

The sepsis data

January 28, 2011

The data:

```
0 0 0 0 56 0
0 0 0 0 80 0
0 0 0 0 61 0
0 0 0 0 26 0
0 0 0 0 53 0
1 0 1 0 87 0
0 0 0 0 21 0
1 0 0 1 69 0
0 0 0 0 57 0
0 0 1 0 76 0
1 0 0 1 66 1
0 0 0 0 48 0
0 0 0 0 18 0
0 0 0 0 46 0
0 0 1 0 22 0
0 0 1 0 33 0
0 0 0 0 38 0
0 0 0 0 27 0
1 1 1 0 60 1
0 0 0 0 31 0
0 0 0 0 59 1
0 0 0 0 29 0
0 1 0 0 60 0
1 1 0 0 63 1
0 0 0 0 80 0
0 0 0 0 23 0
0 0 0 0 71 0
0 0 0 0 87 0
1 1 1 0 70 0
0 0 0 0 22 0
0 0 0 0 17 0
1 0 0 1 49 0
0 1 0 0 50 0
```

```

0 0 0 0 51 0
0 0 1 1 37 0
0 0 0 0 76 0
0 0 0 1 60 0
1 1 0 0 78 1
0 0 1 1 60 0
1 1 1 0 57 0
0 0 0 0 28 1
0 0 0 0 94 0
0 0 0 0 43 0
0 0 0 0 70 0
0 0 0 0 70 0
0 0 0 0 26 0
0 0 0 0 19 0
0 0 0 0 80 0
0 0 1 0 66 0
0 0 1 0 55 0
0 0 0 0 36 0
0 0 0 0 28 0
0 0 0 0 59 1
1 0 1 0 50 1
0 0 0 0 20 0
0 0 0 0 74 1
0 0 0 0 54 0
1 0 1 0 68 0
0 0 0 0 25 0
0 0 0 0 27 0
0 0 0 0 77 0
0 0 1 0 54 0
0 0 0 0 43 0
0 0 1 0 27 0
1 0 1 1 66 1
0 0 1 1 47 0
0 0 0 1 37 0
0 0 1 0 36 1
1 1 1 0 76 0
0 0 0 0 33 0
0 0 0 0 40 0
0 0 1 0 90 0
0 0 0 1 45 0
0 0 0 0 75 0
1 0 0 1 70 1
0 0 0 0 36 0
0 0 0 1 57 0
0 0 1 0 22 0
0 0 0 0 33 0

```

```

0 0 1 0 75 0
0 0 0 0 22 0
0 0 1 0 80 0
1 0 1 0 85 0
0 0 1 0 90 0
1 0 0 1 71 0
0 0 0 1 51 0
1 0 1 1 67 0
0 0 1 0 77 0
0 0 0 0 20 0
0 0 0 0 52 1
1 1 0 1 60 0
0 0 0 0 29 0
0 0 0 0 30 1
0 0 0 0 20 0
0 0 0 0 36 0
0 0 1 1 54 0
0 0 0 0 65 0
1 0 0 0 47 0
0 0 0 0 22 0
1 0 0 1 69 0
1 0 1 1 68 0
0 0 1 1 49 0
0 0 0 0 25 0
0 1 1 0 44 0
0 0 0 1 56 0
0 0 1 1 42 0

```

The SAS code and output:

```

options linesize=70;

data x;
  infile "sepsis.dat";
  input death shock malnut alcohol age bowelinf;

proc logistic;
  model death=shock malnut alcohol age bowelinf;
  test malnut=0, bowelinf=0;

proc logistic;
  model death=shock alcohol age bowelinf;
  output out=z pred=p;

proc print data=z;

```

The LOGISTIC Procedure

Model Information

Data Set WORK.X
 Response Variable death
 Number of Response Levels 2
 Model binary logit
 Optimization Technique Fisher's scoring

Number of Observations Read 106
 Number of Observations Used 106

Response Profile

Ordered Value	death	Total Frequency
1	0	85
2	1	21

Probability modeled is death=0.

Model Convergence Status

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

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
AIC	107.528	65.122
SC	110.192	81.103
-2 Log L	105.528	53.122

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	52.4060	5	<.0001
Score	43.8921	5	<.0001
Wald	16.2433	5	0.0062

The LOGISTIC Procedure

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	9.7539	2.5417	14.7267	0.0001
shock	1	-3.6739	1.1648	9.9479	0.0016
malnut	1	-1.2166	0.7282	2.7909	0.0948
alcohol	1	-3.3549	0.9821	11.6691	0.0006
age	1	-0.0922	0.0303	9.2353	0.0024
bowelinf	1	-2.7976	1.1640	5.7767	0.0162

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
shock	0.025	0.003	0.249
malnut	0.296	0.071	1.235
alcohol	0.035	0.005	0.239
age	0.912	0.859	0.968
bowelinf	0.061	0.006	0.597

Association of Predicted Probabilities and Observed Responses

Percent Concordant	92.8	Somers' D	0.858
Percent Discordant	7.0	Gamma	0.860
Percent Tied	0.2	Tau-a	0.275
Pairs	1785	c	0.929

Linear Hypotheses Testing Results

Wald			
Label	Chi-Square	DF	Pr > ChiSq
Test 1	6.8302	2	0.0329

The LOGISTIC Procedure

Model Information

Data Set	WORK.X
Response Variable	death
Number of Response Levels	2
Model	binary logit
Optimization Technique	Fisher's scoring

Number of Observations Read	106
Number of Observations Used	106

Response Profile

Ordered Value	death	Total Frequency
1	0	85
2	1	21

Probability modeled is death=0.

Model Convergence Status

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

Model Fit Statistics

Criterion	Intercept and Covariates	
	Intercept Only	
AIC	107.528	66.073
SC	110.192	79.390

-2 Log L 105.528 56.073

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood Ratio	49.4556	4	<.0001
Score	42.8578	4	<.0001
Wald	16.9078	4	0.0020

The LOGISTIC Procedure

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	8.8946	2.3169	14.7380	0.0001
shock	1	-3.7012	1.1035	11.2489	0.0008
alcohol	1	-3.1859	0.9172	12.0641	0.0005
age	1	-0.0898	0.0292	9.4545	0.0021
bowelinf	1	-2.3865	1.0723	4.9534	0.0260

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits
shock	0.025	0.003 0.215
alcohol	0.041	0.007 0.250
age	0.914	0.863 0.968
bowelinf	0.092	0.011 0.752

Association of Predicted Probabilities and Observed Responses

Percent Concordant	91.0	Somers' D	0.821
Percent Discordant	8.9	Gamma	0.823
Percent Tied	0.2	Tau-a	0.263
Pairs	1785	c	0.911

Obs	death	shock	malnut	alcohol	age	bowelinf	_LEVEL_	p
1	0	0	0	0	56	0	0	0.97945
2	0	0	0	0	80	0	0	0.84658
3	0	0	0	0	61	0	0	0.96817
4	0	0	0	0	26	0	0	0.99858
5	0	0	0	0	53	0	0	0.98423
6	1	0	1	0	87	0	0	0.74635
7	0	0	0	0	21	0	0	0.99910
8	1	0	0	1	69	0	0	0.37996
9	0	0	0	0	57	0	0	0.97756
10	0	0	1	0	76	0	0	0.88769
11	1	0	0	1	66	1	0	0.06871
12	0	0	0	0	48	0	0	0.98988
13	0	0	0	0	18	0	0	0.99931

14	0	0	0	0	46	0	0	0.99153
15	0	0	1	0	22	0	0	0.99901
16	0	0	1	0	33	0	0	0.99735
17	0	0	0	0	38	0	0	0.99585
18	0	0	0	0	27	0	0	0.99845
19	1	1	1	0	60	1	0	0.07024
20	0	0	0	0	31	0	0	0.99778
21	0	0	0	0	59	1	0	0.76995
22	0	0	0	0	29	0	0	0.99815
23	0	1	0	0	60	0	0	0.45103
24	1	1	0	0	63	1	0	0.05455
25	0	0	0	0	80	0	0	0.84658
26	0	0	0	0	23	0	0	0.99892
27	0	0	0	0	71	0	0	0.92529
28	0	0	0	0	87	0	0	0.74635
29	1	1	1	0	70	0	0	0.25071
30	0	0	0	0	22	0	0	0.99901
31	0	0	0	0	17	0	0	0.99937
32	1	0	0	1	49	0	0	0.78700
33	0	1	0	0	50	0	0	0.66859
34	0	0	0	0	51	0	0	0.98679
35	0	0	1	1	37	0	0	0.91567
36	0	0	0	0	76	0	0	0.88769
37	0	0	0	1	60	0	0	0.57903
38	1	1	0	0	78	1	0	0.01477
39	0	0	1	1	60	0	0	0.57903
40	1	1	1	0	57	0	0	0.51824
41	0	0	0	0	28	1	0	0.98189
42	0	0	0	0	94	0	0	0.61074
43	0	0	0	0	43	0	0	0.99352
44	0	0	0	0	70	0	0	0.93127
45	0	0	0	0	70	0	0	0.93127
46	0	0	0	0	26	0	0	0.99858
47	0	0	0	0	19	0	0	0.99924
48	0	0	0	0	80	0	0	0.84658
49	0	0	1	0	66	0	0	0.95100
50	0	0	1	0	55	0	0	0.98118
51	0	0	0	0	36	0	0	0.99653
52	0	0	0	0	28	0	0	0.99831
53	0	0	0	0	59	1	0	0.76995
54	1	0	1	0	50	1	0	0.88252
55	0	0	0	0	20	0	0	0.99917
56	0	0	0	0	74	1	0	0.46520
57	0	0	0	0	54	0	0	0.98277
58	1	0	1	0	68	0	0	0.94192

Obs	death	shock	malnut	alcohol	age	bowelinf	_LEVEL_	p
59	0	0	0	0	25	0	0	0.99871
60	0	0	0	0	27	0	0	0.99845
61	0	0	0	0	77	0	0	0.87842
62	0	0	1	0	54	0	0	0.98277
63	0	0	0	0	43	0	0	0.99352
64	0	0	1	0	27	0	0	0.99845
65	1	0	1	1	66	1	0	0.06871
66	0	0	1	1	47	0	0	0.81557
67	0	0	0	1	37	0	0	0.91567
68	0	0	1	0	36	1	0	0.96353
69	1	1	1	0	76	0	0	0.16331
70	0	0	0	0	33	0	0	0.99735
71	0	0	0	0	40	0	0	0.99504
72	0	0	1	0	90	0	0	0.69205
73	0	0	0	1	45	0	0	0.84108
74	0	0	0	0	75	0	0	0.89634
75	1	0	0	1	70	1	0	0.04899
76	0	0	0	0	36	0	0	0.99653
77	0	0	0	1	57	0	0	0.64297
78	0	0	1	0	22	0	0	0.99901
79	0	0	0	0	33	0	0	0.99735
80	0	0	1	0	75	0	0	0.89634
81	0	0	0	0	22	0	0	0.99901
82	0	0	1	0	80	0	0	0.84658
83	1	0	1	0	85	0	0	0.77884
84	0	0	1	0	90	0	0	0.69205
85	1	0	0	1	71	0	0	0.33864
86	0	0	0	1	51	0	0	0.75533
87	1	0	1	1	67	0	0	0.42310
88	0	0	1	0	77	0	0	0.87842
89	0	0	0	0	20	0	0	0.99917
90	0	0	0	0	52	1	0	0.86258
91	1	1	0	1	60	0	0	0.03285
92	0	0	0	0	29	0	0	0.99815
93	0	0	0	0	30	1	0	0.97840
94	0	0	0	0	20	0	0	0.99917
95	0	0	0	0	36	0	0	0.99653
96	0	0	1	1	54	0	0	0.70219
97	0	0	0	0	65	0	0	0.95502
98	1	0	0	0	47	0	0	0.99074
99	0	0	0	0	22	0	0	0.99901
100	1	0	0	1	69	0	0	0.37996
101	1	0	1	1	68	0	0	0.40134
102	0	0	1	1	49	0	0	0.78700
103	0	0	0	0	25	0	0	0.99871

104	0	1	1	0	44	0	0	0.77570
105	0	0	0	1	56	0	0	0.66332
106	0	0	1	1	42	0	0	0.87388