Laboratory 8  
Conditional Logistic Regression  
Homework 8 Answer Key

1:1 Conditional Logistic Regression

Description of Data

‘CASECONTROL11.DBF’ is data from a 1:1 matched case-control study of low birth weight (<2500 grams) babies. There are 56 matched pairs, with the variable STATUS=1 indicating a case and STATUS=0 indicating a control. Controls were age-matched mothers who gave birth to a baby above 2500 grams. Risk factors under study were race, maternal smoking during pregnancy, history of hypertension, history of premature labor, presence of uterine irritability, and mother’s pre-pregnant weight. The goal of the analysis is to determine whether the low birth weight is associated with any of the explanatory variables. Following is the data dictionary (in order as on file):

ID identification variable for each matched pair  
Status 0= GE 2500 grams (controls), 1=<2500 grams (cases)  
AGE age of mother in years  
LWT pre-pregnant weight, weight in pounds at last menstrual period  
RACE race of mother (1=white, 2=black, 3= other)  
SMOKE smoking status during pregnancy (1=yes, 0=no)  
PTD history of premature labor (1=yes, 0=no)  
HT history of hypertension (1=yes, 0=no)  
UI presence of uterine irritability (1=yes, 0=no)

Please run the following SAS program, report and interpret the results

SAS Output of the Final Model

Analysis of Maximum Likelihood Estimates

<table>
<thead>
<tr>
<th>Variable</th>
<th>DF</th>
<th>Parameter Estimate</th>
<th>Standard Error</th>
<th>Chi-Square</th>
<th>Pr &gt; ChiSq</th>
<th>Hazard Ratio</th>
<th>95% Hazard Ratio Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>smoke</td>
<td>1</td>
<td>0.95320</td>
<td>0.40663</td>
<td>5.4949</td>
<td>0.0191</td>
<td>2.594</td>
<td>1.169               5.756</td>
</tr>
<tr>
<td>ptd</td>
<td>1</td>
<td>1.06310</td>
<td>0.50571</td>
<td>4.4192</td>
<td>0.0355</td>
<td>2.895</td>
<td>1.075               7.801</td>
</tr>
</tbody>
</table>

In the model selection process, only the variables SMOKE, PTD are entered into the model, variables AGE, RACE1, RACE2, HT, UI are not.

Parameter estimates for both SMOKE and PTD are significant.
The odds ratio for SMOKE indicates that mothers who smoked during pregnancy are 2.594 times as likely to have a low birth weight baby as those mothers who did not smoke. (Mothers who smoked increased the odds of getting a low birth weight baby by 159.4% compared to those mothers who did not smoke).

The odds ratio for PTD indicates that mothers with a history of premature labor are 2.895 times as likely to have a low birth weight baby as those mothers without it. (Mothers who had a history of premature labor increased their odds of getting a low birth weight baby by 189.5% compared to those who without a history of premature labor).

1:3 Conditional Logistic Regression

**Description of Data**

‘CASECONTROL13.TXT’ is data from a 1:3 matched hospital based case-control study. Cases are women diagnosed with benign breast disease from two hospitals. Controls were selected from other patients at the same two hospitals. Following is a list of variables in order:

- **ID**: stratum number
- **SUBJECT**: observation within a matched set (1=case, 2-4= controls)
- **AGEINTER**: age of the subject at the interview
- **STATUS**: diagnosis (1=case, 0=control)
- **MCHECK**: regular medical checkup history (1=yes, 0=no)
- **AGEP**: age at first pregnancy
- **AGEM**: age at menarche
- **NONLIVEN**: number of stillbirths, miscarriages, and other non live births
- **LIVEN**: number of live births
- **WEIGHT**: weight of the subject
- **AGELM**: age at last menstrual period

Please run the following SAS program, report and interpret the results.
SAS Output of the Final Model

Analysis of Maximum Likelihood Estimates

<table>
<thead>
<tr>
<th>Variable</th>
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<th>95% Hazard Ratio Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>agrm</td>
<td>1</td>
<td>0.41021</td>
<td>0.11789</td>
<td>12.1076</td>
<td>0.0005</td>
<td>1.507</td>
<td>1.196</td>
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<td>weight</td>
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<td>-0.02730</td>
<td>0.00950</td>
<td>8.2677</td>
<td>0.0040</td>
<td>0.973</td>
<td>0.955</td>
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<tr>
<td>agelm</td>
<td>1</td>
<td>0.06396</td>
<td>0.02846</td>
<td>5.0502</td>
<td>0.0246</td>
<td>1.066</td>
<td>1.008</td>
</tr>
</tbody>
</table>

The variables AGEM, WEIGHT, AGELM are entered into the model, but variables AGEINTER, MCHECK AGEP, NONLIVEN, LIVEN are not.

For each year increase in the age of menarche there was a 50.7% increase in the risk of getting benign breast disease.

There was a protective effect against benign breast disease, with a decline in odds of 2.7% for each unit increase in weight in this data.

For each year increase in the age at last menstrual period there was a 6.6% increase in the risk of getting benign breast disease.