

Time to Event ...
(Kaplan-Meier Curve, Log Rank Test, SAS, Spotfire, Shiny R)



- A**
- 10 little JELLY BABIES went to do a job
 - 1st one got a call on day one, after that he dropped
 - 9 little jelly babies went to do a job
 - 2nd caught a flu, did quit at day two.
 - 8 little jelly babies went to do a job
 - 3rd one did roar with laughter already on day four
 - 7 little jelly babies went to do a job
 - 4th one did it finalize at day five
 - 6 little jelly babies went to do a job
 - 5th one sadly went to heaven at day seven
 - 5 little jelly babies went to do a job
 - 6th one solved without a break at day eight
 - 4 little jelly babies went to do a job
 - 7th and 8th get it done together at day nine
 - 2 little jelly babies went to do a job
 - 9th on day ten and 10th finished day eleven.

Kaplan-Meier estimator is a product of the form:

$$\hat{S}(t) = \prod_{t_i < t} \frac{n_i - d_i}{n_i}$$

time	at Risk	events		
$t(i)$	$n(i)$	$d(i)$	$\frac{n_i - d_i}{n_i}$	$\hat{S}(t)$
0				1
1	10	0	$\frac{10-0}{10} = 1$	1
5	7	1	$\frac{7-1}{7} = \frac{6}{7}$	$1 \cdot \frac{6}{7} = 0,8571$
8	5	1	$\frac{5-1}{5} = \frac{4}{5}$	$1 \cdot \frac{6}{7} \cdot \frac{4}{5} = 0,6857$
9	4	2	$\frac{4-2}{4} = \frac{1}{2}$	$1 \cdot \frac{6}{7} \cdot \frac{4}{5} \cdot \frac{1}{2} = 0,3429$
10	2	1	$\frac{2-1}{2} = \frac{1}{2}$	$1 \cdot \frac{6}{7} \cdot \frac{4}{5} \cdot \frac{1}{2} \cdot \frac{1}{2} = 0,1714$
11	1	1	$\frac{1-1}{1} = 0$	0

proc lifetest (SAS 9.2®)

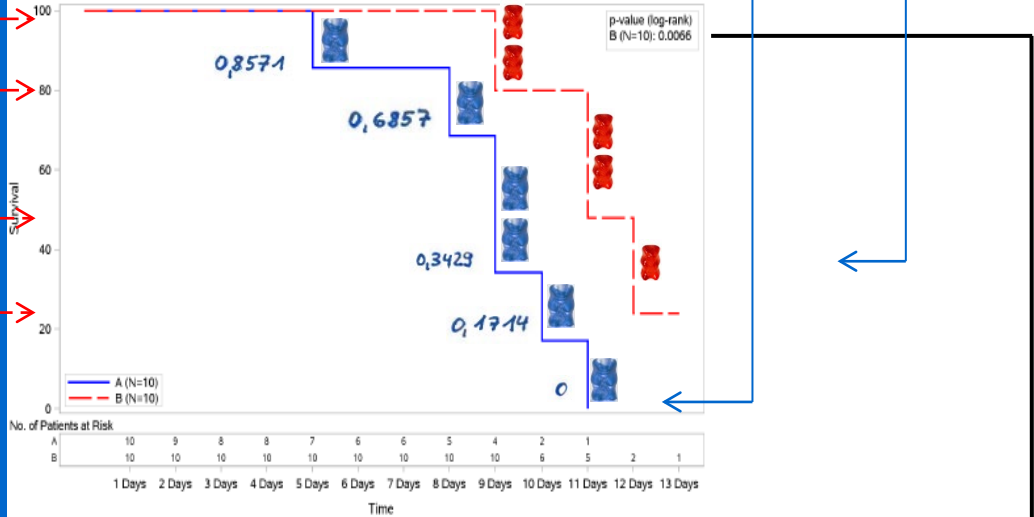
B

The LIFETEST Procedure
Product-Limit Survival Estimates

TIME	Survival	Failure	Survival Standard Error	Number Failed	Number Left
0.0000	1.0000	0	0	0	10
9.0000	0.8000	0.2000	0.1265	1	9
9.0000*				2	8
9.0000*				2	7
9.0000*				2	6
10.0000*				2	5
11.0000	0.4800	0.5200	0.1910	3	4
11.0000*				4	3
11.0000*				4	2
12.0000	0.2400	0.7600	0.1947	5	1
13.0000*				5	0

NOTE: The marked survival times are censored observations.

Kaplan-Meier curve (STREAM)



How to calculate Log Rank Test manually

	A	B	C	D	E	F	G	H	I	J
1	d(Ai)	d(Bi)	d(i)	n(Ai)	n(Bi)	n(i)	e(Ai)	v(Ai)	e(Bi)	
2							$\frac{d(i) \cdot n(Ai)}{n(i)}$	$\frac{d(i) \cdot n(Ai) \cdot n(Bi) \cdot (n(i) - d(i))}{n(i) \cdot n(i) \cdot (n(i) - 1)}$	$\frac{d(i) \cdot n(Bi)}{n(i)}$	
3	time	Events A	Events B	Events (A or B)	At risk A	At risk B	At risk Total	expected events in A	Variance A	expected events in B
4	1	0	0	0	10	10	20	0	0	0
5	2	0	0	0	9	10	19	0	0	0
6	4	0	0	0	8	10	18	0	0	0
7	5	1	0	1	7	10	17	0.411764706	0.242214533	0.588235294
8	7	0	0	0	6	10	16	0	0	0
9	8	1	0	1	5	10	15	0.333333333	0.222222222	0.666666667
10	9	2	2	4	4	10	14	1.142857143	0.627943485	2.857142857
11	10	1	0	1	2	6	8	0.25	0.1875	0.75
12	11	1	2	3	1	5	6	0.5	0.25	2.5
13	12	0	1	1	0	2	2	0	0	1
14	Sum	6	5				Sum	2.637955182	1.52988024	8.362044818
15										
16								LogRank	3.362044818	-3.36204482
17								Chi-square	7.388385745	

proc lifetest

Rank Statistics

ARM	Log-Rank
A	3.3620
B	-3.3620

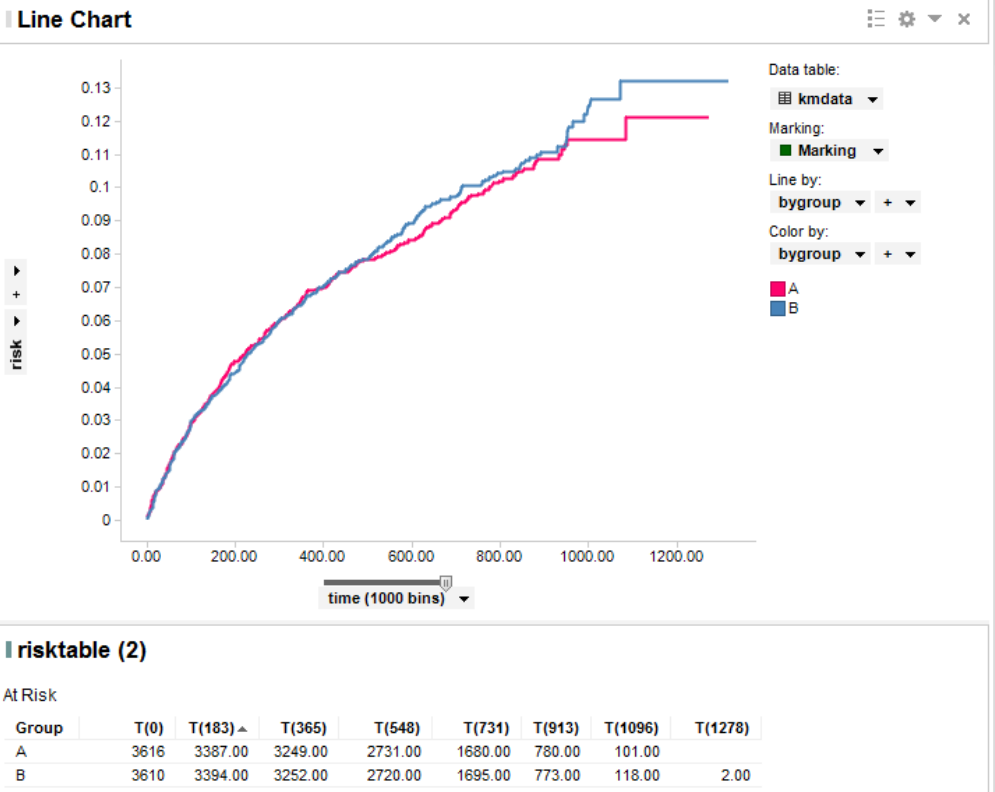
Covariance Matrix for the Log-Rank Statistics

ARM	A	B
A	1.52988	-1.52988
B	-1.52988	1.52988

Test of Equality over Strata

Test	Chi-Square	DF	Pr > Chi-Square
Log-Rank	7.3884	1	0.0066

TIBCO Spotfire® (real study data)



Shiny R (real study data)

