominator degrees of freedom for the t tests is 15.

```

title "Analysis Example 7.5: Unweighted and Without Design Correction: NHANES" ;
proc glm data=nhanes0506 ;
class ridreth1 marcat ;
format ridreth1 ridreth1f. marcat marcatf. ;
where age18p=1 ;
model bpxdi1_1 = ridreth1 marcat female agec / solution clparm ;
run ;
quit ;

```

Analysis Example 7.5: Unweighted and Without Design Correction: NHANES

The GLM Procedure

Class Level Information

Class	Levels	Values
RIDRETH1	5	1:Other 2:Black 3:White 4:Other Hispanic 5:Mexican
marcat	3	1:Never Married 2:Previously Married 3:Married

Number of Observations Read 5563
Number of Observations Used 4578

Analysis Example 7.5: Unweighted and Without Design Correction: NHANES

The GLM Procedure

Dependent Variable: bpxdi1_1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	45386.9160	5673.3645	36.38	<.0001
Error	4569	712510.7345	155.9446		
Corrected Total	4577	757897.6505			

R-Square 0.059885 Coeff Var 18.10052 Root MSE 12.48778 bpxdi1_1 Mean 68.99126

Source	DF	Type I SS	Mean Square	F Value	Pr > F
RIDRETH1	4	9055.83793	2263.95948	14.52	<.0001
marcat	2	20194.67123	10097.33561	64.75	<.0001
female	1	14331.55871	14331.55871	91.90	<.0001
agec	1	1804.84818	1804.84818	11.57	0.0007

Source	DF	Type III SS	Mean Square	F Value	Pr > F
RIDRETH1	4	10445.09264	2611.27316	16.74	<.0001
marcat	2	10992.73993	5496.36996	35.25	<.0001
female	1	12861.12125	12861.12125	82.47	<.0001
agec	1	1804.84818	1804.84818	11.57	0.0007

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Limits
Intercept	69.67211341 B	0.46434675	150.04	<.0001	68.76176934 70.58245748
RIDRETH1 1:Other	2.31194851 B	1.00453718	2.30	0.0214	0.34257010 4.28132691
RIDRETH1 2:Black	4.50813405 B	0.56347275	8.00	<.0001	3.40345511 5.61281300
RIDRETH1 3:White	1.67193446 B	0.49147452	3.40	0.0007	0.70840686 2.63546206
RIDRETH1 4:Other Hispanic	1.89823176 B	1.12537901	1.69	0.0917	-0.30805503 4.10451854
RIDRETH1 5:Mexican	0.00000000 B	.	.	.	.
marcat 1:Never Married	-4.21635601 B	0.51005544	-8.27	<.0001	-5.21631120 -3.21640082
marcat 2:Previously Married	0.32690705 B	0.52221142	0.63	0.5313	-0.69687974 1.35069383
marcat 3:Married	0.00000000 B	.	.	.	.
female	-3.40181354	0.37459003	-9.08	<.0001	-4.13619105 -2.66743603
agec	0.03897510	0.01145650	3.40	0.0007	0.01651482 0.06143537

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

```

title "Analysis Example 7.5: Weighted and Without Design Correction: NHANES" ;
proc glm data=nhanes0506 ;
class ridreth1 marcat ;
format ridreth1 ridreth1f. marcat marcatf. ;
weight wtmec2yr ;
where age18p=1 ;
model bpxdi1_1 = ridreth1 marcat female agec / solution clparm ;
run ;
quit ;

```

Analysis Example 7.5: Weighted and Without Design Correction: NHANES
The GLM Procedure
Class Level Information

Class	Levels	Values
RIDRETH1	5	1:Other 2:Black 3:White 4:Other Hispanic 5:Mexican
marcat	3	1:Never Married 2:Previously Married 3:Married

Number of Observations Read 5563
Number of Observations Used 4578

Analysis Example 7.5: Weighted and Without Design Correction: NHANES
The GLM Procedure

Dependent Variable: bpxdi1_1

Weight: WTMEC2YR Full Sample 2 Year MEC Exam Weight

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	8	1124482773	140560347	23.20	<.0001
Error	4569	27687559578	6059873		
Corrected Total	4577	28812042351			

R-Square	Coeff Var	Root MSE	bpxdi1_1 Mean
0.039028	3486.275	2461.681	70.61063

Source	DF	Type I SS	Mean Square	F Value	Pr > F
RIDRETH1	4	130116537.0	32529134.2	5.37	0.0003
marcat	2	561015751.3	280507875.6	46.29	<.0001
female	1	421136520.5	421136520.5	69.50	<.0001
agec	1	12213964.8	12213964.8	2.02	0.1558

Source	DF	Type III SS	Mean Square	F Value	Pr > F
RIDRETH1	4	171761867.5	42940466.9	7.09	<.0001
marcat	2	422894231.8	211447115.9	34.89	<.0001
female	1	418697606.0	418697606.0	69.09	<.0001
agec	1	12213964.8	12213964.8	2.02	0.1558

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Limits	
Intercept	70.67811977 B	0.66677101	106.00	<.0001	69.37092632	71.98531322
RIDRETH1 1:Other	1.95844693 B	1.00649881	1.95	0.0517	-0.01477722	3.93167107
RIDRETH1 2:Black	4.40863121 B	0.84061310	5.24	<.0001	2.76062325	6.05663917
RIDRETH1 3:White	2.19190607 B	0.67356513	3.25	0.0011	0.87139286	3.51241928
RIDRETH1 4:Other Hispanic	1.78650881 B	1.16011259	1.54	0.1236	-0.48787259	4.06089020
RIDRETH1 5:Mexican	0.00000000 B	.	.	.	.	.
marcat 1:Never Married	-4.35623216 B	0.52403087	-8.31	<.0001	-5.38358594	-3.32887839
marcat 2:Previously Married	0.01725098 B	0.50332139	0.03	0.9727	-0.96950222	1.00400418
marcat 3:Married	0.00000000 B	.	.	.	.	.
female	-2.99733918	0.36059310	-8.31	<.0001	-3.70427594	-2.29040242
agec	0.01703492	0.01199896	1.42	0.1558	-0.00648884	0.04055868

NOTE: The X'X matrix has been found to be singular, and a generalized inverse was used to solve the normal equations. Terms whose estimates are followed by the letter 'B' are not uniquely estimable.

```

title "Analysis Example 7.5: Survey Adjusted with Weight and Domain Statement: NHANES" ;
proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmec2yr ;
domain age18p ;
model bpxdi1_1 = other black white othhis nevmar prevmar female agec / solution deff clparm ;
output out=outdiag2 p=phat r=resid ;
run ;

```

Analysis Example 7.5: Survey Adjusted with Weight and Domain Statement: NHANES

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	5526
Sum of Weights	205384307
Weighted Mean of bpxdi1_1	69.86812
Weighted Sum of bpxdi1_1	1.43498E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.06534
Root MSE	12.0624
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	44.60	<.0001
Intercept	1	24821.2	<.0001
other	1	3.39	0.0855
black	1	35.49	<.0001
white	1	13.42	0.0023
othhis	1	3.26	0.0911
nevmar	1	138.69	<.0001
prevmar	1	0.13	0.7267
female	1	70.64	<.0001
agec	1	2.87	0.1107

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval		Design Effect
Intercept	70.5642197	0.44789155	157.55	<.0001	69.6095614	71.5188779	0.55
other	1.7404078	0.94542958	1.84	0.0855	-0.2747276	3.7555433	1.09
black	4.2550968	0.71421499	5.96	<.0001	2.7327836	5.7774100	0.89
white	2.0758091	0.56658912	3.66	0.0023	0.8681530	3.2834652	0.87
othhis	1.7650324	0.97744606	1.81	0.0911	-0.3183445	3.8484094	0.88
nevmar	-5.7832021	0.49107672	-11.78	<.0001	-6.8299073	-4.7364969	1.14
prevmar	-0.2612923	0.73381535	-0.36	0.7267	-1.8253827	1.3027981	2.40
female	-2.5703573	0.30581309	-8.40	<.0001	-3.2221825	-1.9185321	0.87
agec	0.0367696	0.02169373	1.69	0.1107	-0.0094694	0.0830087	3.88

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis Example 7.5: Survey Adjusted with Weight and Domain Statement: NHANES

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	948
Number of Observations Not in Domain	4578
Sum of Weights in Domain	15536185
Weighted Mean of bpxdi1_1	60.79484
Weighted Sum of bpxdi1_1	944519855

Fit Statistics

R-square	0.03575
Root MSE	10.3557
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	12.27	<.0001
Intercept	1	33.36	<.0001
other	1	0.04	0.8402
black	1	1.55	0.2329
white	1	7.60	0.0147
othhis	1	0.96	0.3423
nevmar	1	0.97	0.3396
prevmar	1	2.48	0.1365
female	1	20.35	0.0004
agec	1	0.06	0.8126

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval	Design Effect
Intercept	65.5540906	11.3495064	5.78	<.0001	41.363190 89.7449909	7.96
other	0.3738570	1.8222854	0.21	0.8402	-3.510252 4.2579664	6.80
black	1.3781440	1.1086697	1.24	0.2329	-0.984929 3.7412174	3.59
white	2.2953531	0.8323851	2.76	0.0147	0.521166 4.0695399	3.11
othhis	1.6420044	1.6744430	0.98	0.3423	-1.926986 5.2109951	4.51
nevmar	-5.2751159	5.3480933	-0.99	0.3396	-16.674307 6.1240752	14.35
prevmar	8.8483620	5.6240963	1.57	0.1365	-3.139116 20.8358396	5.02
female	2.9326236	0.6501388	4.51	0.0004	1.546885 4.3183617	5.36
agec	0.0954309	0.3956031	0.24	0.8126	-0.747777 0.9386389	9.53

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis Example 7.5: Survey Adjusted with Weight and Domain Statement: NHANES

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	4578
Number of Observations Not in Domain	948
Sum of Weights in Domain	189848122
Weighted Mean of bpxdi1_1	70.61063
Weighted Sum of bpxdi1_1	1.34053E10

Fit Statistics

R-square	0.03903
Root MSE	12.0863
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	23.71	<.0001
Intercept	1	19891.8	<.0001
other	1	3.92	0.0663
black	1	33.50	<.0001
white	1	13.11	0.0025
othhis	1	2.44	0.1389
nevmar	1	59.36	<.0001
prevmar	1	0.00	0.9812
female	1	81.82	<.0001
agec	1	0.61	0.4484

NOTE: The denominator degrees of freedom for the F tests is 15.

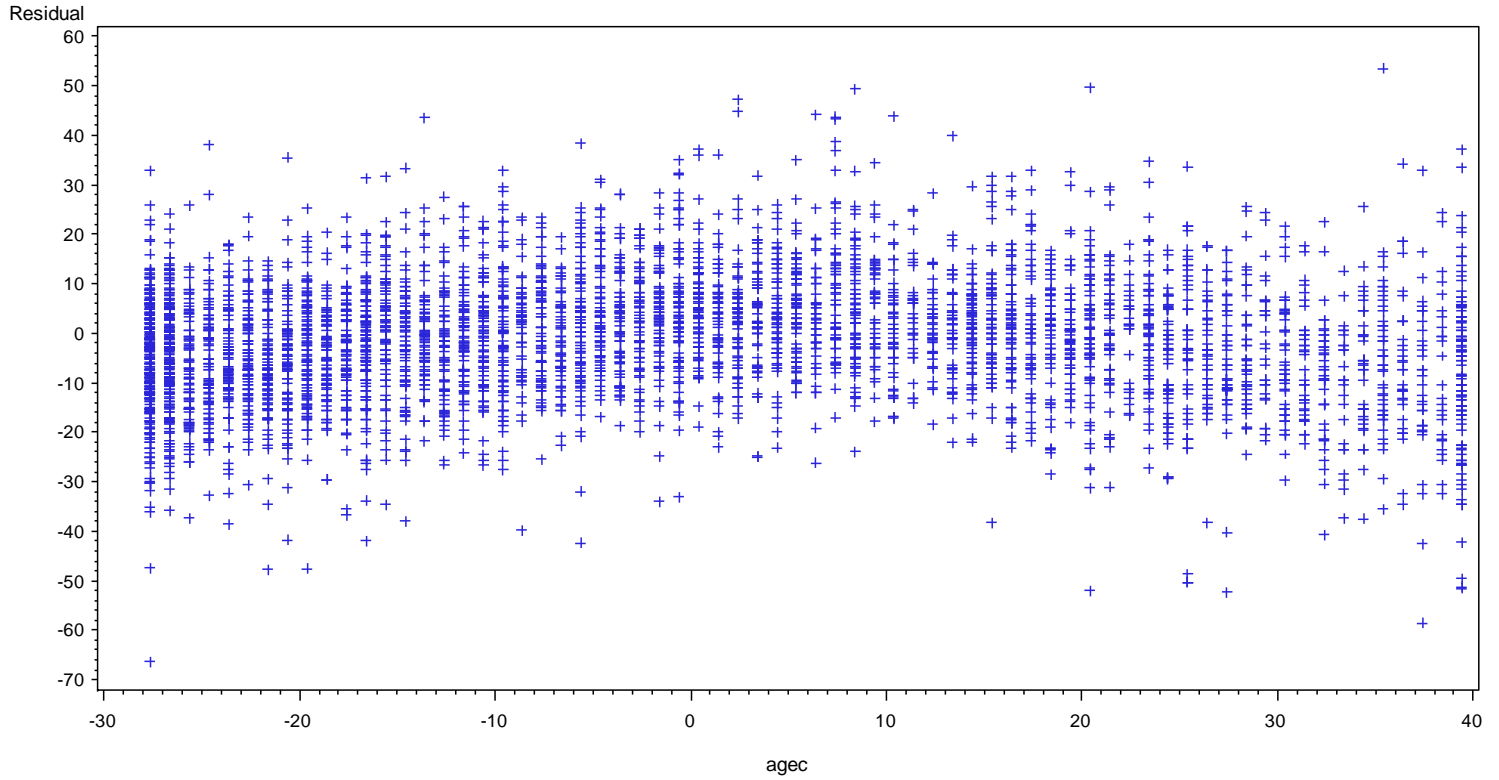
Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval	Design Effect
Intercept	70.6781198	0.50112706	141.04	<.0001	69.6099927 71.7462468	0.68
other	1.9584469	0.98879862	1.98	0.0663	-0.1491274 4.0660213	1.17
black	4.4086312	0.76170828	5.79	<.0001	2.7850885 6.0321740	0.99
white	2.1919061	0.60525854	3.62	0.0025	0.9018280 3.4819841	0.97
othhis	1.7865088	1.14302116	1.56	0.1389	-0.6497831 4.2228007	1.17
nevmar	-4.3562322	0.56539549	-7.70	<.0001	-5.5613441 -3.1511202	1.41
prevmar	0.0172510	0.71829006	0.02	0.9812	-1.5137480 1.5482500	2.46
female	-2.9973392	0.33136044	-9.05	<.0001	-3.7036172 -2.2910611	1.02
agec	0.0170349	0.02188363	0.78	0.4484	-0.0296089 0.0636788	4.02

NOTE: The denominator degrees of freedom for the t tests is 15.

```
*plot of residual v. age centered using output data set from previous step ;  
proc gplot data=outdiag2 ;  
where age18p=1 and domain="age18p=1" ;  
title "Analysis Example 7.5 : Residual by Age Centered: NHANES " ;  
plot resid*agec ;  
run ;  
quit ;
```

Analysis Example 7.5 : Residual by Age Centered: NHANES



```

title "Analysis Example 7.5: Survey Adjusted with Weight and Domain Statement and Age Squared Term: NHANES" ;
proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmec2yr ;
class ridreth1 marcat ;
format ridreth1 ridreth1f. marcat marcatf. ;
domain age18p ;
model bpxdi1_1 = other black white othhis nevmar prevmar female agec agecsq / solution deff clparm ;
output out=outdiag3 p=phat r=resid ;
run ;

```

Analysis Example 7.5: Survey Adjusted with Weight and Domain Statement and Age Squared Term

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	5526
Sum of Weights	205384307
Weighted Mean of bpxdi1_1	69.86812
Weighted Sum of bpxdi1_1	1.43498E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.1602
Root MSE	11.4350
Denominator DF	15

Class Level Information

Class	Variable	Label	Levels
RIDRETH1		1=mex 2=oth hisp 3=white 4=black 5=other	5
marcat		1=married 2=prev married 3=never married	3

Class Level Information

Values

1:Other 2:Black 3:White 4:Other Hispanic 5:Mexican
1:Never Married 2:Previously Married 3:Married

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	203.64	<.0001
Intercept	1	32438.1	<.0001
other	1	2.08	0.1702
black	1	19.61	0.0005
white	1	11.07	0.0046
othhis	1	1.68	0.2141
nevmar	1	0.11	0.7477
prevmar	1	2.58	0.1293
female	1	50.77	<.0001
agec	1	64.24	<.0001
agecsq	1	275.70	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval		Design Effect
Intercept	73.4719515	0.40793743	180.11	<.0001	72.6024535	74.3414496	0.49
other	1.1739858	0.81489849	1.44	0.1702	-0.5629292	2.9109009	0.90
black	3.2887298	0.74265295	4.43	0.0005	1.7058026	4.8716571	1.07
white	1.8673065	0.56126595	3.33	0.0046	0.6709965	3.0636166	0.95
othhis	1.2984065	1.00083045	1.30	0.2141	-0.8348131	3.4316262	1.03
nevmar	-0.2015485	0.61524802	-0.33	0.7477	-1.5129187	1.1098216	1.58
prevmar	1.0250764	0.63854238	1.61	0.1293	-0.3359445	2.3860972	2.00
female	-2.2994526	0.32270153	-7.13	<.0001	-2.9872746	-1.6116306	1.08
agec	0.1129675	0.01409495	8.01	<.0001	0.0829249	0.1430102	1.68
agecsq	-0.0118506	0.00071371	-16.60	<.0001	-0.0133718	-0.0103293	2.26

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis Example 7.5: Survey Adjusted with Weight and Domain Statement and Age Squared Term

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	948
Number of Observations Not in Domain	4578
Sum of Weights in Domain	15536185
Weighted Mean of bpxdi1_1	60.79484
Weighted Sum of bpxdi1_1	944519855

Fit Statistics

R-square	0.04190
Root MSE	10.3236
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	11.66	<.0001
Intercept	1	2.16	0.1620
other	1	0.13	0.7284
black	1	1.63	0.2206
white	1	7.15	0.0174
othhis	1	1.03	0.3263
nevmar	1	1.02	0.3289
prevmar	1	1.95	0.1829
female	1	22.57	0.0003
agec	1	2.55	0.1310
agecsq	1	2.54	0.1319

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval	Design Effect
Intercept	-686.76104	466.894354	-1.47	0.1620	-1681.9228 308.400721	13.61
other	0.64489	1.822789	0.35	0.7284	-3.2403 4.530074	6.82
black	1.50701	1.179104	1.28	0.2206	-1.0062 4.020212	4.08
white	2.32158	0.868448	2.67	0.0174	0.4705 4.172637	3.41
othhis	1.80786	1.781350	1.01	0.3263	-1.9890 5.604715	5.13
nevmar	-5.55490	5.504367	-1.01	0.3289	-17.2872 6.177384	15.27
prevmar	8.14227	5.830655	1.40	0.1829	-4.2855 20.570014	5.42
female	2.93677	0.618107	4.75	0.0003	1.6193 4.254230	4.87
agec	-49.95878	31.272220	-1.60	0.1310	-116.6139 16.696377	13.80
agecsq	-0.83123	0.521673	-1.59	0.1319	-1.9431 0.280691	13.93

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis Example 7.5: Survey Adjusted with Weight and Domain Statement and Age Squared Term

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	4578
Number of Observations Not in Domain	948
Sum of Weights in Domain	189848122
Weighted Mean of bpxdi1_1	70.61063
Weighted Sum of bpxdi1_1	1.34053E10

Fit Statistics

R-square	0.1335
Root MSE	11.4776
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	186.37	<.0001
Intercept	1	26320.8	<.0001
other	1	1.62	0.2230
black	1	19.74	0.0005
white	1	7.96	0.0129
othhis	1	1.20	0.2915
nevmar	1	0.35	0.5643
prevmar	1	2.80	0.1152
female	1	64.88	<.0001
agec	1	71.35	<.0001
agecsq	1	266.43	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

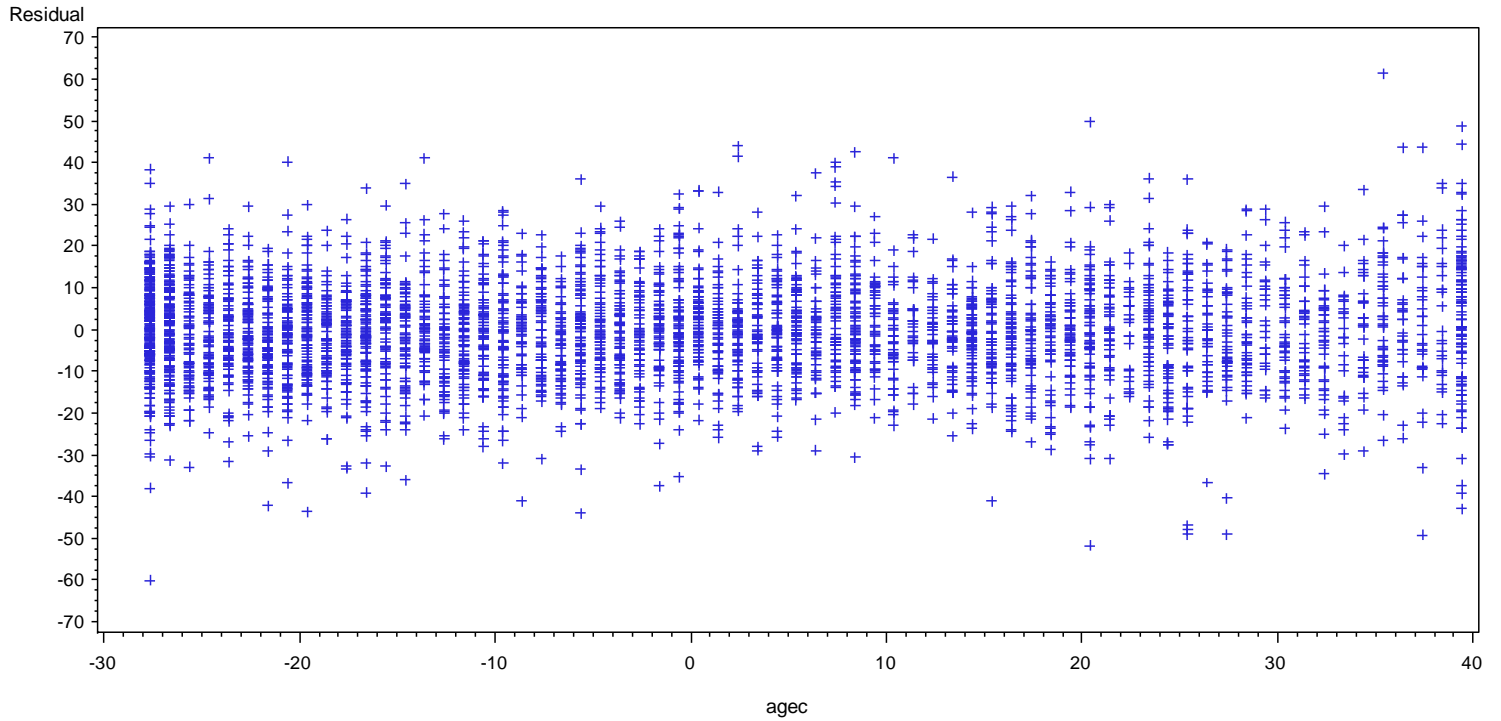
Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval		Design Effect
Intercept	73.8590162	0.45525381	162.24	<.0001	72.8886657	74.8293667	0.59
other	1.1885852	0.93493249	1.27	0.2230	-0.8041763	3.1813466	1.15
black	3.4651170	0.77988086	4.44	0.0005	1.8028403	5.1273938	1.15
white	1.7805528	0.63117165	2.82	0.0129	0.4352422	3.1258633	1.17
othhis	1.1891589	1.08758018	1.09	0.2915	-1.1289634	3.5072812	1.18
nevmar	-0.3432436	0.58228425	-0.59	0.5643	-1.5843531	0.8978659	1.46
prevmar	1.0404757	0.62224370	1.67	0.1152	-0.2858053	2.3667568	2.03
female	-2.7211812	0.33783604	-8.05	<.0001	-3.4412617	-2.0011007	1.17
agec	0.1252717	0.01483093	8.45	<.0001	0.0936603	0.1568831	1.73
agecsq	-0.0124771	0.00076441	-16.32	<.0001	-0.0141064	-0.0108478	2.26

NOTE: The denominator degrees of freedom for the t tests is 15.

```
proc gplot data=outdiag3 ;  
where age18p=1 and domain="age18p=1" ;  
title H=2.3 "Analysis Example 7.5 : Residuals by Centered Age " ;  
title2 h=2.3 "Including Age Squared in Model: NHANES" ;  
plot resid*agec;  
run ;  
quit ;
```

Analysis Example 7.5 : Residuals by Centered Age Including Age Squared in Model: NHANES




```

title "Analysis Example 7.5 : Final Model with Contrasts : NHANES " ;
proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmec2yr ;
domain age18p ;
model bpxdi1_1 = other black white othhis nevmar prevmar female agec agecsq
      other*agec black*agec white*agec othhis*agec
      other*agecsq black*agecsq white*agecsq othhis*agecsq / solution deff ;
contrast 'race/eth/age'
      other*agec 1 , black*agec 1 , white*agec 1 , othhis*agec 1 , other*agecsq 1 , black*agecsq 1 ,
      white*agecsq 1 , othhis*agecsq 1 ;
run ;

```

Analysis Example 7.5 : Final Model with Contrasts : NHANES

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	5526
Sum of Weights	205384307
Weighted Mean of bpxdi1_1	69.86812
Weighted Sum of bpxdi1_1	1.43498E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.1618
Root MSE	11.4325
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	15	1567.12	<.0001
Intercept	1	25779.8	<.0001
other	1	0.65	0.4316
black	1	11.97	0.0035
white	1	6.77	0.0200
othhis	1	0.25	0.6252
nevmar	1	0.11	0.7413
prevmar	1	2.23	0.1558
female	1	49.77	<.0001
agec	1	22.81	0.0002
agecsq	1	109.66	<.0001
other*agec	1	1.85	0.1939
black*agec	1	2.54	0.1321
white*agec	1	0.16	0.6962
othhis*agec	1	0.86	0.3695
other*agecsq	1	0.16	0.6974
black*agecsq	1	0.37	0.5514
white*agecsq	1	0.27	0.6116
othhis*agecsq	1	1.92	0.1860

NOTE: The denominator degrees of freedom for the F tests is 15.

Analysis Example 7.5 : Final Model with Contrasts : NHANES

The SURVEYREG Procedure
 Regression Analysis for Dependent Variable bpxdi1_1

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	73.7207827	0.45914560	160.56	<.0001	0.32
other	0.9724960	1.20330395	0.81	0.4316	0.99
black	3.2199425	0.93068785	3.46	0.0035	0.80
white	1.5994720	0.61476733	2.60	0.0200	0.54
othhis	0.6267099	1.25660068	0.50	0.6252	0.79
nevmar	-0.2062645	0.61329860	-0.34	0.7413	1.56
prevmar	0.9504808	0.63600130	1.49	0.1558	1.97
female	-2.2953829	0.32537903	-7.05	<.0001	1.10
agec	0.1203931	0.02520770	4.78	0.0002	0.45
agecsq	-0.0123583	0.00118015	-10.47	<.0001	0.43
other*agec	-0.0752345	0.05531549	-1.36	0.1939	0.96
black*agec	0.0519300	0.03261074	1.59	0.1321	0.51
white*agec	-0.0136996	0.03441248	-0.40	0.6962	0.81
othhis*agec	0.0688942	0.07446611	0.93	0.3695	1.14
other*agecsq	-0.0010672	0.00269250	-0.40	0.6974	0.99
black*agecsq	0.0010244	0.00168113	0.61	0.5514	0.56
white*agecsq	0.0005869	0.00113176	0.52	0.6116	0.37
othhis*agecsq	0.0041229	0.00297461	1.39	0.1860	0.76

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis of Contrasts

Contrast	Num DF	F Value	Pr > F
race/eth/age	8	3.60	0.0157

NOTE: The denominator degrees of freedom for the F tests is 15.

Analysis Example 7.5 : Final Model with Contrasts : NHANES
The SURVEYREG Procedure
age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	948
Number of Observations Not in Domain	4578
Sum of Weights in Domain	15536185
Weighted Mean of bpxdi1_1	60.79484
Weighted Sum of bpxdi1_1	944519855

Fit Statistics

R-square	0.04657
Root MSE	10.3059
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	16	111062	<.0001
Intercept	1	0.20	0.6612
other	1	0.53	0.4778
black	1	1.00	0.3335
white	1	1.99	0.1790
othhis	1	0.28	0.6059
nevmar	1	0.89	0.3608
prevmar	1	2.32	0.1485
female	1	23.64	0.0002
agec	1	0.13	0.7223
agecsq	1	0.12	0.7291
other*agec	1	0.53	0.4787
black*agec	1	1.00	0.3331
white*agec	1	1.97	0.1807
othhis*agec	1	0.29	0.6004
other*agecsq	1	0.53	0.4798
black*agecsq	1	1.00	0.3332
white*agecsq	1	1.95	0.1831
othhis*agecsq	1	0.30	0.5943

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	369.6154	826.61034	0.45	0.6612	4.34
other	-1267.9941	1741.76844	-0.73	0.4778	7.41
black	-1036.6830	1037.33393	-1.00	0.3335	3.88
white	-1345.2183	954.22904	-1.41	0.1790	5.00
othhis	982.5540	1864.41501	0.53	0.6059	6.76
nevmar	-4.8134	5.10617	-0.94	0.3608	12.71
prevmar	8.5609	5.62082	1.52	0.1485	4.97
female	2.9572	0.60821	4.86	0.0002	4.69
agec	19.8887	54.92061	0.36	0.7223	4.33
agecsq	0.3211	0.91007	0.35	0.7291	4.30
other*agec	-83.4937	114.91287	-0.73	0.4787	7.30
black*agec	-69.0443	69.02717	-1.00	0.3331	3.88
white*agec	-89.0640	63.44305	-1.40	0.1807	5.00
othhis*agec	66.4773	124.23840	0.54	0.6004	6.76
other*agecsq	-1.3720	1.89310	-0.72	0.4798	7.19
black*agecsq	-1.1465	1.14669	-1.00	0.3332	3.88
white*agecsq	-1.4698	1.05302	-1.40	0.1831	4.99

Analysis Example 7.5 : Final Model with Contrasts : NHANES

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
othhis*agecsq	1.1244	2.06639	0.54	0.5943	6.75

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis of Contrasts

Contrast	Num DF	F Value	Pr > F
race/eth/age	8	1.35	0.2940

NOTE: The denominator degrees of freedom for the F tests is 15.

Analysis Example 7.5 : Final Model with Contrasts : NHANES

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	4578
Number of Observations Not in Domain	948
Sum of Weights in Domain	189848122
Weighted Mean of bpxdi1_1	70.61063
Weighted Sum of bpxdi1_1	1.34053E10

Fit Statistics

R-square	0.1351
Root MSE	11.4758
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	15	1971.40	<.0001
Intercept	1	25336.4	<.0001
other	1	0.36	0.5587
black	1	10.82	0.0050
white	1	6.30	0.0241
othhis	1	0.24	0.6345
nevmar	1	0.33	0.5758
prevmar	1	2.51	0.1343
female	1	63.09	<.0001
agec	1	18.93	0.0006
agecsq	1	143.39	<.0001
other*agec	1	2.91	0.1085
black*agec	1	1.26	0.2792
white*agec	1	0.11	0.7429
othhis*agec	1	0.75	0.4005
other*agecsq	1	0.00	0.9453
black*agecsq	1	1.37	0.2601
white*agecsq	1	0.93	0.3492
othhis*agecsq	1	1.35	0.2632

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	74.2200284	0.46628224	159.17	<.0001	0.31
other	0.7066885	1.18169701	0.60	0.5587	0.94
black	3.0221785	0.91859068	3.29	0.0050	0.77
white	1.4238774	0.56744397	2.51	0.0241	0.44
othhis	0.6084534	1.25383259	0.49	0.6345	0.75
nevmar	-0.3356543	0.58681325	-0.57	0.5758	1.48
prevmar	0.9900764	0.62548635	1.58	0.1343	2.04
female	-2.7209908	0.34256148	-7.94	<.0001	1.21
agec	0.1336988	0.03073016	4.35	0.0006	0.65
agecsq	-0.0135515	0.00113168	-11.97	<.0001	0.31
other*agec	-0.0910532	0.05334539	-1.71	0.1085	0.82
black*agec	0.0411398	0.03664607	1.12	0.2792	0.60
white*agec	-0.0132595	0.03967919	-0.33	0.7429	1.02
othhis*agec	0.0673284	0.07781384	0.87	0.4005	1.20
other*agecsq	0.0002030	0.00291198	0.07	0.9453	0.87
black*agecsq	0.0019761	0.00168835	1.17	0.2601	0.44
white*agecsq	0.0011135	0.00115218	0.97	0.3492	0.30

Analysis Example 7.5 : Final Model with Contrasts : NHANES

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
othhis*agecsq	0.0040395	0.00347475	1.16	0.2632	0.77

NOTE: The denominator degrees of freedom for the t tests is 15.

Analysis of Contrasts

Contrast	Num DF	F Value	Pr > F
race/eth/age	8	1.84	0.1473

NOTE: The denominator degrees of freedom for the F tests is 15.

```

title "Analysis Example 7.5: Final Model with Interactions of Age and Gender: NHANES " ;
proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmecl2yr ;
domain age18p ;
model bpxdi1_1 = ridreth1 marcat female agec agecsq female*agec female*agecsq / solution deff ;
contrast 'gender/age'
    female*agec      1 , female*agecsq 1 ;
run ;

```

Analysis Example 7.5: Final Model with Interactions of Age and Gender: NHANES

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	5526
Sum of Weights	205384307
Weighted Mean of bpxdi1_1	69.86812
Weighted Sum of bpxdi1_1	1.43498E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.1628
Root MSE	11.4193
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	11	267.72	<.0001
Intercept	1	20869.8	<.0001
RIDRETH1	4	5.91	0.0046
marcat	2	1.11	0.3566
female	1	29.34	<.0001
agec	1	58.92	<.0001
agecsq	1	182.08	<.0001
female*agec	1	1.00	0.3341
female*agecsq	1	8.28	0.0115

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	74.1021953	0.50445224	146.90	<.0001	0.70
RIDRETH1 1:Other	1.1495043	0.81384419	1.41	0.1782	0.90
RIDRETH1 2:Black	3.2850628	0.73558204	4.47	0.0005	1.05
RIDRETH1 3:White	1.8714476	0.56276624	3.33	0.0046	0.96
RIDRETH1 4:Other Hispanic	1.2646052	0.99466696	1.27	0.2230	1.02
RIDRETH1 5:Mexican	0.0000000	0.00000000	.	.	.
marcat 1:Never Married	-0.1460394	0.60837046	-0.24	0.8135	1.55
marcat 2:Previously Married	0.9569265	0.66284056	1.44	0.1694	2.11

Analysis Example 7.5: Final Model with Interactions of Age and Gender: NHANES

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
marcat 3:Married	0.0000000	0.0000000	.	.	.
female	-3.5142770	0.64881998	-5.42	<.0001	2.31
agec	0.1224606	0.01595346	7.68	<.0001	1.30
agecsq	-0.0136864	0.00101428	-13.49	<.0001	2.36
female*agec	-0.0195351	0.01957531	-1.00	0.3341	1.34
female*agecsq	0.0034183	0.00118781	2.88	0.0115	1.96

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis of Contrasts

Contrast	Num DF	F Value	Pr > F
gender/age	2	4.15	0.0367

NOTE: The denominator degrees of freedom for the F tests is 15.

Analysis Example 7.5: Final Model with Interactions of Age and Gender: NHANES

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	948
Number of Observations Not in Domain	4578
Sum of Weights in Domain	15536185
Weighted Mean of bpxdi1_1	60.79484
Weighted Sum of bpxdi1_1	944519855

Fit Statistics

R-square	0.04352
Root MSE	10.3167
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	11	11.79	<.0001
Intercept	1	4.87	0.0433
RIDRETH1	4	2.24	0.1130
marcat	2	20.08	<.0001
female	1	1.17	0.2967
agec	1	5.40	0.0346
agecsq	1	5.34	0.0355
female*agec	1	1.16	0.2982
female*agecsq	1	1.16	0.2983

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	-1075.4508	484.529906	-2.22	0.0423	7.23
RIDRETH1 1:Other	0.6652	1.829850	0.36	0.7213	6.87
RIDRETH1 2:Black	1.5604	1.170033	1.33	0.2022	4.02
RIDRETH1 3:White	2.3872	0.866146	2.76	0.0147	3.39
RIDRETH1 4:Other Hispanic	1.8655	1.759789	1.06	0.3059	4.98
RIDRETH1 5:Mexican	0.0000	0.000000	.	.	.
marcat 1:Never Married	-5.4889	5.380034	-1.02	0.3238	14.53
marcat 2:Previously Married	7.8686	5.846225	1.35	0.1983	5.43
marcat 3:Married	0.0000	0.000000	.	.	.
female	768.5714	710.839631	1.08	0.2967	7.92
agec	-75.8371	32.641096	-2.32	0.0346	7.42
agecsq	-1.2615	0.546035	-2.31	0.0355	7.54
female*agec	51.0020	47.328821	1.08	0.2982	7.94
female*agecsq	0.8482	0.787206	1.08	0.2983	7.97

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis of Contrasts

Contrast	Num DF	F Value	Pr > F
gender/age	2	0.58	0.5716

NOTE: The denominator degrees of freedom for the F tests is 15.

Analysis Example 7.5: Final Model with Interactions of Age and Gender: NHANES

The SURVEYREG Procedure

age18p=1

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	4578
Number of Observations Not in Domain	948
Sum of Weights in Domain	189848122
Weighted Mean of bpxdi1_1	70.61063
Weighted Sum of bpxdi1_1	1.34053E10

Fit Statistics

R-square	0.1344
Root MSE	11.4742
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	11	287.32	<.0001
Intercept	1	18394.1	<.0001
RIDRETH1	4	6.44	0.0032
marcat	2	1.19	0.3318
female	1	20.55	0.0004
agec	1	36.36	<.0001
agecsq	1	109.33	<.0001
female*agec	1	0.25	0.6214
female*agecsq	1	1.16	0.2988

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	Design Effect
Intercept	74.1383275	0.56782276	130.57	<.0001	0.87
RIDRETH1 1:Other	1.2078677	0.93392040	1.29	0.2155	1.15
RIDRETH1 2:Black	3.4920233	0.77822696	4.49	0.0004	1.14
RIDRETH1 3:White	1.7964121	0.63233816	2.84	0.0124	1.18
RIDRETH1 4:Other Hispanic	1.2009240	1.09715919	1.09	0.2910	1.20
RIDRETH1 5:Mexican	0.0000000	0.00000000	.	.	.
marcat 1:Never Married	-0.3462009	0.58546423	-0.59	0.5631	1.47
marcat 2:Previously Married	0.9072390	0.65327912	1.39	0.1852	2.19
marcat 3:Married	0.0000000	0.00000000	.	.	.
female	-3.2372226	0.71416904	-4.53	0.0004	2.87
agec	0.1178361	0.01954319	6.03	<.0001	1.70
agecsq	-0.0134673	0.00128799	-10.46	<.0001	3.12
female*agec	0.0140117	0.02778241	0.50	0.6214	2.14
female*agecsq	0.0017819	0.00165547	1.08	0.2988	2.96

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis of Contrasts

Contrast	Num DF	F Value	Pr > F
gender/age	2	1.85	0.1910

NOTE: The denominator degrees of freedom for the F tests is 15.

```

title "Analysis Example 7.5: Final Model of Main Effects: NHANES " ;
proc surveyreg data=nhanes0506 ;
strata sdmvstra ;
cluster sdmvpsu ;
weight wtmecl2yr ;
domain age18p ;
class ridreth1 marcat ;
format ridreth1 ridreth1f. marcat marcatf. ;
model bpxdi1_1 = ridreth1 marcat female agec agecsq / clparm solution deff ;
run ;

```

Analysis Example 7.5: Final Model of Main Effects: NHANES

The SURVEYREG Procedure

Regression Analysis for Dependent Variable bpxdi1_1

Data Summary

Number of Observations	5526
Sum of Weights	205384307
Weighted Mean of bpxdi1_1	69.86812
Weighted Sum of bpxdi1_1	1.43498E10

Design Summary

Number of Strata	15
Number of Clusters	30

Fit Statistics

R-square	0.1602
Root MSE	11.4350
Denominator DF	15

Class Level Information

Class Variable	Label	Levels
RIDRETH1	1=mex 2=oth hisp 3=white 4=black 5=other	5
marcat	1=married 2=prev married 3=never married	3

Class Level Information

Values

1:Other 2:Black 3:White 4:Other Hispanic 5:Mexican
1:Never Married 2:Previously Married 3:Married

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	203.64	<.0001
Intercept	1	22069.5	<.0001
RIDRETH1	4	5.81	0.0050
marcat	2	1.39	0.2796
female	1	50.77	<.0001
agec	1	64.24	<.0001
agecsq	1	275.70	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval	
Intercept	73.4719515	0.40793743	180.11	<.0001	72.6024535	74.3414496
RIDRETH1 1:Other	1.1739858	0.81489849	1.44	0.1702	-0.5629292	2.9109009
RIDRETH1 2:Black	3.2887298	0.74265295	4.43	0.0005	1.7058026	4.8716571
RIDRETH1 3:White	1.8673065	0.56126595	3.33	0.0046	0.6709965	3.0636166
RIDRETH1 4:Other Hispanic	1.2984065	1.00083045	1.30	0.2141	-0.8348131	3.4316262
RIDRETH1 5:Mexican	0.0000000	0.00000000	.	.	0.0000000	0.0000000
marcat 1:Never Married	-0.2015485	0.61524802	-0.33	0.7477	-1.5129187	1.1098216
marcat 2:Previously Married	1.0250764	0.63854238	1.61	0.1293	-0.3359445	2.3860972
marcat 3:Married	0.0000000	0.00000000	.	.	0.0000000	0.0000000
female	-2.2994526	0.32270153	-7.13	<.0001	-2.9872746	-1.6116306
agec	0.1129675	0.01409495	8.01	<.0001	0.0829249	0.1430102
agecsq	-0.0118506	0.00071371	-16.60	<.0001	-0.0133718	-0.0103293

Estimated Regression Coefficients

Parameter	Design Effect
Intercept	0.49
RIDRETH1 1:Other	0.90
RIDRETH1 2:Black	1.07
RIDRETH1 3:White	0.95
RIDRETH1 4:Other Hispanic	1.03
RIDRETH1 5:Mexican	.
marcat 1:Never Married	1.58
marcat 2:Previously Married	2.00
marcat 3:Married	.
female	1.08
agec	1.68
agecsq	2.26

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis Example 7.5: Final Model of Main Effects: NHANES

The SURVEYREG Procedure

age18p=0

Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	948
Number of Observations Not in Domain	4578
Sum of Weights in Domain	15536185
Weighted Mean of bpxdi1_1	60.79484
Weighted Sum of bpxdi1_1	944519855

Fit Statistics

R-square	0.04190
Root MSE	10.3236
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	11.66	<.0001
Intercept	1	2.14	0.1639
RIDRETH1	4	2.05	0.1380
marcat	2	19.20	<.0001
female	1	22.57	0.0003
agec	1	2.55	0.1310
agecsq	1	2.54	0.1319

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval
Intercept	-686.76104	466.894354	-1.47	0.1620	-1681.9228 308.400721
RIDRETH1 1:Other	0.64489	1.822789	0.35	0.7284	-3.2403 4.530074
RIDRETH1 2:Black	1.50701	1.179104	1.28	0.2206	-1.0062 4.020212
RIDRETH1 3:White	2.32158	0.868448	2.67	0.0174	0.4705 4.172637
RIDRETH1 4:Other Hispanic	1.80786	1.781350	1.01	0.3263	-1.9890 5.604715
RIDRETH1 5:Mexican	0.00000	0.000000	.	.	0.0000 0.000000
marcat 1:Never Married	-5.55490	5.504367	-1.01	0.3289	-17.2872 6.177384
marcat 2:Previously Married	8.14227	5.830655	1.40	0.1829	-4.2855 20.570014
marcat 3:Married	0.00000	0.000000	.	.	0.0000 0.000000
female	2.93677	0.618107	4.75	0.0003	1.6193 4.254230
agec	-49.95878	31.272220	-1.60	0.1310	-116.6139 16.696377
agecsq	-0.83123	0.521673	-1.59	0.1319	-1.9431 0.280691

Estimated Regression Coefficients

Parameter	Design Effect
Intercept	13.61
RIDRETH1 1:Other	6.82
RIDRETH1 2:Black	4.08
RIDRETH1 3:White	3.41
RIDRETH1 4:Other Hispanic	5.13
RIDRETH1 5:Mexican	.
marcat 1:Never Married	15.27
marcat 2:Previously Married	5.42
marcat 3:Married	.
female	4.87
agec	13.80
agecsq	13.93

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

Analysis Example 7.5: Final Model of Main Effects: NHANES
 The SURVEYREG Procedure
 age18p=1
 Domain Regression Analysis for Variable bpxdi1_1

Domain Summary

Number of Observations	5526
Number of Observations in Domain	4578
Number of Observations Not in Domain	948
Sum of Weights in Domain	189848122
Weighted Mean of bpxdi1_1	70.61063
Weighted Sum of bpxdi1_1	1.34053E10

Fit Statistics

R-square	0.1335
Root MSE	11.4776
Denominator DF	15

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	186.37	<.0001
Intercept	1	22187.1	<.0001
RIDRETH1	4	6.39	0.0033
marcat	2	1.61	0.2324
female	1	64.88	<.0001
agec	1	71.35	<.0001
agecsq	1	266.43	<.0001

NOTE: The denominator degrees of freedom for the F tests is 15.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Interval	
Intercept	73.8590162	0.45525381	162.24	<.0001	72.8886657	74.8293667
RIDRETH1 1:Other	1.1885852	0.93493249	1.27	0.2230	-0.8041763	3.1813466
RIDRETH1 2:Black	3.4651170	0.77988086	4.44	0.0005	1.8028403	5.1273938
RIDRETH1 3:White	1.7805528	0.63117165	2.82	0.0129	0.4352422	3.1258633
RIDRETH1 4:Other Hispanic	1.1891589	1.08758018	1.09	0.2915	-1.1289634	3.5072812
RIDRETH1 5:Mexican	0.0000000	0.00000000	.	.	0.0000000	0.0000000
marcat 1:Never Married	-0.3432436	0.58228425	-0.59	0.5643	-1.5843531	0.8978659
marcat 2:Previously Married	1.0404757	0.62224370	1.67	0.1152	-0.2858053	2.3667568
marcat 3:Married	0.0000000	0.00000000	.	.	0.0000000	0.0000000
female	-2.7211812	0.33783604	-8.05	<.0001	-3.4412617	-2.0011007
agec	0.1252717	0.01483093	8.45	<.0001	0.0936603	0.1568831
agecsq	-0.0124771	0.00076441	-16.32	<.0001	-0.0141064	-0.0108478

Estimated Regression Coefficients

Parameter	Design Effect
Intercept	0.59
RIDRETH1 1:Other	1.15
RIDRETH1 2:Black	1.15
RIDRETH1 3:White	1.17
RIDRETH1 4:Other Hispanic	1.18
RIDRETH1 5:Mexican	.
marcat 1:Never Married	1.46
marcat 2:Previously Married	2.03
marcat 3:Married	.
female	1.17
agec	1.73
agecsq	2.26

NOTE: The denominator degrees of freedom for the t tests is 15.

Matrix X'WX is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

```

title "Analysis Example 7.5: Final Model with Regression Diagnostic Plots: NHANES " ;
proc reg data=nhanes0506 ;
weight wtmec2yr ;
where age18p=1 ;
model bpxdi1_1 = other black white othhis married prevmar female agec agecsq ;
plot    r.*nqq.
        r.*p. ;
output out=outdiag r=resid p=yhat ;
run ;

proc univariate data=outdiag noprint ;
var resid ;
where age18p=1 ;
histogram resid / cfill=grey normal ;
run ;

```

Analysis Example 7.5: Final Model with Regression Diagnostic Plots: NHANES

The REG Procedure
Model: MODEL1
Dependent Variable: bpxdi1_1

Number of Observations Read	5563
Number of Observations Used	4578
Number of Observations with Missing Values	985

Weight: WTMEC2YR Full Sample 2 Year MEC Exam Weight

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	3847654448	427517161	78.23	<.0001
Error	4568	24964387903	5465059		
Corrected Total	4577	28812042351			

Root MSE	2337.74649	R-Square	0.1335
Dependent Mean	70.61063	Adj R-Sq	0.1318
Coeff Var	3310.75704		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	73.51577	0.82540	89.07	<.0001
other	1	1.18859	0.95645	1.24	0.2140
black	1	3.46512	0.79941	4.33	<.0001
white	1	1.78055	0.63992	2.78	0.0054
othhis	1	1.18916	1.10203	1.08	0.2806
married	1	0.34324	0.52912	0.65	0.5166
prevmar	1	1.38372	0.67007	2.07	0.0390
female	1	-2.72118	0.34266	-7.94	<.0001
agec	1	0.12527	0.01238	10.12	<.0001
agecsq	1	-0.01248	0.00055895	-22.32	<.0001

Analysis Example 7.5: Final Model with Regression Diagnostic Plots: NHANES

The UNIVARIATE Procedure
Fitted Normal Distribution for resid

Parameters for Normal Distribution

Parameter	Symbol	Estimate
Mean	Mu	-0.29643
Std Dev	Sigma	11.8299

Goodness-of-Fit Tests for Normal Distribution

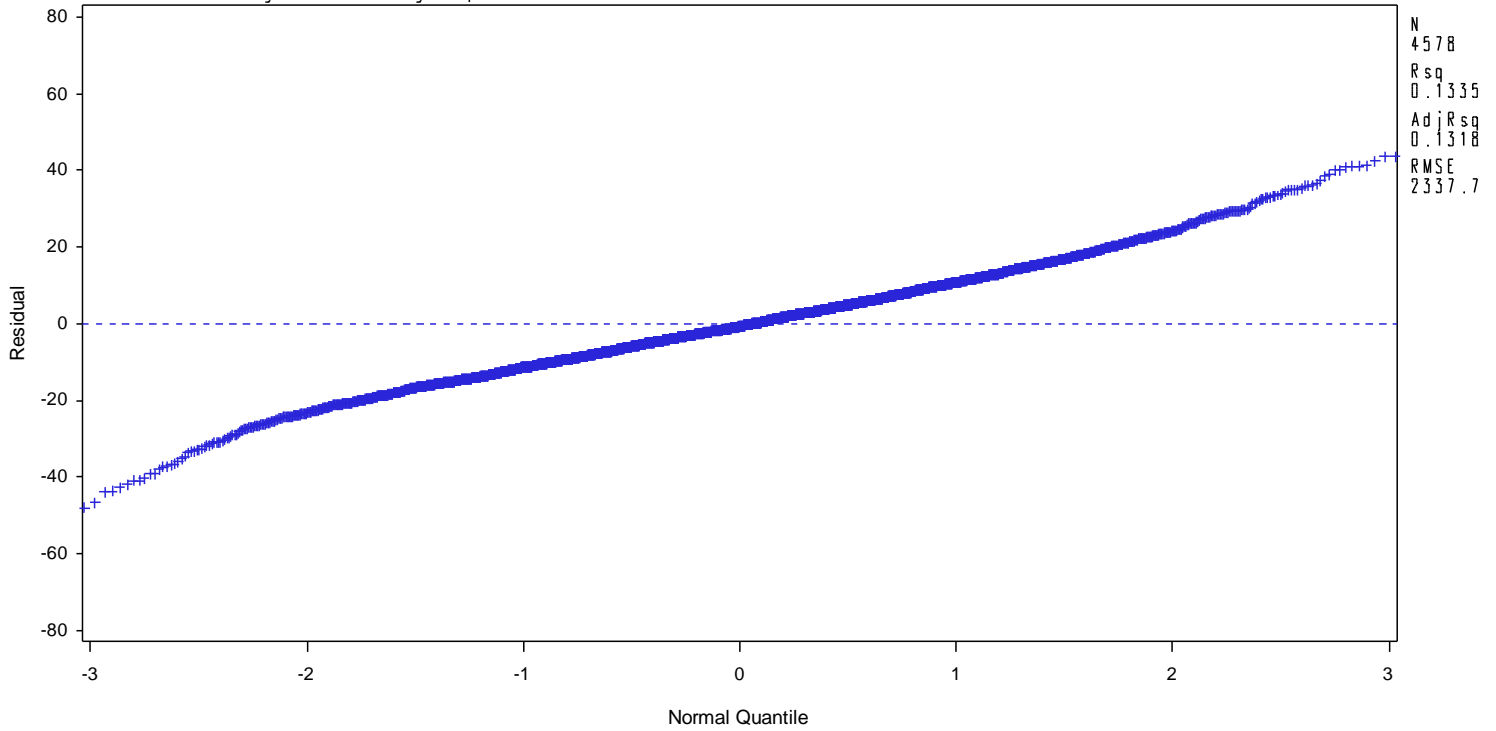
Test	Statistic	p Value
Kolmogorov-Smirnov	D 0.02270328	Pr > D <0.010
Cramer-von Mises	W-Sq 0.73830572	Pr > W-Sq <0.005
Anderson-Darling	A-Sq 5.22436051	Pr > A-Sq <0.005

Quantiles for Normal Distribution

Percent	Quantile	
	Observed	Estimated
1.0	-28.89356	-27.81690
5.0	-18.66551	-19.75489
10.0	-14.54148	-15.45706
25.0	-7.91394	-8.27557
50.0	-0.62384	-0.29643
75.0	6.93070	7.68272
90.0	14.38360	14.86421
95.0	18.98581	19.16203
99.0	29.69328	27.22405

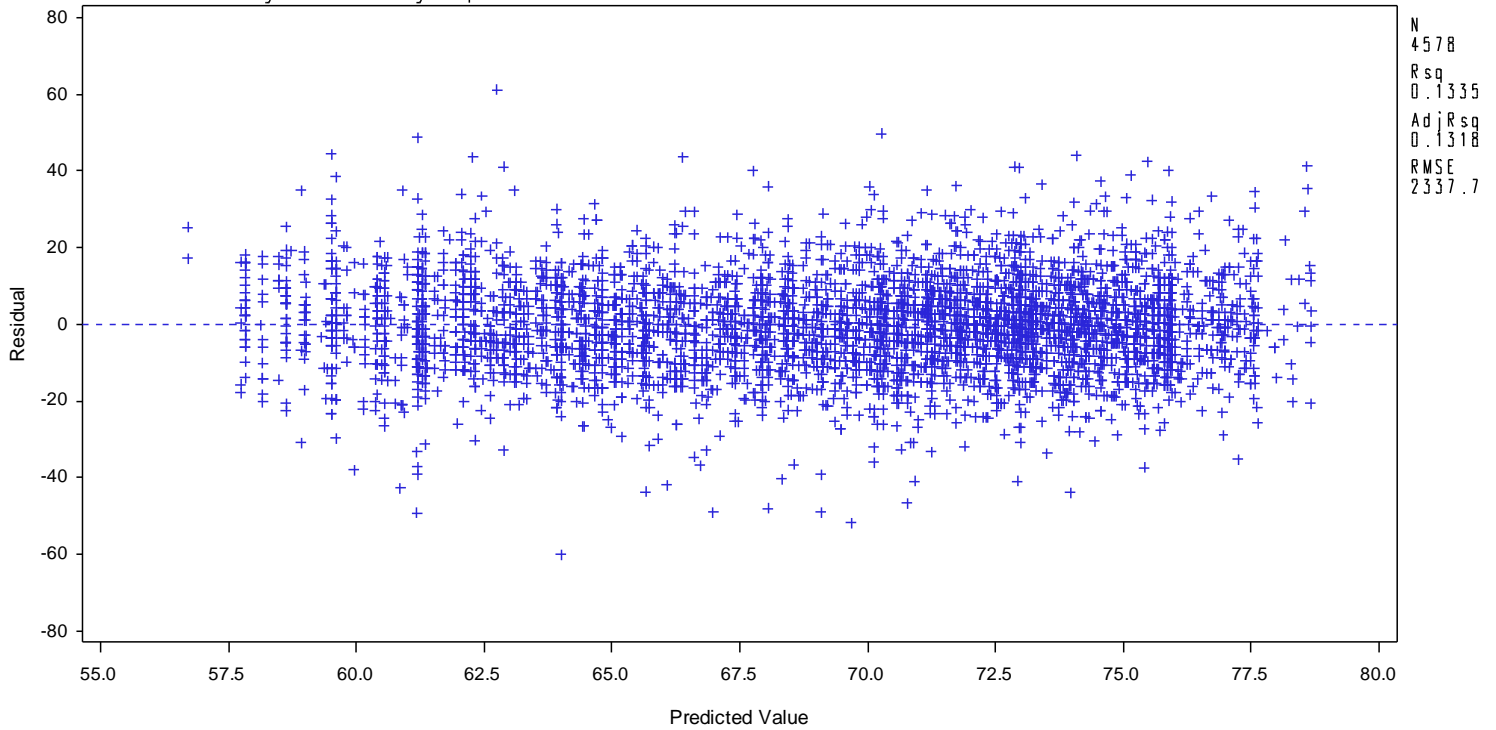
Analysis Example 7.5: Final Model with Regression Diagnostic Plots: NHANES

$bp\ xdi1_1 = 73.516 + 1.1886\ other + 3.4651\ block + 1.7806\ white + 1.1892\ olhhis + 0.3432\ married + 1.3837\ prevmor - 2.7212\ female$
 $+ 0.1253\ ogec - 0.0125\ ogecsq$



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