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/*
Example, using ITC-4 Wave 3 data, of SAS Surveylogistic
for workshop on Complex Survey Data

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*/

options pagesize=50 linesize=80 nonumber nodate;
title1 bold height=14pt "Example of SAS Surveylogistic"
      height=10pt " (using ITC-4 wave 3 data)";
title2 " ";
title3 "Do smokers know the tar level of their current cigarette brand?";
title4 height=16pt " ";

libname pathDAT '$HOME/ITC4/Data/';
/* reading the SAS formats (i.e, file formats.sas7bdat) */
proc format cntlin=pathDAT.formats;
run;
/* creating the TAR_DAT */
data TAR_DAT;
    set pathDAT.tar;
run;

ods pdf file="egSurveylogistic.pdf" style=journal;

/* Fitting the weighted logistic regression */
proc surveylogistic;
    class cohort (ref='wave 1 recruits') country (ref='UK') sex (ref='male')
        ageGrp (ref='55-max') white (ref='0') income (ref='high')
        cigsday (ref='more than 31 cigarettes') chosenTar (ref='2')
        brand12months (ref='2') / param=ref;
    model knowTar(event='1') = country sex ageGrp white cohort chosenTar
        cigsday income brand12months us*w2cohort;
    weight cDE919v;
    strata cStrata;
    contrast 'AU vs US' country 1 0 -1 / est=exp;
    contrast 'CA vs US' country 0 1 -1 / est=exp;
    contrast 'UK vs US' country 0 0 -1 / est=exp;
    contrast 'AU vs UK' country 1 0 0 / est=exp;
    contrast 'CA vs UK' country 0 1 0 / est=exp;
    contrast 'AU vs CA' country 1 -1 0 / est=exp;
    contrast 'US cohort: wave 2 vs wave 1' cohort 1 0 us*w2cohort 1 /
est=exp;
    contrast 'US cohort: wave 3 vs wave 1' cohort 0 1 / est=exp;
    contrast 'US cohort: wave 3 vs wave 2' cohort -1 1 us*w2cohort -1 /
est=exp;
    contrast 'Cohort (overall): wave 2 vs wave 1' cohort 1 0 / est=exp;
    contrast 'Cohort (overall): wave 3 vs wave 1' cohort 0 1 / est=exp;
    contrast 'moderate vs high income' income 1 0 0 / est=exp;
    contrast 'low vs high income' income 0 1 0 / est=exp;
    contrast 'no answer vs high income' income 0 0 1 / est=exp;
run;

ods pdf close;

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Example of SAS Surveylogistic (using ITC-4 wave 3 data)

Do smokers know the tar level of their current cigarette brand?

The SURVEYLOGISTIC Procedure

Model Information		
Data Set	WORK.TAR_DAT	
Response Variable	knowTar	Gave response / Didn't know tar level
Number of Response Levels	2	
Stratum Variable	cStrata	Wave 3 strata information, all countries
Number of Strata	52	
Weight Variable	cDE919v	combined cross-sectional weight for M2/P2-P3
Model	Binary Logit	
Optimization Technique	Fisher's Scoring	
Variance Adjustment	Degrees of Freedom (DF)	

Number of Observations Read	25218
Number of Observations Used	6677
Sum of Weights Read	6667.758
Sum of Weights Used	6667.758

Response Profile			
Ordered Value	knowTar	Total Frequency	Total Weight
1	0	4427	4364.1509
2	1	2250	2303.6070

Probability modeled is knowTar=1.

Note: 18541 observations were deleted due to missing values for the response or explanatory variables.

Class Level Information				
Class	Value	Design Variables		
cohort	wave 1 recruits	0	0	
	wave 2 recruits	1	0	
	wave 3 recruits	0	1	
COUNTRY	AU	1	0	0
	CA	0	1	0
	UK	0	0	0
	US	0	0	1
sex	female	1		
	male	0		
ageGrp	18-24	1	0	0
	25-39	0	1	0
	40-54	0	0	1

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The SURVEYLOGISTIC Procedure

Class Level Information				
Class	Value	Design Variables		
	55-max	0	0	0
white	0	0		
	1	1		
income	high	0	0	0
	low	1	0	0
	moderate	0	1	0
	no answer	0	0	1
cigsday	1-10 cigarettes	1	0	0
	11-20 cigarettes	0	1	0
	21-30 cigarettes	0	0	1
	more than 31 cigarettes	0	0	0
chosentar	1	1		
	2	0		
brand12months	1	1		
	2	0		

Model Convergence Status

Convergence criterion (GCONV=1E-8) satisfied.

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
AIC	8598.160	6944.852
SC	8604.966	7080.980
-2 Log L	8596.160	6904.852

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	1691.3078	19	<.0001
Score	1562.8612	19	<.0001
Wald	970.4267	19	<.0001

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The SURVEYLOGISTIC Procedure

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
COUNTRY	3	699.1159	<.0001
sex	1	20.5332	<.0001
ageGrp	3	47.4634	<.0001
white	1	0.2503	0.6169
cohort	2	6.9433	0.0311
chosentar	1	53.4834	<.0001
cigsday	3	9.6353	0.0219
income	3	8.1119	0.0438
brand12months	1	8.2279	0.0041
us*w2cohort	1	5.2287	0.0222

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	-1.0101	0.2214	20.8076	<.0001
COUNTRY	AU	1	1.3076	0.0946	191.1990	<.0001
COUNTRY	CA	1	-0.3138	0.0950	10.9116	0.0010
COUNTRY	US	1	-1.6785	0.1272	174.1984	<.0001
sex	female	1	-0.3171	0.0700	20.5332	<.0001
ageGrp	18-24	1	0.7200	0.1373	27.4934	<.0001
ageGrp	25-39	1	0.6178	0.1005	37.7719	<.0001
ageGrp	40-54	1	0.3189	0.0984	10.5076	0.0012
white	1	1	0.0570	0.1140	0.2503	0.6169
cohort	wave 2 recruits	1	0.0605	0.1214	0.2484	0.6182
cohort	wave 3 recruits	1	0.2046	0.0777	6.9365	0.0084
chosentar	1	1	0.5845	0.0799	53.4834	<.0001
cigsday	1-10 cigarettes	1	-0.0878	0.1597	0.3022	0.5825
cigsday	11-20 cigarettes	1	0.1330	0.1521	0.7645	0.3819
cigsday	21-30 cigarettes	1	0.1908	0.1644	1.3462	0.2459
income	low	1	-0.2650	0.0934	8.0440	0.0046
income	moderate	1	-0.1087	0.0858	1.6047	0.2052
income	no answer	1	-0.1478	0.1537	0.9246	0.3363
brand12months	1	1	-0.2790	0.0973	8.2279	0.0041
us*w2cohort		1	-0.7052	0.3084	5.2287	0.0222

Example of SAS Surveylogistic (using ITC-4 wave 3 data)

Do smokers know the tar level of their current cigarette brand?

The SURVEYLOGISTIC Procedure

Odds Ratio Estimates				
Effect		Point Estimate	95% Wald Confidence Limits	
COUNTRY	AU vs UK	3.697	3.072	4.450
COUNTRY	CA vs UK	0.731	0.606	0.880
COUNTRY	US vs UK	0.187	0.145	0.239
sex	female vs male	0.728	0.635	0.835
ageGrp	18-24 vs 55-max	2.054	1.570	2.689
ageGrp	25-39 vs 55-max	1.855	1.523	2.259
ageGrp	40-54 vs 55-max	1.376	1.134	1.668
white	1 vs 0	1.059	0.847	1.324
cohort	wave 2 recruits vs wave 1 recruits	1.062	0.837	1.348
cohort	wave 3 recruits vs wave 1 recruits	1.227	1.054	1.429
chosentar	1 vs 2	1.794	1.534	2.098
cigsday	1-10 cigarettes vs more than 31 cigarettes	0.916	0.670	1.253
cigsday	11-20 cigarettes vs more than 31 cigarettes	1.142	0.848	1.539
cigsday	21-30 cigarettes vs more than 31 cigarettes	1.210	0.877	1.670
income	low vs high	0.767	0.639	0.921
income	moderate vs high	0.897	0.758	1.061
income	no answer vs high	0.863	0.638	1.166
brand12months	1 vs 2	0.757	0.625	0.915

Association of Predicted Probabilities and Observed Responses

Percent Concordant	78.9	Somers' D	0.581
Percent Discordant	20.8	Gamma	0.583
Percent Tied	0.3	Tau-a	0.260
Pairs	9960750	c	0.791

Contrast Test Results

Contrast	DF	Wald Chi-Square	Pr > ChiSq
AU vs US	1	577.9574	<.0001
CA vs US	1	118.4064	<.0001
UK vs US	1	174.1984	<.0001
AU vs UK	1	191.1990	<.0001
CA vs UK	1	10.9116	0.0010
AU vs CA	1	339.0170	<.0001
US cohort: wave 2 vs wave 1	1	5.0300	0.0249
US cohort: wave 3 vs wave 1	1	6.9365	0.0084

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The SURVEYLOGISTIC Procedure

Contrast Test Results

Contrast	DF	Wald	
		Chi-Square	Pr > ChiSq
US cohort: wave 3 vs wave 2	1	8.8080	0.0030
Cohort (overall): wave 2 vs wave 1	1	0.2484	0.6182
Cohort (overall): wave 3 vs wave 1	1	6.9365	0.0084
moderate vs high income	1	8.0440	0.0046
low vs high income	1	1.6047	0.2052
no answer vs high income	1	0.9246	0.3363

Contrast Rows Estimation and Testing Results

Contrast	Type	Row	Estimate	Standard Error	Alpha	Confidence Limits		Wald	
								Chi-Square	Pr > ChiSq
AU vs US	EXP	1	19.8081	2.4604	0.05	15.5280	25.2680	577.9574	<.0001
CA vs US	EXP	1	3.9145	0.4909	0.05	3.0614	5.0053	118.4064	<.0001
UK vs US	EXP	1	5.3577	0.6814	0.05	4.1757	6.8744	174.1984	<.0001
AU vs UK	EXP	1	3.6971	0.3496	0.05	3.0717	4.4500	191.1990	<.0001
CA vs UK	EXP	1	0.7306	0.0694	0.05	0.6065	0.8802	10.9116	0.0010
AU vs CA	EXP	1	5.0602	0.4456	0.05	4.2580	6.0134	339.0170	<.0001
US cohort: wave 2 vs wave 1	EXP	1	0.5248	0.1509	0.05	0.2988	0.9219	5.0300	0.0249
US cohort: wave 3 vs wave 1	EXP	1	1.2271	0.0953	0.05	1.0537	1.4289	6.9365	0.0084
US cohort: wave 3 vs wave 2	EXP	1	2.3380	0.6691	0.05	1.3343	4.0967	8.8080	0.0030
Cohort (overall): wave 2 vs wave 1	EXP	1	1.0624	0.1290	0.05	0.8374	1.3479	0.2484	0.6182
Cohort (overall): wave 3 vs wave 1	EXP	1	1.2271	0.0953	0.05	1.0537	1.4289	6.9365	0.0084
moderate vs high income	EXP	1	0.7672	0.0717	0.05	0.6388	0.9214	8.0440	0.0046
low vs high income	EXP	1	0.8970	0.0769	0.05	0.7582	1.0613	1.6047	0.2052
no answer vs high income	EXP	1	0.8626	0.1326	0.05	0.6382	1.1659	0.9246	0.3363