Running a Cumulative Incidence analyses with XLSTAT-Life

demoICU.xls

Dataset for running a Cumulative Incidence analyses

An Excel sheet with both the data and results can be downloaded by clicking here.

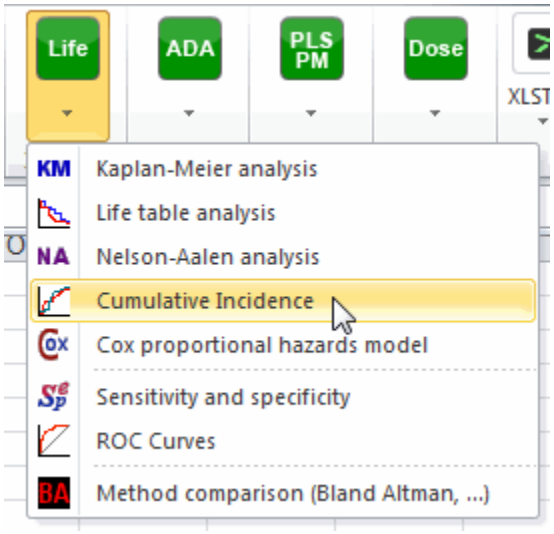
The data have been obtained from Marubini and Valsecchi (1996) and represent a randomized clinical trial investigating the effect of a treatment on the time of appearance of a set of symptoms on patients. Two groups of patients are studied, the first being treated and the second being a control group.

The cumulative incidence applies in cases where you are in the presence of competing events (known as competing risks), that is to say, when several events can occur in addition to censorship.

In our case, it is either a local relapse (event 1), or the appearance of new metastases (event 2) or a censoring (cure or lost sight of by those responsible for the study).

Setting up a Cumulative Incidence analyses

After opening XLSTAT, select the **XLSTAT / XLSTAT-Life / Cumulative Incidence** command, or click on the corresponding button of the **XLSTAT-Life** toolbar (see below).

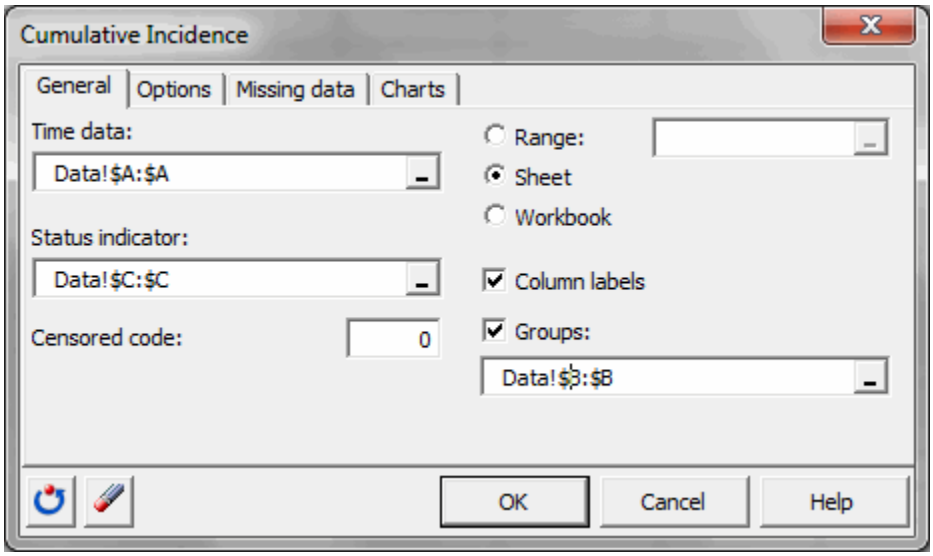


Once you've clicked on the button, the **Cumulative Incidence** box will appear.

Select the data on the Excel sheet. The **Time data** corresponds to the durations when the patients either relapsed locally (event 1),or have new metastases (event 2) or were censored (event 0).

The "Status indicator" describes whether a patient locally relapse (event code=1), has new metastasis (event code=2) or was censored (censored code = 0) at a given time.

So that XLSTAT takes into account the information whether the patient belongs to the control or the treated group, we need to select the **groups** information.



The computations begin once you have clicked on **OK**. The results will then be displayed on a new Excel sheet.

Interpreting the results of a Cumulative Incidence analyses

The results for the first group are displayed first (treatment). The first table displays a summary of the data for the treated patients.

Summary statistics (Treatment):			
Total observed	Event 1	Event 2	Total censored
35	10	20	5

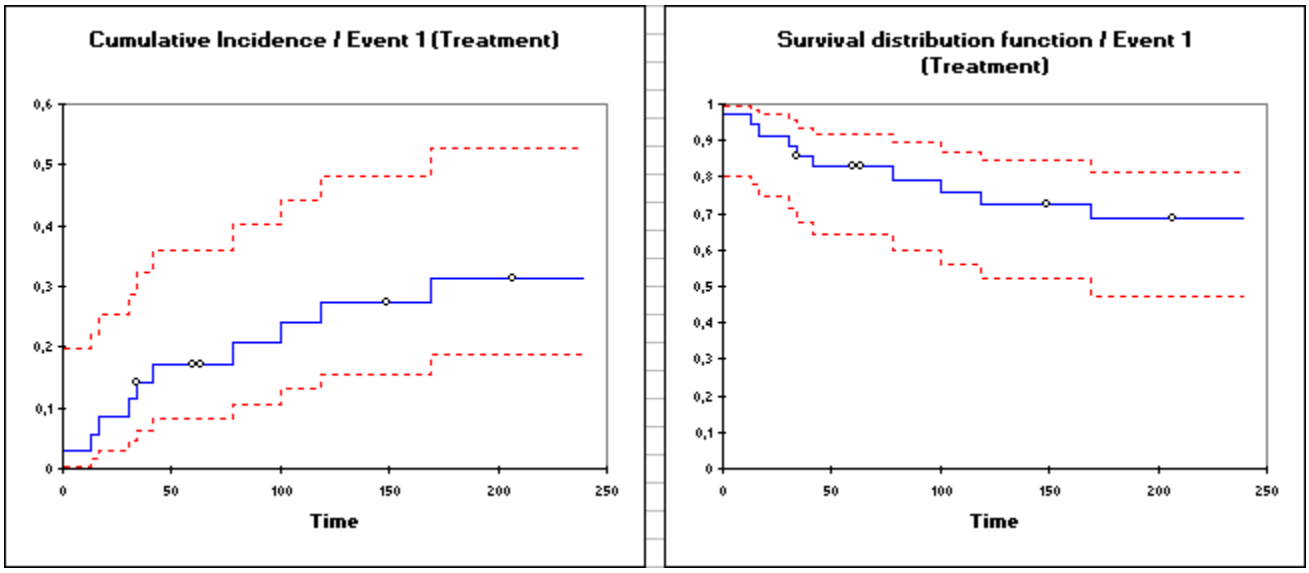
The next table corresponds to the "Cumulative incidence table" for event 1 in treated group. It contains the results of the cumulative incidence with several key indicators.

Cumulative incidence table / Event 1 (Treatment):								
Time	At risk	Event type 1	Event of all type	Censored	Cumulative Incidence	Standard error	ver bound (95	er bound (95
1	35	1	2	0	0,029	0,028	0,004	0,197
6	33	0	1	0	0,029	0,028	0,004	0,197
8	32	0	1	0	0,029	0,028	0,004	0,197
13	31	1	3	0	0,057	0,039	0,015	0,219
15	28	0	1	0	0,057	0,039	0,015	0,219
17	27	1	1	0	0,086	0,047	0,029	0,253
30	26	1	1	0	0,114	0,054	0,045	0,287
33	25	0	1	0	0,114	0,054	0,045	0,287
34	24	1	1	1	0,143	0,059	0,063	0,322
37	22	0	1	0	0,143	0,059	0,063	0,322
41	21	1	1	0	0,173	0,064	0,083	0,358
44	20	0	1	0	0,173	0,064	0,083	0,358
45	19	0	1	0	0,173	0,064	0,083	0,358
60	18	0	0	1	0,173	0,064	0,083	0,358
63	17	0	1	1	0,173	0,064	0,083	0,358
78	15	1	1	0	0,206	0,070	0,106	0,401
80	14	0	1	0	0,206	0,070	0,106	0,401
89	13	0	2	0	0,206	0,070	0,106	0,401
91	11	0	1	0	0,206	0,070	0,106	0,401
100	10	1	1	0	0,240	0,074	0,131	0,441
119	9	1	1	0	0,274	0,078	0,156	0,480
132	8	0	1	0	0,274	0,078	0,156	0,480
144	7	0	1	0	0,274	0,078	0,156	0,480
149	6	0	0	1	0,274	0,078	0,156	0,480
169	5	1	1	0	0,314	0,083	0,187	0,528
171	4	0	1	0	0,314	0,083	0,187	0,528
183	3	0	1	0	0,314	0,083	0,187	0,528
207	2	0	0	1	0,314	0,083	0,187	0,528
240	1	0	1	0	0,314	0,083	0,187	0,528

The next table corresponds to the cumulative survival function for event 1 in the treated group.

Cumulative survival table / Event 1 (Treatment):								
Time	At risk	Event type 1	Event of all type	Censored	rvival distribution funct	Standard error	ver bound (95	er bound (95
1	35	1	2	0	0,971	0,028	0,803	0,996
6	33	0	1	0	0,971	0,028	0,803	0,996
8	32	0	1	0	0,971	0,028	0,803	0,996
13	31	1	3	0	0,943	0,039	0,781	0,985
15	28	0	1	0	0,943	0,039	0,781	0,985
17	27	1	1	0	0,914	0,047	0,747	0,971
30	26	1	1	0	0,886	0,054	0,713	0,955
33	25	0	1	0	0,886	0,054	0,713	0,955
34	24	1	1	1	0,857	0,059	0,678	0,937
37	22	0	1	0	0,857	0,059	0,678	0,937
41	21	1	1	0	0,827	0,064	0,642	0,917
44	20	0	1	0	0,827	0,064	0,642	0,917
45	19	0	1	0	0,827	0,064	0,642	0,917
60	18	0	0	1	0,827	0,064	0,642	0,917
63	17	0	1	1	0,827	0,064	0,642	0,917
78	15	1	1	0	0,794	0,070	0,599	0,894
80	14	0	1	0	0,794	0,070	0,599	0,894
89	13	0	2	0	0,794	0,070	0,599	0,894
91	11	0	1	0	0,794	0,070	0,599	0,894
100	10	1	1	0	0,760	0,074	0,559	0,869
119	9	1	1	0	0,726	0,078	0,520	0,844
132	8	0	1	0	0,726	0,078	0,520	0,844
144	7	0	1	0	0,726	0,078	0,520	0,844
149	6	0	0	1	0,726	0,078	0,520	0,844
169	5	1	1	0	0,686	0,083	0,472	0,813
171	4	0	1	0	0,686	0,083	0,472	0,813
183	3	0	1	0	0,686	0,083	0,472	0,813
207	2	0	0	1	0,686	0,083	0,472	0,813
240	1	0	1	0	0,686	0,083	0,472	0,813

Then, we can visualize the cumulative incidence function and the cumulative survival function, bounded by the confidence intervals. The circles identify the censored data.

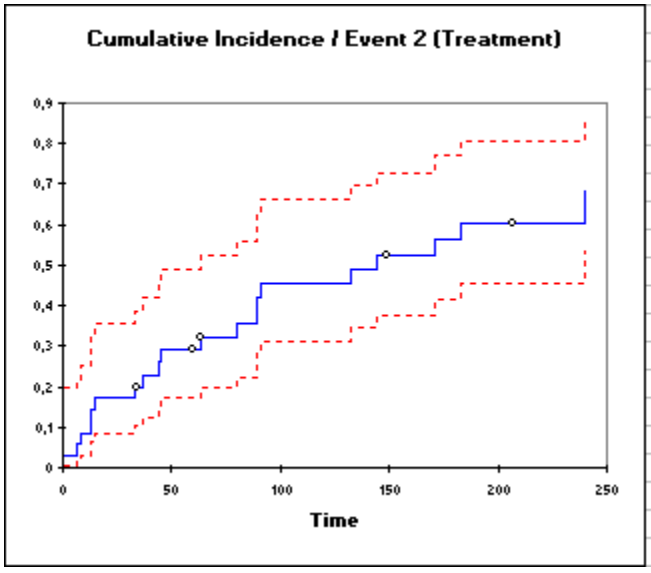


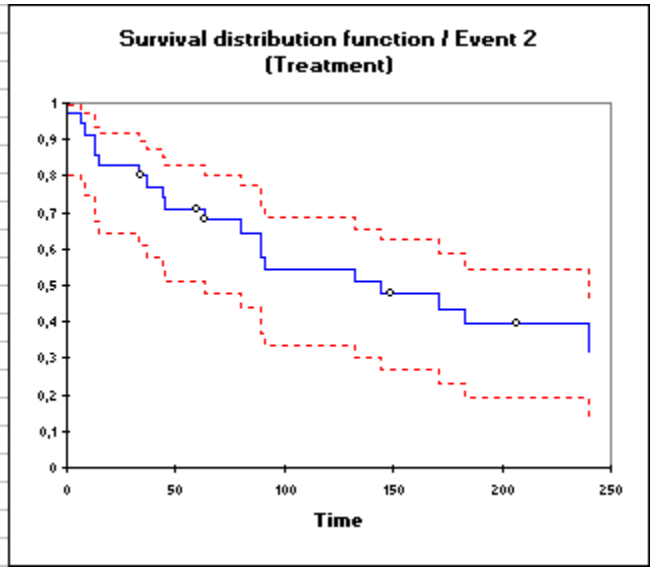
Next, the same series of results is displayed for the second event for the treated group.

Cumulative incidence table / Event 2 (Treatment):								
Time	At risk	Event type 2	Event of all type	Censored	Cumulative Incidence	Standard error	ver bound (95	er bound (95
1	35	1	2	0	0,029	0,028	0,004	0,197
6	33	1	1	0	0,057	0,039	0,015	0,219
8	32	1	1	0	0,086	0,047	0,029	0,253
13	31	2	3	0	0,143	0,059	0,063	0,322
15	28	1	1	0	0,171	0,064	0,083	0,355
17	27	0	1	0	0,171	0,064	0,083	0,355
30	26	0	1	0	0,171	0,064	0,083	0,355
33	25	1	1	0	0,200	0,068	0,103	0,388
34	24	0	1	1	0,200	0,068	0,103	0,388
37	22	1	1	0	0,230	0,071	0,125	0,422
41	21	0	1	0	0,230	0,071	0,125	0,422
44	20	1	1	0	0,260	0,075	0,148	0,456
45	19	1	1	0	0,290	0,077	0,172	0,489
60	18	0	0	1	0,290	0,077	0,172	0,489
63	17	1	1	1	0,321	0,080	0,197	0,524
78	15	0	1	0	0,321	0,080	0,197	0,524
80	14	1	1	0	0,355	0,083	0,225	0,561
89	13	2	2	0	0,422	0,087	0,283	0,631
91	11	1	1	0	0,456	0,088	0,313	0,665
100	10	0	1	0	0,456	0,088	0,313	0,665
119	9	0	1	0	0,456	0,088	0,313	0,665
132	8	1	1	0	0,490	0,088	0,344	0,698
144	7	1	1	0	0,524	0,088	0,376	0,729
149	6	0	0	1	0,524	0,088	0,376	0,729
169	5	0	1	0	0,524	0,088	0,376	0,729
171	4	1	1	0	0,564	0,089	0,414	0,769
183	3	1	1	0	0,605	0,089	0,454	0,806
207	2	0	0	1	0,605	0,089	0,454	0,806
240	1	1	1	0	0,686	0,083	0,540	0,870

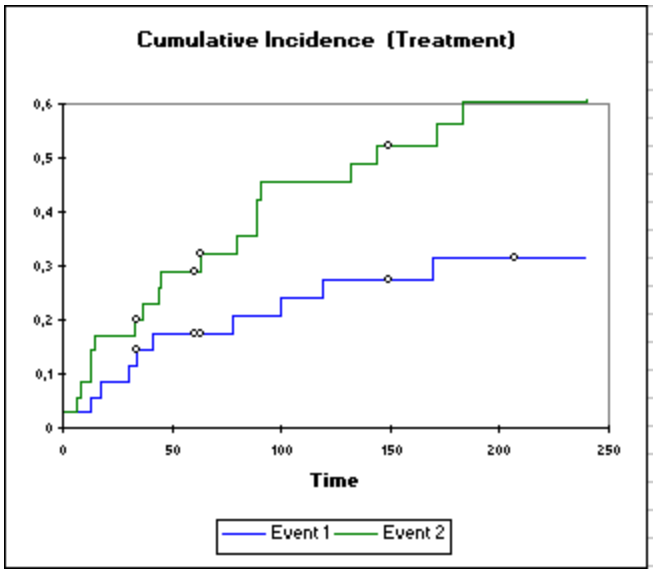
Cumulative survival table / Event 2 (Treatment):

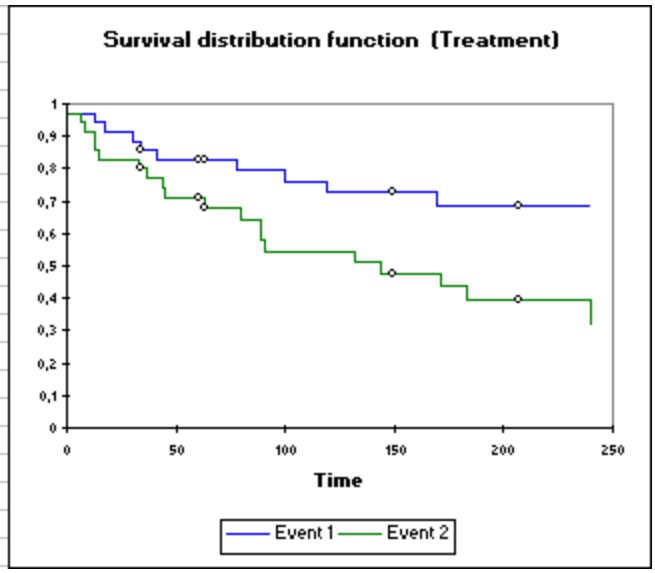
Time	At risk	Event type 2	Event of all type	Censored	rvival distribution funct	Standard error	ver bound (95	er bound (95
1	35	1	2	0	0,971	0,028	0,803	0,996
6	33	1	1	0	0,943	0,039	0,781	0,985
8	32	1	1	0	0,914	0,047	0,747	0,971
13	31	2	3	0	0,857	0,059	0,678	0,937
15	28	1	1	0	0,829	0,064	0,645	0,917
17	27	0	1	0	0,829	0,064	0,645	0,917
30	26	0	1	0	0,829	0,064	0,645	0,917
33	25	1	1	0	0,800	0,068	0,612	0,897
34	24	0	1	1	0,800	0,068	0,612	0,897
37	22	1	1	0	0,770	0,071	0,578	0,875
41	21	0	1	0	0,770	0,071	0,578	0,875
44	20	1	1	0	0,740	0,075	0,544	0,852
45	19	1	1	0	0,710	0,077	0,511	0,828
60	18	0	0	1	0,710	0,077	0,511	0,828
63	17	1	1	1	0,679	0,080	0,476	0,803
78	15	0	1	0	0,679	0,080	0,476	0,803
80	14	1	1	0	0,645	0,083	0,439	0,775
89	13	2	2	0	0,578	0,087	0,369	0,717
91	11	1	1	0	0,544	0,088	0,335	0,687
100	10	0	1	0	0,544	0,088	0,335	0,687
119	9	0	1	0	0,544	0,088	0,335	0,687
132	8	1	1	0	0,510	0,088	0,302	0,656
144	7	1	1	0	0,476	0,088	0,271	0,624
149	6	0	0	1	0,476	0,088	0,271	0,624
169	5	0	1	0	0,476	0,088	0,271	0,624
171	4	1	1	0	0,436	0,089	0,231	0,586
183	3	1	1	0	0,395	0,089	0,194	0,546
207	2	0	0	1	0,395	0,089	0,194	0,546
240	1	1	1	0	0,314	0,083	0,130	0,460



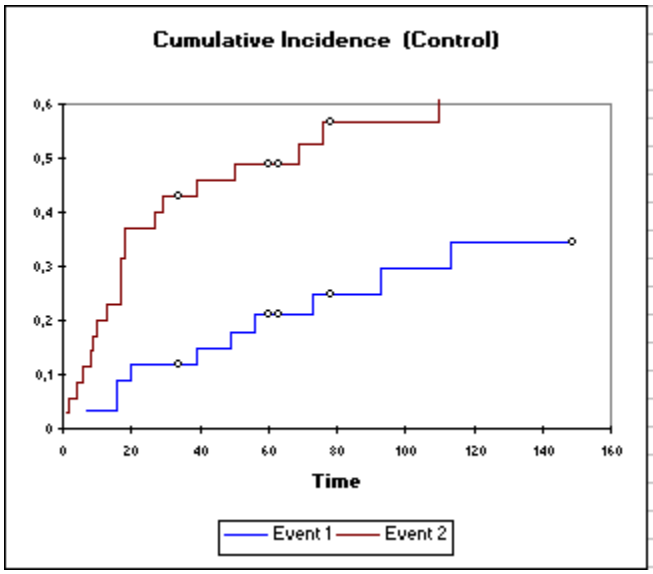


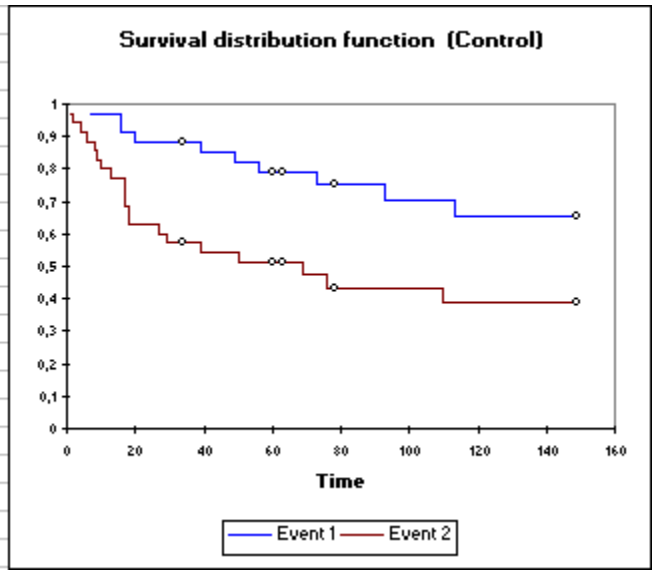
Then, we can compare the two events for the treated group. We can see that new metastases have a greater incidence than local relapses.



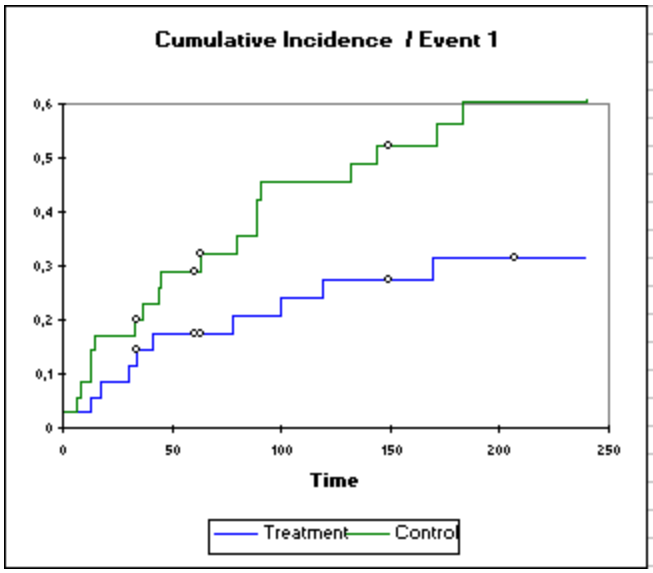


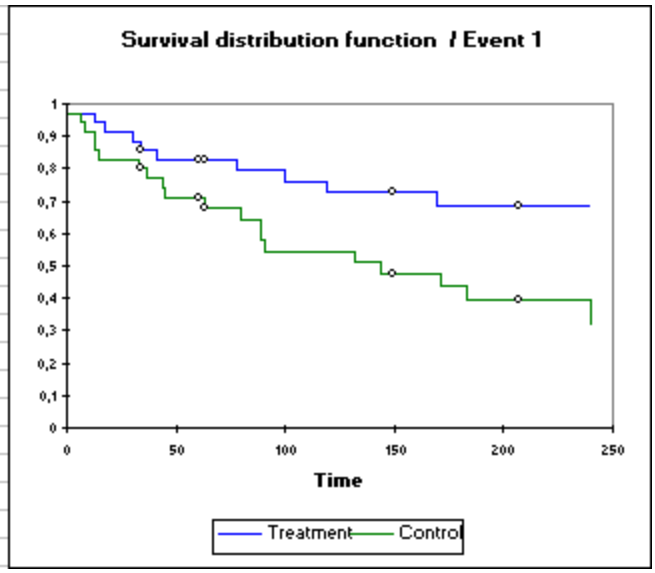
Next, the same series of results are displayed for each of the events for the control group. The comparison plot shows that both groups have the same behavior with respect to each event.

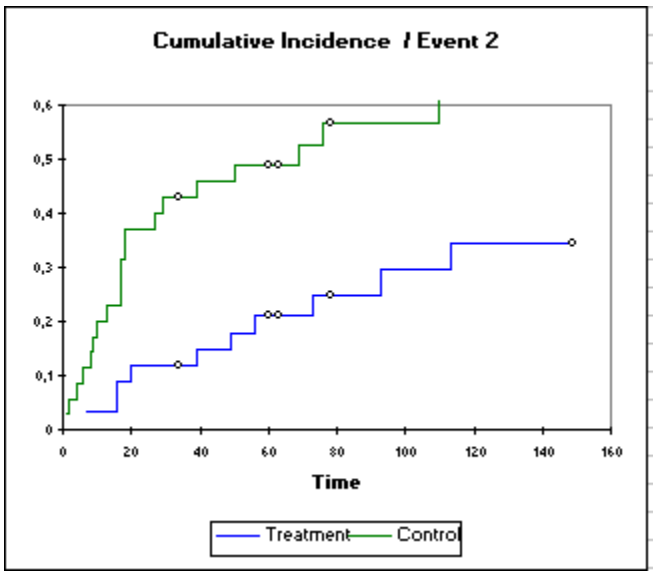


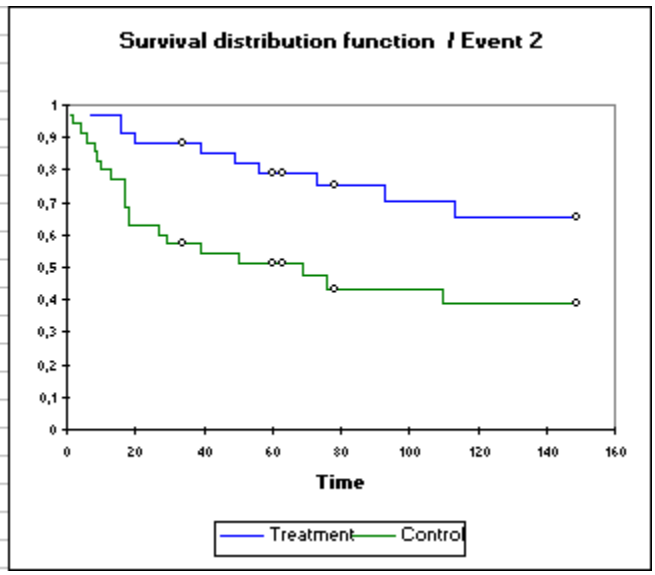


Last the comparison of the two groups for each event is of great interests. On the following curves, we can see that for both events (local relapse and new metastases), the treatment impacts significantly negatively the incidence of the events and impacts significantly positively the survival time of the patients.


Cumulative Incidence / Event 1
0,6
0,5
0,4
0,3
0,2
0,1
0
0
50
100
150
200
250
Time
Treatment
Control


Survival distribution function / Event 1
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0
50
100
150
200
250
Time
Treatment
Control


Cumulative Incidence / Event 2
0,6
0,5
0,4
0,3
0,2
0,1
0
0
20
40
60
80
100
120
140
160
Time
Treatment
Control


Survival distribution function / Event 2
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0
20
40
60
80
100
120
140
160
Time
Treatment
Control