

FORELESNING 4

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TMA4275 LEVETIDSANALYSE

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Kaplan-Meier Estimator - Table 9.3 in HR (Table 11.1 in RH)

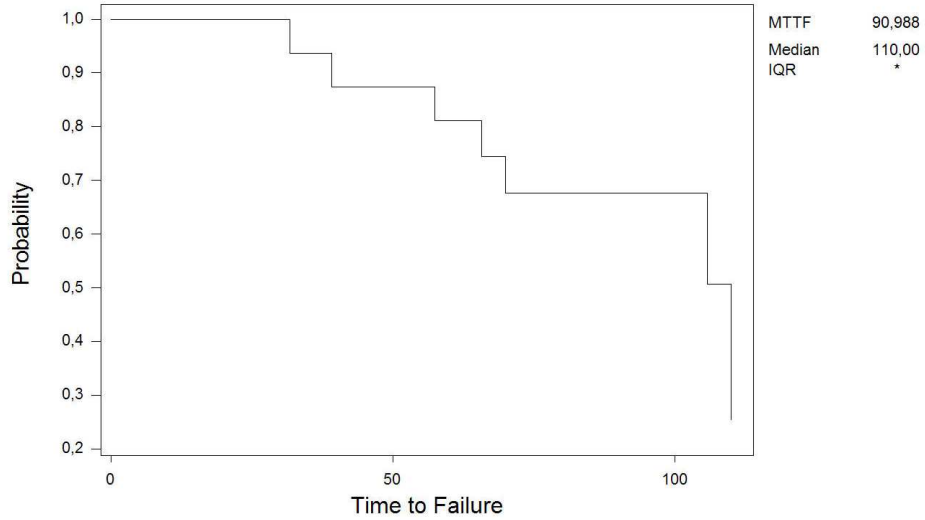
Row	C1	C2
1	31,7	1
2	39,2	1
3	57,5	1
4	65,0	0
5	65,8	1
6	70,0	1
7	75,0	0
8	75,2	0
9	87,5	0
10	88,3	0
11	94,2	0
12	101,7	0
13	105,8	1
14	109,2	0
15	110,0	1
16	130,0	0

Time	Number at Risk	Number Failed	Survival Probability	Standard Error	95,0% Normal CI Lower	Upper
31,7000	16	1	0,9375	0,0605	0,8189	1,0000
39,2000	15	1	0,8750	0,0827	0,7130	1,0000
57,5000	14	1	0,8125	0,0976	0,6213	1,0000
65,8000	12	1	0,7448	0,1105	0,5283	0,9613
70,0000	11	1	0,6771	0,1194	0,4431	0,9111
105,8000	4	1	0,5078	0,1718	0,1711	0,8445
110,0000	2	1	0,2539	0,1990	0,0000	0,6440

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Nonparametric Survival Plot for C1

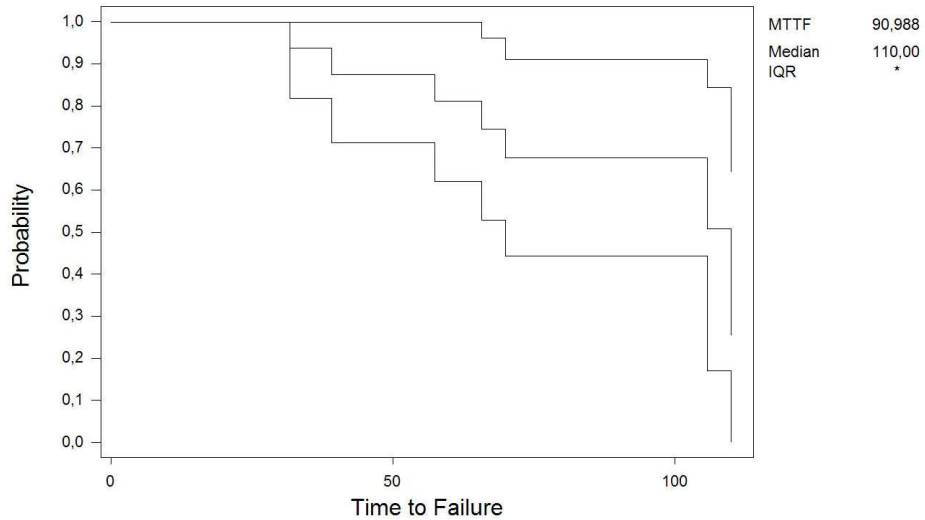
Kaplan-Meier Method
Censoring Column in C2



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Nonparametric Survival Plot for C1

Kaplan-Meier Method - 95,0% CI
Censoring Column in C2



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Leukemia Data

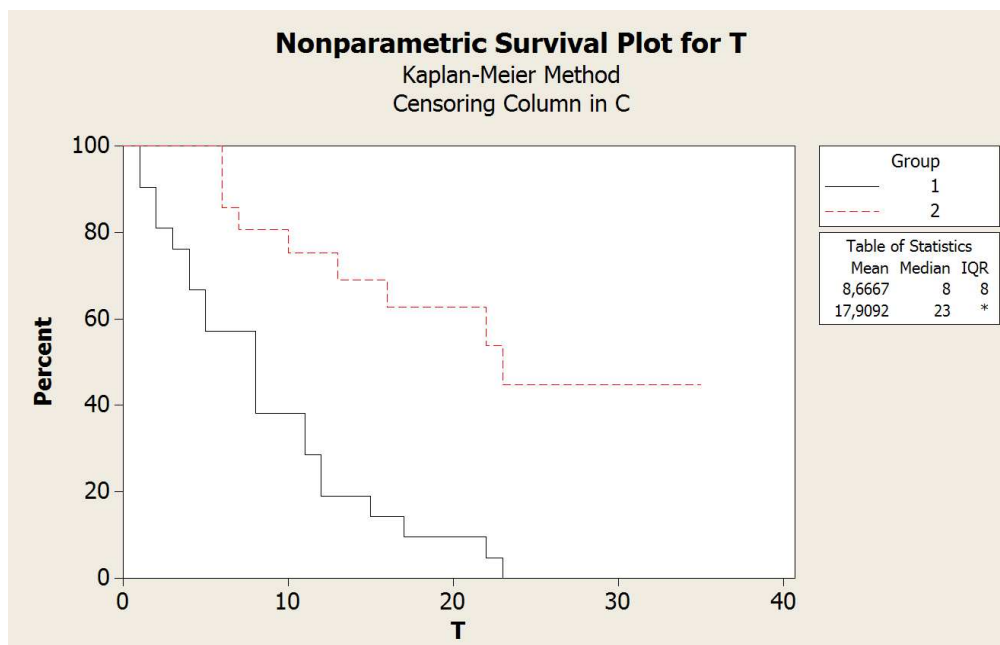
Remission times for 42 children with acute leukemia (free of symptoms).

PL=Placebo, MP=6MP treatment, Y=time, C=censoring (0 means censored)

Row	YPL	CPL	YMP	CMP
1	1	1	6	1
2	1	1	6	1
3	2	1	6	1
4	2	1	6	0
5	3	1	7	1
6	4	1	9	0
7	4	1	10	1
8	5	1	10	0
9	5	1	11	0
10	8	1	13	1
11	8	1	16	1
12	8	1	17	0
13	8	1	19	0
14	11	1	20	0
15	11	1	22	1
16	12	1	23	1
17	12	1	25	0
18	15	1	32	0
19	17	1	32	0
20	22	1	34	0
21	23	1	35	0

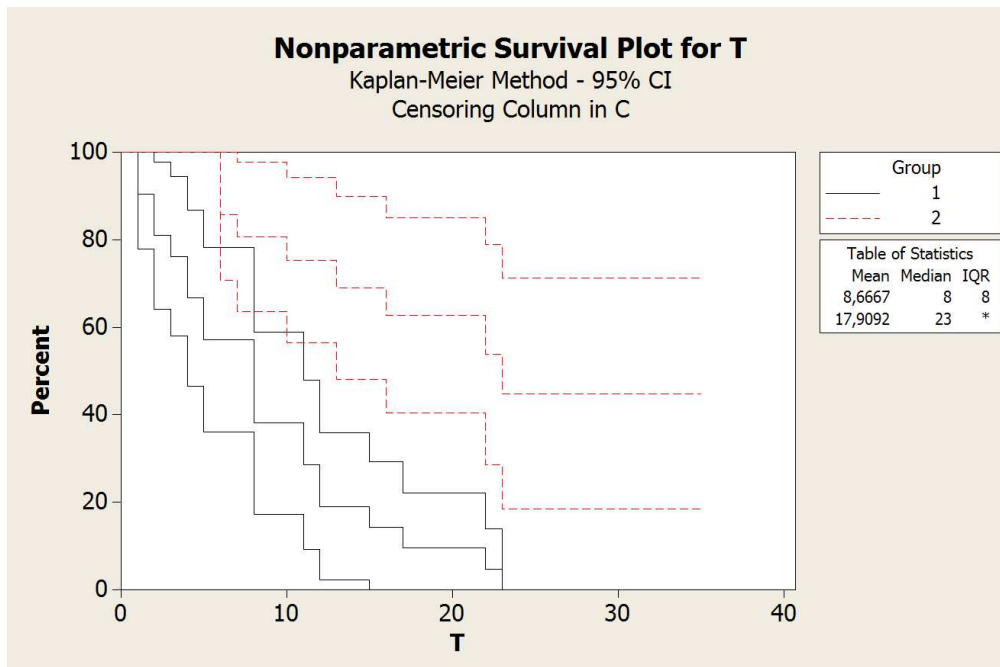
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Example: Leukemia data (1=Placebo, 2=6MP)



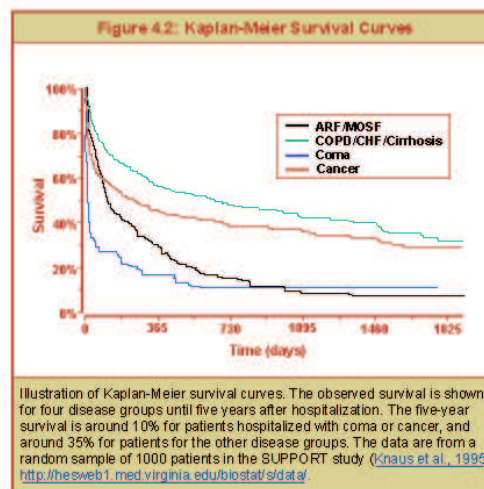
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Example: Leukemia data (1=Placebo, 2=6MP, with confidence limits)



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Example: KM-plots in practice



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NELSON ESTIMATOR – Table 9.3 (11.1)

Row	C1	C2
1	31,7	1
2	39,2	1
3	57,5	1
4	65,0	0
5	65,8	1
6	70,0	1
7	75,0	0
8	75,2	0
9	87,5	0
10	88,3	0
11	94,2	0
12	101,7	0
13	105,8	1
14	109,2	0
15	110,0	1
16	130,0	0

Row	Time	Numb at risk	1/Numb at risk	Cum Haz Nelson	Survival Nelson
1	31,7	16	0,062500	0,06250	0,939413
2	39,2	15	0,066667	0,12917	0,878827
3	57,5	14	0,071429	0,20060	0,818244
4	65,8	12	0,083333	0,28393	0,752820
5	70,0	11	0,090909	0,37484	0,687401
6	105,8	4	0,250000	0,62484	0,535348
7	110,0	2	0,500000	1,12484	0,324705

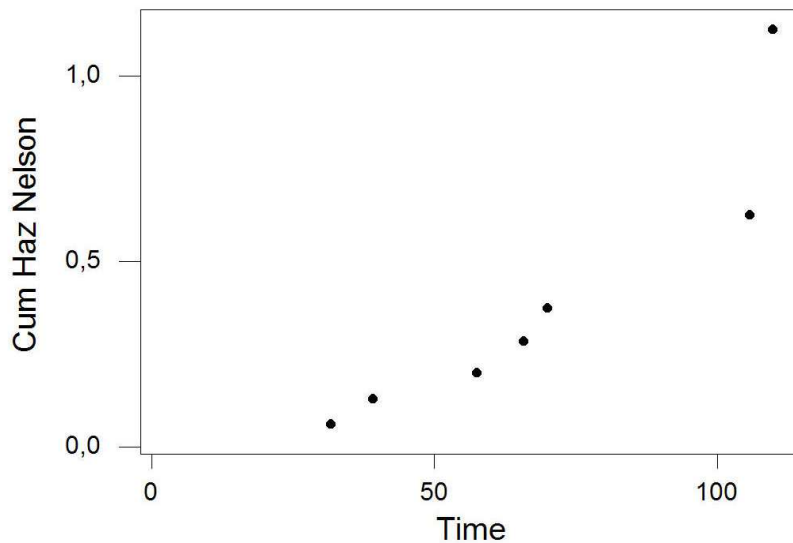
Compare with "Survival KM"

0,937500 0,875000 0,812500 0,744792 0,677083 0,507813
0,253906

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NELSON PLOT – Table 9.3 (11.1)

Nelson Plot



(Slightly convex means IFR)

Example 9.8 in HR (Example 11.15 in RH)

Row	Time	Censor	No at risk	Total time	Cum total time	
1	0,35	1	12	4,20	4,20	4,2
2	0,50	0	11	1,65	5,85	10,6
3	0,75	0	10	2,50	8,35	13,0
4	1,00	1	9	2,25	10,60	16,5
5	1,30	1	8	2,40	13,00	33,2
6	1,80	1	7	3,50	16,50	
7	3,00	0	6	7,20	23,70	
8	3,15	0	5	0,75	24,45	
9	4,85	0	4	6,80	31,25	
10	5,50	1	3	1,95	33,20	
11	5,50	0	2	0,00	33,20	
12	6,25	0	1	0,75	33,95	

Row	i/n	TTT
1	0,2	0,12651
2	0,4	0,31928
3	0,6	0,39157
4	0,8	0,49699
5	1,0	1,00000

BARLOW-PROSCHAN'S TEST:

$$W = (4.2+10.6+13.0+16.5)/33.2 = 1.33$$

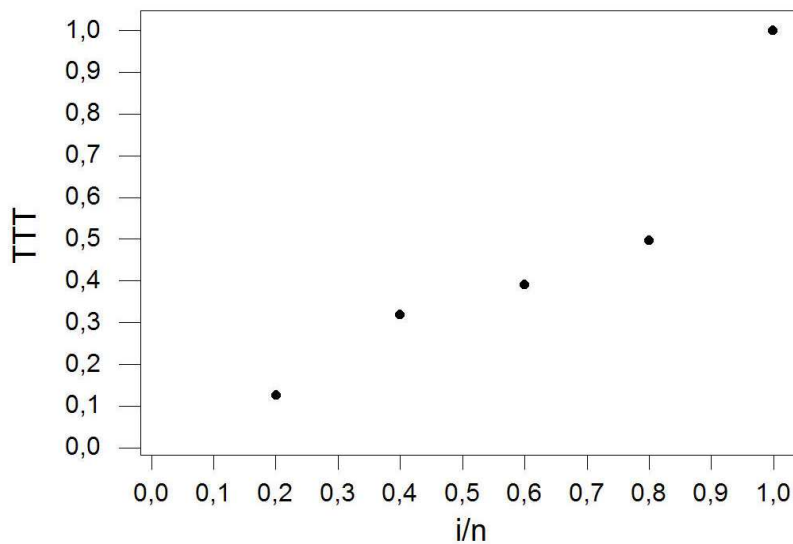
$$\text{alt. } W = 0.13 + 0.32 + 0.39 + 0.50 = 1.34$$

(k-1 = 4)

Example 9.8 in HR (Example 11.15 in RH)

NB! Ikke samme type plott som s. 410 i HR (kap. 11.3.8 i RH)

TTT-plot censored data



Row	Time	Censor	No at risk	Total time	Cum total time	Plot total time
1	31,7	1	16	507,2	507,2	507,2
2	39,2	1	15	112,5	619,7	619,7
3	57,5	1	14	256,2	875,9	875,9
4	65,0	0	13	97,5	973,4	983,0
5	65,8	1	12	9,6	983,0	1029,2
6	70,0	1	11	46,2	1029,2	1274,3
7	75,0	0	10	50,0	1079,2	1286,1
8	75,2	0	9	1,8	1081,0	
9	87,5	0	8	98,4	1179,4	
10	88,3	0	7	5,6	1185,0	
11	94,2	0	6	35,4	1220,4	
12	101,7	0	5	37,5	1257,9	
13	105,8	1	4	16,4	1274,3	
14	109,2	0	3	10,2	1284,5	
15	110,0	1	2	1,6	1286,1	
16	130,0	0	1	20,0	1306,1	

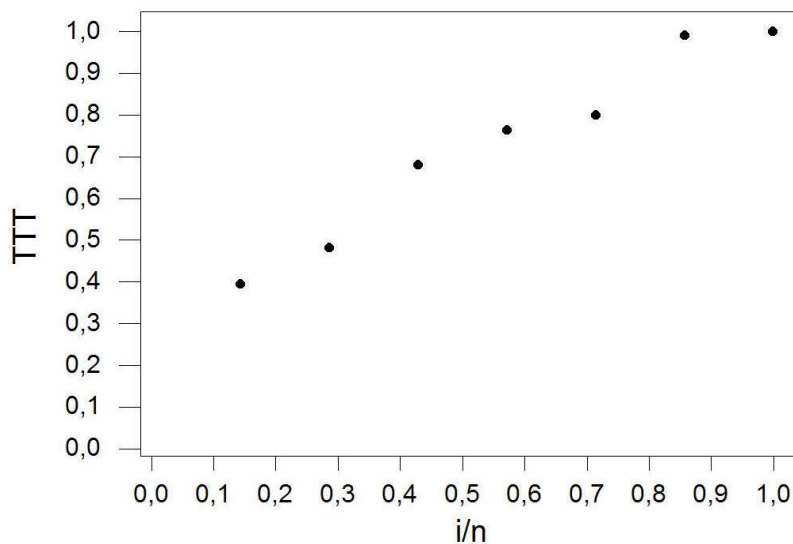
Row	i/n	TTT
1	0,14286	0,39437
2	0,28571	0,48184
3	0,42857	0,68105
4	0,57143	0,76433
5	0,71429	0,80025
6	0,85714	0,99082
7	1,00000	1,00000

Data from Table 9.3 (Table 11.1)
 BARLOW-PROSCHAN'S TEST:

$$W = 0.39 + 0.48 + 0.68 + 0.76 + 0.80 + 0.99 = 4.10 \quad (k-1 = 6)$$

Table 9.3 (Table 11.1)

TTT-plot censored data



ESTIMERING AV MTTF

Row	C1	C2
1	0,35	1
2	0,50	0
3	0,75	0
4	1,00	1
5	1,30	1
6	1,80	1
7	3,00	0
8	3,15	0
9	4,85	0
10	5,50	1
11	5,50	0
12	6,25	0

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Censoring Information
 5 Right censored value
 = 0

Count Uncensored value
 7 Censoring value: C2

Nonparametric Estimates

Characteristics of Variable

Mean(MTTF)	Standard Error	95,0% Normal CI Lower	Upper
3,8079	0,7487	2,3405	5,2753

Median = 5,5000 IQR = * Q1 = 1,3000 Q3 = *

Kaplan-Meier Estimates

Time	Number at Risk	Number Failed	Survival Probability	Standard Error	95,0% Normal CI Lower	Upper
0,3500	12	1	0,9167	0,0798	0,7603	1,0000
1,000	9	1	0,8148	0,1194	0,5808	1,0000
1,3000	8	1	0,7130	0,1414	0,4359	0,9901
1,8000	7	1	0,6111	0,1535	0,3102	0,9121
5,5000	3	1	0,4074	0,1953	0,0246	0,7902

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Nonparametric Survival Plot for C1

Kaplan-Meier Method
Censoring Column in C2

