```
1          OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
72
73         title 'Heart Data study';
74
75
76         proc format;
77
77       !  value ynfmt  0 = 'No'  1 = 'Yes';
NOTE: Format YNFMT has been output.
78
78       !  value alivefmt  0 = 'Alive'  1 = 'Dead';
NOTE: Format ALIVEFMT has been output.
79
79       !  value dayfmt 1 = 'Sunday' 2 = 'Monday' 3 = 'Tuesday' 4 = 'Wednesday'
80          5 = 'Thursday' 6 = 'Friday' 7 =' Saturday' 9 = 'Missing';
NOTE: Format DAYFMT has been output.
81
81       !  value hdfmt 1  =  'NO CHD'
82                          2  =  'SUDDEN  DEATH'
83                          3  =  'NONFATALMI'
84                          5  =  'FATAL   MI'
85                          6  =  'OTHER   CHD';
NOTE: Format HDFMT has been output.
86           value newfmt 1 ='DiedFirstHA'  2 ='DiedNextTenYears' 3 ='AliveTenYearsLater';
NOTE: Format NEWFMT has been output.
87

NOTE: PROCEDURE FORMAT used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds

88         data heart;

89         infile '/folders/myfolders/sasuser.v94/heart.txt';
90             input heartDisease age bloodpressure ed Choles numcigarettes Stature bweight dayDeath alive familyHistory havehd;
91             label heartDisease = 'FIRST CORONARY HEART DISEASE EVENT '
92             age = 'AGE AT ENTRY TO STUDY'
93             bloodpressure = 'AVERAGE DIASTOLIC BLOOD PRESSURE IN 1958'
94             ed = 'YEARS OF EDUCATION'
95             choles = 'SERUM CHOLESTEROL IN 1958 -- MG PER DL'
96             numcigarettes = 'NUMBER OF CIGARETTES PER DAY IN 1958'
97             stature = 'STATURE, 1958 -- TO NEAREST 0.1 INCH'
98             bweight = 'BODY WEIGHT, 1958 -- IN POUNDS'
99             dayDeath = 'DAY OF DEATH '
100            alive = 'ALIVE 10 YEARS AFTER ENTERING STUDY'
101            familyHistory = 'FAMILY HISTORY OF CORONARY HEART DISEASE'
102            havehd = 'HAVE CORONARY HEART DISEASE';
103
104        format familyHistory havehd ynfmt.;
105        format alive alivefmt.;
106        format dayDeath dayfmt.;
107        format heartDisease hdfmt.;
108
109        if bloodpressure = 999 then bloodpressure =.;
110        if ed = 99 then ed = .;
111        if numcigarettes = 999 then numcigarettes =.;
112
113        if heartDisease = 2 or heartDisease = 5 then new = 1; else new =2;
114        if alive =0 then new =3;
115        format new newfmt.;
116
117

NOTE: The infile '/folders/myfolders/sasuser.v94/heart.txt' is:
      Filename=/folders/myfolders/sasuser.v94/heart.txt,
      Owner Name=sasdemo,Group Name=sas,
      Access Permission=-rw-rw-r--,
      Last Modified=February 24, 2018 10:40:08,
      File Size (bytes)=18642

NOTE: 239 records were read from the infile '/folders/myfolders/sasuser.v94/heart.txt'.
      The minimum record length was 76.
      The maximum record length was 76.
NOTE: The data set WORK.HEART has 239 observations and 13 variables.
NOTE: DATA statement used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds

118        proc means;

119         var age bloodpressure ed choles numcigarettes stature bweight;
120

NOTE: There were 239 observations read from the data set WORK.HEART.
NOTE: PROCEDURE MEANS used (Total process time):
      real time           0.09 seconds
      cpu time            0.09 seconds

121        proc freq;

122        tables familyHistory havehd alive dayDeath heartDisease new;
123        tables (heartDisease alive)* new / norow nocol nopercent missing;
124        tables (havehd alive)*heartDisease/ norow nocol nopercent missing;
125

NOTE: There were 239 observations read from the data set WORK.HEART.
```

```
NOTE: PROCEDURE FREQ used (Total process time):
      real time           0.23 seconds
      cpu time            0.23 seconds

126         proc logistic data=heart;

127         model new(ref='AliveTenYearsLater')= age bloodpressure numcigarettes familyHistory/ link = glogit;
128         run;

NOTE: PROC LOGISTIC is fitting the generalized logit model. The logits modeled contrast each response category against the
      reference category (new='AliveTenYearsLater').
NOTE: Convergence criterion (GCONV=1E-8) satisfied.
NOTE: There were 239 observations read from the data set WORK.HEART.
NOTE: PROCEDURE LOGISTIC used (Total process time):
      real time           0.21 seconds
      cpu time            0.19 seconds


129
130         proc transpose data=heart;
131         run;

NOTE: There were 239 observations read from the data set WORK.HEART.
NOTE: The data set WORK.DATA1 has 13 observations and 241 variables.
NOTE: PROCEDURE TRANSPOSE used (Total process time):
      real time           0.01 seconds
      cpu time            0.02 seconds


132
133         proc print;
134         run;

NOTE: There were 13 observations read from the data set WORK.DATA1.
NOTE: PROCEDURE PRINT used (Total process time):
      real time           3.01 seconds
      cpu time            2.98 seconds


135
136         proc logistic data=heart;
137         model new(ref='AliveTenYearsLater')= age bloodpressure numcigarettes familyHistory/ link = glogit;
138         contrast 'numcigarettes and familyHistory' numcigarettes 1, familyHistory 1;
139         numcigarettes_n_familyhistory:test numcigarettes_DiedFirstHA = numcigarettes_DiedNextTenYears
140         = familyHistory_DiedFirstHA = familyHistory_DiedNextTenYears = 0;
141
142

NOTE: PROC LOGISTIC is fitting the generalized logit model. The logits modeled contrast each response category against the
      reference category (new='AliveTenYearsLater').
NOTE: Convergence criterion (GCONV=1E-8) satisfied.
NOTE: There were 239 observations read from the data set WORK.HEART.
NOTE: PROCEDURE LOGISTIC used (Total process time):
      real time           0.14 seconds
      cpu time            0.14 seconds

143         proc logistic data=heart;

144         model new(ref='AliveTenYearsLater')= age bloodpressure / link = glogit;
145         run;

NOTE: PROC LOGISTIC is fitting the generalized logit model. The logits modeled contrast each response category against the
      reference category (new='AliveTenYearsLater').
NOTE: Convergence criterion (GCONV=1E-8) satisfied.
NOTE: There were 239 observations read from the data set WORK.HEART.
NOTE: PROCEDURE LOGISTIC used (Total process time):
      real time           0.10 seconds
      cpu time            0.11 seconds


146
147         proc iml;
NOTE: IML Ready
148
148       !  b01 = -7.6634;
148       !                 b11 = 0.0901;
148       !                               b21 = 0.0219;
149
149       !  b02 = -13.5278;
149       !                  b21 = 0.1450;
149       !                                b22 = 0.0448;
150
150       !  age = 50;
150       !             bloodpressure = 100;
151
151       !  L1= -7.6634 + 0.0901 * 50 + 0.0219 * 100;
152
152       !  L2= -13.5278 + 0.1450 * 50 + 0.0448 * 100;
153
153       !  denom = 1 + exp(L1) + exp(L2);
154
154       !  DeadFirstHA = exp(L1)/denom;
155
155       !  DeadTenYears = exp(L2)/denom;
156
156       !  Alive = 1 /denom;
157
157       !  print" For a 50 year old with a diastolic blood pressure of 100 ";
```

```
158
158      !  print DeadFirstHA DeadTenYears Alive;
159
160
161
161      !  age = 5;
161      !            bloodpressure = 400;
162
162      !  L1= -7.6634 + 0.0901 * 5 + 0.0219 * 400;
163
163      !  L2= -13.5278 + 0.1450 * 5 + 0.0448 * 400;
164
164      !  denom = 1 + exp(L1) + exp(L2);
165
165      !  DeadFirstHA = exp(L1)/denom;
166
166      !  DeadTenYears = exp(L2)/denom;
167
167      !  Alive = 1 /denom;
168
168      !  print" For a 5 year old with a diastolic blood pressure of 400 ";
169
169      !  print DeadFirstHA DeadTenYears Alive;
170
171
172
173
174
175        OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
188
```