Logrank test

An example

An example

Suppose we have data:

Group 0: 3.1, 6.8+, 9 , 9, 11.3+, 16.2

Group 1: 8.7, 9 , 10.1+, 12.1+, 18.7, 23.1+

Calculate the Logrank test statistics.

An example

Group 0: 3.1, 6.8+, 9 , 9, 11.3+, 16.2

Group 1: 8.7, 9 , 10.1+, 12.1+, 18.7, 23.1+

$t_1 = 3.1$

	d_i	a_i	
Group 0	1	5	6
Group 1	0	6	6
Total	1	11	12

$t_2 = 8.7$

d_i	a_i	
0	4	4
1	5	6
1	9	10

$t_3 = 9$

d_i	a_i	
2	2	4
1	4	5
3	6	9

$t_4 = 16.2$

d_i	a_i	
1	0	1
0	2	2
1	2	3

$t_5 = 18.7$

d_i	a_i	
0	0	0
1	1	2
1	1	2

d_{i1}=	0	1	1	0	1
e_{i1}=	1/2	6/10	15/9	2/3	1
v_{i1}=	1/4	6/25	5/9	2/9	0

An example

$\boldsymbol{d_{i1}}$	0	1	1	0	1	d= $\sum_{i=1}^{D} d_{i1} = 3$
$\boldsymbol{e_{i1}}$	½	6/10	15/9	2/3	1	e= $\sum_{i=1}^{D} e_{i1} = 4.43$
$\boldsymbol{v_{i1}}$	¼	6/25	5/9	2/9	0	v= $\sum_{i=1}^{D} v_{i1} = 1.26$

- Logrank=$\frac{[\sum_{i=1}^{D}(d_{i1}-e_{i1})]^2}{\sum_{i=1}^{D} v_{i1}} = \frac{(d-e)^2}{v} = \frac{(3-4.43)^2}{1.26}$=0.162
- P-value=P($\chi_1^2 \geq 0.162$)=0.203
- There is no significant evidence that the survival of the two groups are different.

Logrank test statistics

- Note that both $\{y_{i1}\}_{i=1}^{D}$ and $\{y_{i2}\}_{i=1}^{D}$ are non-increasing sequences. If either y_{i1} or $y_{i2} = 0$, then we must have $d_{i1} = e_{i1}$.
- Therefore, the 2×2 tables at those times and after, does not contribution into the calculation of the test statistics.

$$\text{Logrank} = \frac{[\sum_{i=1}^{D}(d_{i1} - e_{i1})]^2}{\sum_{i=1}^{D} v_{i1}}.$$