5. SAS

```
Title      'clinical_305.sas         2006-1-26
Y.Takahashi ' ;

data clinical ;
     input id hosp drug sex age age3 severity
c_drug y123 y122 y112 ;
           if  y122=1   then  y122r   =
'Placebo' ;
           if  y122=2   then  y122r   =
'Active ' ;
           if  y112=1   then  y112r   =
'Placebo' ;
           if  y112=2   then  y112r   =
'Active ' ;

/*
                          123        122
     112*/
datalines ;
1    1   2   1   63   2   1   1   1   1   1
2    1   2   1   63   2   1   1   3   2   2
3    1   2   1   57   2   1   2   1   1   1
4    1   2   1   22   1   1   2   3   2   2
5    1   2   1   45   2   2   2   2   2   1
6    1   2   1   56   2   3   2   1   1   1
7    1   2   1   46   2   3   2   2   2   1
8    1   2   2   52   2   1   2   1   1   1
9    1   2   2   64   2   2   1   1   1   1
10   1   2   2   69   3   2   1   1   1   1
11   1   2   2   67   3   2   2   3   2   2
12   1   2   2   48   2   3   1   3   2   2
13   1   1   1   56   2   1   2   3   2   2
14   1   1   1   64   2   2   2   2   2   1
15   1   1   1   67   3   2   2   2   2   1
16   1   1   1   67   3   3   2   3   2   2
17   1   1   1   69   3   3   2   3   2   2
18   1   1   1   36   1   3   2   3   2   2
19   1   1   2   76   3   1   1   3   2   2
20   1   1   2   64   2   1   1   3   2   2
21   1   1   2   72   3   1   2   2   2   1
22   1   1   2   45   2   2   1   3   2   2
23   1   1   2   58   2   2   1   3   2   2
24   1   1   2   69   3   3   1   2   2   1
25   1   1   2   47   2   3   1   3   2   2
26   1   1   2   32   1   3   2   1   1   1
27   1   1   2   58   2   3   2   2   2   1
28   1   1   2   33   1   3   2   2   2   1
29   1   1   2   63   2   3   2   3   2   2
30   2   2   1   69   3   1   1   1   1   1
31   2   2   1   61   2   1   1   1   1   1
32   2   2   1   44   1   1   1   1   1   1
33   2   2   1   62   2   1   1   2   2   1
34   2   2   1   56   2   1   1   2   2   1
35   2   2   1   57   2   1   1   2   2   1
36   2   2   1   40   1   1   1   2   2   1
37   2   2   1   61   2   1   1   3   2   2
38   2   2   1   63   2   1   1   3   2   2
39   2   2   1   56   2   1   3   2   2   1
40   2   2   1   42   1   1   2   2   2   1
41   2   2   1   49   2   1   2   2   2   1
42   2   2   1   42   1   1   2   3   2   2
43   2   2   1   58   2   2   1   2   2   1
44   2   2   1   31   1   2   1   2   2   1
45   2   2   1   35   1   2   1   3   2   2
46   2   2   1   48   2   2   2   1   1   1
47   2   2   1   53   2   2   2   2   2   1
48   2   2   1   39   1   2   2   2   2   1
49   2   2   1   38   1   3   1   3   2   2
50   2   2   1   60   2   3   2   1   1   1
51   2   2   1   35   1   3   2   2   2   1
52   2   2   1   61   2   3   2   3   2   2
53   2   2   2   74   3   1   1   1   1   1
54   2   2   2   55   2   1   1   2   2   1
55   2   2   2   41   1   1   1   3   2   2
56   2   2   2   66   3   1   1   3   2   2
57   2   2   2   33   1   1   2   2   2   1
58   2   2   2   55   2   1   2   2   2   1
59   2   2   2   61   2   1   2   3   2   2
60   2   2   2   44   1   1   2   3   2   2
61   2   2   2   51   2   1   2   3   2   2
62   2   2   2   32   1   1   2   3   2   2
63   2   2   2   69   3   2   1   1   1   1
64   2   2   2   60   2   2   1   2   2   1
65   2   2   2   52   2   2   1   2   2   1
66   2   2   2   53   2   2   1   2   2   1
67   2   2   2   61   2   2   1   3   2   2
68   2   2   2   76   3   2   2   2   2   1
69   2   2   2   56   2   2   2   3   2   2
70   2   2   2   55   2   2   2   3   2   2
71   2   2   2   32   1   2   2   3   2   2
72   2   2   2   51   2   3   1   1   1   1
73   2   2   2   40   1   3   1   1   1   1
74   2   2   2   51   2   3   1   2   2   1
75   2   2   2   36   1   3   1   2   2   1
76   2   2   2   36   1   3   1   3   2   2
77   2   2   2   58   2   3   1   3   2   2
78   2   2   2   56   2   3   1   3   2   2
79   2   2   2   59   2   3   2   3   2   2
80   2   1   1   57   2   1   1   2   2   1
81   2   1   1   65   3   1   1   3   2   2
82   2   1   1   44   1   1   2   3   2   2
83   2   1   1   62   2   2   1   2   2   1
84   2   1   1   65   3   2   1   3   2   2
85   2   1   1   41   1   2   1   3   2   2
86   2   1   1   51   2   2   2   1   1   1
87   2   1   1   69   3   2   2   1   1   1
88   2   1   1   53   2   2   2   3   2   2
89   2   1   1   52   2   3   1   3   2   2
90   2   1   1   69   3   3   1   3   2   2
91   2   1   1   41   1   3   2   2   2   1
92   2   1   1   58   2   3   2   3   2   2
93   2   1   1   55   2   3   2   3   2   2
94   2   1   1   48   2   3   2   3   2   2
95   2   1   2   61   2   1   1   1   1   1
96   2   1   2   68   3   1   1   2   2   1
97   2   1   2   46   2   1   1   2   2   1
98   2   1   2   33   1   1   1   3   2   2
99   2   1   2   57   2   1   1   3   2   2
100  2   1   2   42   1   1   2   1   1   1
101  2   1   2   39   1   1   2   2   2   1
102  2   1   2   59   2   1   2   2   2   1
103  2   1   2   69   3   1   2   2   2   1
104  2   1   2   55   2   1   2   3   2   2
105  2   1   2   42   1   2   1   1   1   1
106  2   1   2   51   2   2   1   2   2   1
107  2   1   2   44   1   2   1   2   2   1
108  2   1   2   43   1   2   1   3   2   2
109  2   1   2   66   3   2   1   3   2   2
110  2   1   2   41   1   2   2   1   1   1
111  2   1   2   68   3   2   2   1   1   1
112  2   1   2   63   2   2   2   2   2   1
113  2   1   2   47   2   2   2   2   2   1
114  2   1   2   52   2   2   2   2   2   1
115  2   1   2   43   1   2   3   3   2   2
116  2   1   2   57   2   2   3   3   2   2
117  2   1   2   66   3   2   3   3   2   2
118  2   1   2   58   2   3   1   1   1   1
119  2   1   2   67   3   3   1   1   1   1
120  2   1   2   65   3   3   1   3   2   2
121  2   1   2   53   2   3   1   3   2   2
122  2   1   2   36   1   3   2   1   1   1
123  2   1   2   55   2   3   2   2   2   1
124  2   1   2   53   2   3   2   3   2   2
125  3   2   1   74   3   1   1   1   1   1
126  3   2   1   61   2   1   1   1   1   1
127  3   2   1   70   3   1   1   2   2   1
128  3   2   1   78   3   1   1   3   2   2
129  3   2   1   35   1   1   1   3   2   2
130  3   2   1   71   3   1   2   1   1   1
131  3   2   1   47   2   1   2   1   1   1
132  3   2   1   67   3   1   2   2   2   1
133  3   2   1   59   2   2   1   1   1   1
134  3   2   1   56   2   2   1   2   2   1
135  3   2   1   59   2   2   2   3   2   2
136  3   2   1   54   2   3   1   1   1   1
137  3   2   1   45   2   3   1   1   1   1
138  3   2   1   48   2   3   2   2   2   1
139  3   2   2   67   3   1   1   2   2   1
140  3   2   2   56   2   1   1   2   2   1
141  3   2   2   53   2   1   1   3   2   2
142  3   2   2   55   2   1   1   3   2   2
143  3   2   2   57   2   1   2   2   2   1
144  3   2   2   42   1   1   2   2   2   1
145  3   2   2   60   2   1   2   3   2   2
146  3   2   2   37   1   2   2   3   2   2
147  3   2   2   44   1   2   2   3   2   2
148  3   2   2   56   2   2   3   2   2   2
149  3   2   2   60   2   3   1   2   2   1
150  3   2   2   58   2   3   1   3   2   2
151  3   2   2   40   1   3   1   3   2   2
152  3   1   1   69   3   1   1   3   2   2
153  3   1   1   47   2   1   2   1   1   1
154  3   1   1   62   2   1   2   3   2   2
155  3   1   1   56   2   1   2   3   2   2
156  3   1   1   55   2   2   1   1   1   1
157  3   1   1   40   1   2   1   2   2   1
158  3   1   1   30   1   2   1   3   2   2
159  3   1   1   39   1   2   1   3   2   2
160  3   1   1   53   2   2   2   2   2   1
161  3   1   1   66   3   3   1   3   2   2
162  3   1   1   64   2   3   2   1   1   1
163  3   1   1   51   2   3   2   1   1   1
164  3   1   1   56   2   3   2   2   2   1
165  3   1   1   61   2   3   2   2   2   1
166  3   1   1   53   2   3   2   3   2   2
167  3   1   1   64   2   3   2   3   2   2
168  3   1   2   41   1   1   1   2   2   1
169  3   1   2   66   3   1   1   3   2   2
170  3   1   2   65   3   1   1   3   2   2
171  3   1   2   56   2   1   2   1   1   1
172  3   1   2   43   1   1   2   2   2   1
173  3   1   2   57   2   1   2   3   2   2
174  3   1   2   52   2   2   1   3   2   2
175  3   1   2   20   1   2   2   2   2   1
176  3   1   2   32   1   2   2   3   2   2
177  3   1   2   72   3   3   1   2   2   1
178  3   1   2   65   3   3   1   2   2   1
179  3   1   2   48   2   3   1   3   2   2
180  3   1   2   54   2   3   1   3   2   2
181  3   1   2   58   2   3   2   1   1   1
182  3   1   2   56   2   3   2   2   2   1
183  4   2   1   76   3   1   1   1   1   1
184  4   2   1   42   1   1   1   1   1   1
185  4   2   1   62   2   1   1   1   1   1
186  4   2   1   37   1   1   1   2   2   1
187  4   2   1   44   1   1   1   2   2   1
188  4   2   1   60   2   1   1   2   2   1
189  4   2   1   41   1   1   1   2   2   1
190  4   2   1   52   2   1   1   3   2   2
191  4   2   1   51   2   1   1   3   2   2
192  4   2   1   54   2   1   1   3   2   2
193  4   2   1   53   2   1   1   3   2   2
194  4   2   1   86   3   1   2   3   2   2
195  4   2   1   69   3   2   1   1   1   1
196  4   2   1   69   3   2   1   1   1   1
197  4   2   1   41   1   2   1   2   2   1
198  4   2   1   41   1   2   1   2   2   1
199  4   2   1   55   2   2   1   3   2   2
200  4   2   1   53   2   2   2   3   2   2
201  4   2   1   67   3   2   2   1   1   1
202  4   2   1   48   2   2   2   1   1   1
203  4   2   1   40   1   2   2   2   2   1
204  4   2   1   60   2   2   2   2   2   1
205  4   2   1   45   2   2   2   3   2   2
206  4   2   1   54   2   2   2   3   2   2
207  4   2   1   45   2   2   2   3   2   2
208  4   2   1   65   3   2   2   3   2   2
209  4   2   1   53   2   2   2   3   2   2
210  4   2   1   81   3   3   1   2   2   1
211  4   2   1   44   1   3   1   2   2   1
212  4   2   1   53   2   3   1   2   2   1
213  4   2   1   75   3   3   1   3   2   2
214  4   2   1   57   2   3   2   1   1   1
215  4   2   1   61   2   3   2   2   2   1
```

```
216  4  2  1  50  2  3  2  2  2  1          256  4  1  1  62  2  1  2  3  2  2          296  4  1  2  37  1  2  2  3  2  2
217  4  2  1  61  2  3  2  3  2  2          257  4  1  1  66  3  2  1  3  2  2          297  4  1  2  78  3  3  1  1  1  1
218  4  2  1  59  2  3  2  3  2  2          258  4  1  1  51  2  2  1  3  2  2          298  4  1  2  65  3  3  1  2  2  1
219  4  2  2  61  2  1  1  1  1  1          259  4  1  1  46  2  2  1  3  2  2          299  4  1  2  41  1  3  1  3  2  2
220  4  2  2  46  2  1  1  1  1  1          260  4  1  1  68  3  2  2  3  2  2          300  4  1  2  63  2  3  1  3  2  2
221  4  2  2  84  3  1  1  1  1  1          261  4  1  1  69  3  2  2  3  2  2          301  4  1  2  32  1  3  1  3  2  2
222  4  2  2  42  1  1  1  2  2  1          262  4  1  1  36  1  2  2  3  2  2          302  4  1  2  53  2  3  1  3  2  2
223  4  2  2  39  1  1  1  2  2  1          263  4  1  1  58  2  3  1  2  2  1          303  4  1  2  40  1  3  2  2  2  1
224  4  2  2  52  2  1  1  3  2  2          264  4  1  1  36  1  3  1  3  2  2          304  4  1  2  45  2  3  2  3  2  2
225  4  2  2  65  3  1  1  3  2  2          265  4  1  1  22  1  3  1  3  2  2          305  4  1  2  47  2  3  2  3  2  2
226  4  2  2  59  2  1  1  3  2  2          266  4  1  1  66  3  3  2  1  1  1
227  4  2  2  58  2  1  2  1  1  1          267  4  1  1  71  3  3  2  2  2  1          ;
228  4  2  2  46  2  1  2  1  1  1          268  4  1  1  67  3  3  2  3  2  2          proc print data=clinical ;
229  4  2  2  56  2  1  2  1  1  1          269  4  1  1  62  2  3  2  3  2  2          run ;
230  4  2  2  55  2  1  2  1  1  1          270  4  1  1  60  2  3  2  3  2  2
231  4  2  2  42  1  1  2  2  2  1          271  4  1  1  57  2  3  2  3  2  2          title2 '<<<          >>>' ;
232  4  2  2  57  2  1  2  2  2  1          272  4  1  2  47  2  1  1  1  1  1          proc   tabulate  data=clinical   noseps
233  4  2  2  63  2  1  2  2  2  1          273  4  1  2  39  1  1  1  3  2  2          format=10. ;
234  4  2  2  60  2  1  2  3  2  2          274  4  1  2  42  1  1  1  3  2  2             class   drug hosp sex age3 severity
235  4  2  2  53  2  1  2  3  2  2          275  4  1  2  60  2  1  1  3  2  2          c_drug   y123 ;
236  4  2  2  47  2  2  1  1  1  1          276  4  1  2  71  3  1  1  3  2  2                  table    all hosp sex age3
237  4  2  2  79  3  2  1  2  2  1          277  4  1  2  31  1  1  1  3  2  2          severity c_drug, y123   all  / rts=15 ;
238  4  2  2  77  3  2  1  3  2  2          278  4  1  2  42  1  1  2  1  1  1                  run ;
239  4  2  2  58  2  2  2  1  1  1          279  4  1  2  51  2  1  2  1  1  1
240  4  2  2  64  2  3  1  1  1  1          280  4  1  2  52  2  1  2  1  1  1          title2 '<<<
241  4  2  2  47  2  3  1  3  2  2          281  4  1  2  66  3  1  2  2  2  1                >>>' ;
242  4  2  2  65  3  3  1  3  2  2          282  4  1  2  68  3  1  2  2  2  1          proc logistic data=clinical  ;
243  4  2  2  59  2  3  1  3  2  2          283  4  1  2  57  2  1  2  2  2  1             class    age3   / param=reference
244  4  2  2  53  2  3  2  1  1  1          284  4  1  2  69  3  1  2  2  2  1          ref=first ;
245  4  2  2  55  2  3  2  2  1  1          285  4  1  2  80  3  1  2  3  2  2                  model   y123 = age3 severity
246  4  2  2  73  3  3  2  3  2  2          286  4  1  2  64  2  1  2  3  2  2          / expb tech=newton    ;
247  4  2  2  44  1  3  2  3  2  2          287  4  1  2  65  3  1  2  3  2  2                  run ;
248  4  1  1  35  1  1  1  1  1  1          288  4  1  2  90  3  1  2  3  2  2
249  4  1  1  54  2  1  1  3  2  2          289  4  1  2  73  3  2  1  1  1  1          title2 '<<<          >>>' ;
250  4  1  1  64  2  1  2  1  1  1          290  4  1  2  65  3  2  1  2  2  1          proc logistic data=clinical   ;
251  4  1  1  36  1  1  2  1  1  1          291  4  1  2  54  2  2  1  3  2  2             class    drug    / param=reference
252  4  1  1  43  1  1  2  2  2  1          292  4  1  2  51  2  2  1  1  1  1          ref=first ;
253  4  1  1  54  2  1  2  2  2  1          293  4  1  2  50  2  2  1  1  1  1                  model   y123 = drug / expb
254  4  1  1  39  1  1  2  2  2  1          294  4  1  2  64  2  2  2  2  2  1          tech=newton    ;
255  4  1  1  64  2  1  2  3  2  2          295  4  1  2  73  3  2  2  2  2  1                  run ;
```

Title 'clinical_305b.sas   2006-1-26   Y.Takahashi ' ;

```
/*data clinical ;
     input id hosp drug sex age age3 severity c_drug y123
y122 y112 ;
          if y122=1 then y122r = 'Placebo' ;
          if y122=2 then y122r = 'Active ' ;
          if y112=1 then y112r = 'Placebo' ;
          if y112=2 then y112r = 'Active ' ;


          123        122        112
datalines ;
1  1  2  1  63  2  1  1  1  1  1
2  1  2  1  63  2  1  1  3  2  2
3  1  2  1  57  2  1  2  1  1  1

304  4  1  2  45  2  3  2  3  2  2
305  4  1  2  47  2  3  2  3  2  2 */
;
proc print data=clinical ;
run ;

title2 '<<<              >>>' ;
proc tabulate data=clinical noseps format=10. ;
     class   drug hosp sex age3 severity c_drug   y123 ;
          table   all hosp sex age3 severity c_drug, y123
all   / rts=15 ;
          run ;
title2 '<<<                  >>>' ;
proc logistic data=clinical   ;
     class   age3   / param=reference ref=first ;
          model     y123  =  age3  severity  /  expb
tech=newton    ;
          run ;
title2 '<<<                  >>>' ;
```

```
proc logistic data=clinical   ;
     class   drug  / param=reference ref=first ;
          model   y123 = drug / expb tech=newton     ;
          run ;


title2 '<<<
     >>>' ;
proc transpose data=clinical   out=clinical_T ;
     var   hosp sex age3 severity c_drug ;
     by   id   drug y123 y122r y112r ;
          run ;

data clinical_T ;
     set clinical_T ;
              var_name = _NAME_ ;
     value     = COL1 ;
          if var_name = 'hosp'       then var_name =
'1:hosp     ' ;
          if var_name = 'sex'        then var_name =
'2:sex      ' ;
          if var_name = 'age3'       then var_name =
'3:age3     ' ;
          if var_name = 'severity'   then var_name =
'4:severity' ;
          if var_name = 'c_drug'     then var_name =
'5:c_drug   ' ;
          drop _NAME_ COL1 ;
     run ;

proc sort data=clinical_T ;
     by var_name id ;
          run ;

proc print data=clinical_T ;
run ;

proc logistic data=clinical_T   ;
     class   drug value / param=reference ref=first ;
```

```
          model   y123 = drug value drug*value/ expb
tech=newton    ;
          by   var_name ;
          run ;

proc logistic data=clinical_T   ;
     class   drug value / param=reference ref=first ;
          model     y123  =   drug   value  /   expb
tech=newton    ;
          by   var_name ;
          run ;


title2 '<<<              ++                >>>' ;
proc tabulate data=clinical noseps format=10. ;
     class   drug hosp sex age3 severity c_drug   y123 y122
y112 ;
          table    all hosp sex age3 severity c_drug,
drug*(y122 all)   / rts=15 ;
          run ;

proc freq data=clinical_T ;
     table   var_name*value*drug*y122r / nopercent nocol
norow relrisk ;
          run ;

title2 '<<<             +                 >>>' ;
proc tabulate data=clinical noseps format=10. ;
     class   drug hosp sex age3 severity c_drug   y123 y122
y112 ;
          table    all hosp sex age3 severity c_drug,
drug*(y112 all)   / rts=15 ;
          run ;
proc freq data=clinical_T ;
     table   var_name*value*drug*y112r / nopercent nocol
norow relrisk ;
          run ;

title2 '<<<
>>>' ;
proc logistic data=clinical   ;
     class   drug hosp / param=reference ref=first ;
          model     y123   =   drug   hosp   /   expb
tech=newton    ;
          run ;

title2 '<<<                         >>>' ;
proc logistic data=clinical   ;
     class   drug hosp / param=reference ref=first ;
          model   y122  =  drug  hosp  drug*hosp/  expb
tech=newton    ;
          run ;

proc logistic data=clinical   ;
     class   drug hosp / param=reference ref=first ;
          model   y112  =  drug  hosp  drug*hosp/  expb
tech=newton    ;
          run ;

proc logistic data=clinical   ;
     class   drug hosp / param=reference ref=first ;
          model   y123  =  drug  hosp  drug*hosp/  expb
tech=newton    ;
          run ;


title2 '<<<                         >>>' ;
proc tabulate data=clinical noseps format=10. ;
```

```
     class   drug hosp sex age3 severity c_drug   y123 y122
y112 ;
          table   all hosp sex age3 severity c_drug, drug
all / rts=15 ;
          run ;

proc freq data=clinical ;
     table   hosp*drug / nopercent nocol norow chisq ;
     table   sex *drug / nopercent nocol norow chisq ;
     table   age3*drug / nopercent nocol norow chisq ;
     table   severity*drug / nopercent nocol norow chisq ;
     table   c_drug   *drug / nopercent nocol norow chisq ;
          run ;

title2 '<<<                         >>>' ;
proc tabulate data=clinical noseps format=6. ;
     class   drug hosp sex age3 severity c_drug   y123 y122
y112 ;
          table   severity, drug*(y123 all) / rts=15 ;
          run ;

proc freq data=clinical ;
     table severity*drug*y123 / nopercent nocol norow cmh
score=table ;
     table severity*drug*y122 / nopercent nocol norow cmh
score=table ;
     table severity*drug*y112 / nopercent nocol norow cmh
score=table ;
          run ;


title2 '<<<
>>>' ;
proc logistic data=clinical   ;
     class   drug   hosp   sex   age3   severity   c_drug   /
param=reference ref=first   ;
          model y123 =   drug | hosp | age3 | sex | severity
|c_drug @2
               / expb tech=newton     ;
          run ;

proc logistic data=clinical   ;
     class   drug   hosp   sex   age3   severity   c_drug   /
param=reference ref=first   ;
          model y123 =   drug | hosp | age3 | sex | severity
|c_drug @2
               / expb tech=newton   selection=backward
slstay=0.20 ;
          run ;

proc logistic data=clinical   ;
     class   drug   hosp   sex   age3   severity   c_drug   /
param=reference ref=first   ;
          model y123 =   drug | hosp | age3 | sex | severity
|c_drug @2
               / expb tech=newton   selection=backward
slstay=0.15 ;
          run ;

proc logistic data=clinical   ;
     class   drug   hosp   sex   age3   severity   c_drug   /
param=reference ref=first   ;
          model y123 =   drug | hosp | age3 | sex | severity
|c_drug @2
               / expb tech=newton   selection=backward
slstay=0.05 ;
          run ;
```