

SURVIVAL ANALYSIS OF CARDIOVASCULAR DISEASE

EXTENSION TO COMPETING RISKS

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- ▶ Determine factors that affect survival time after diagnosis
- ▶ Compare the survival times of different groups
- ▶ Analyse the competing risks

OBJECTIVES

- ▶ CVD is also known as heart and blood vessels disease
- ▶ CVD is the number one cause of death in America and the rest of the world
- ▶ The most common form of CVD is heart attack.
- ▶ Other examples of CVD are; Ischemic heart disease, HBP, cardiac arrest, congestive heart failure, etc

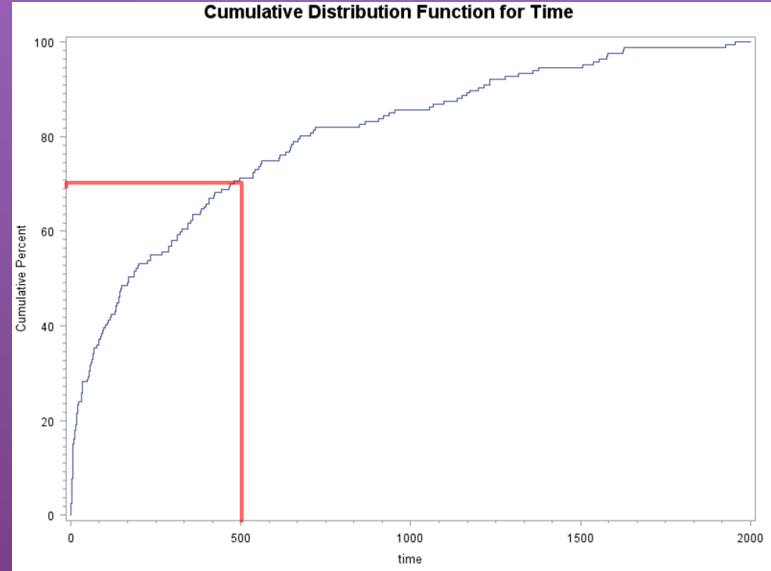
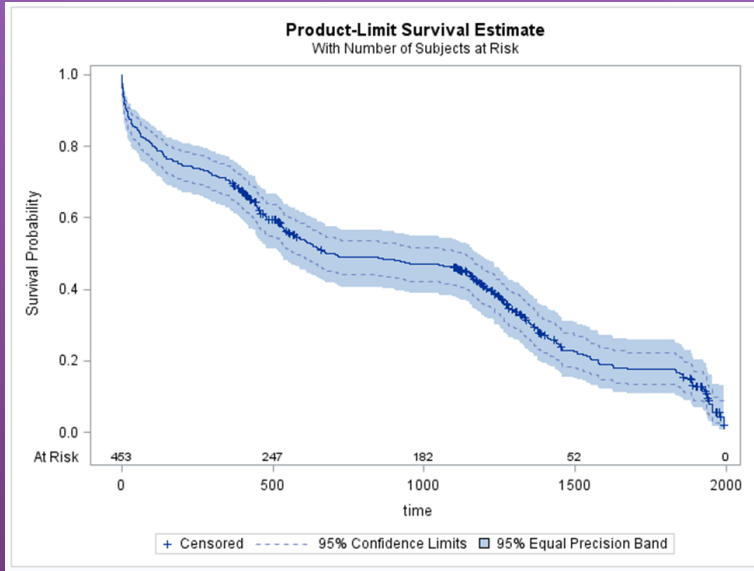
CARDIOVASCULAR DISEASES

- ▶ Survival analysis is a type of analysis where the response variable is the time until an event of interest occurs. Example.
- ▶ Time of origin is when a patient is diagnosed with CVD.
- ▶ All participant who drop out of the study or the study ends and haven't experienced the event are censored

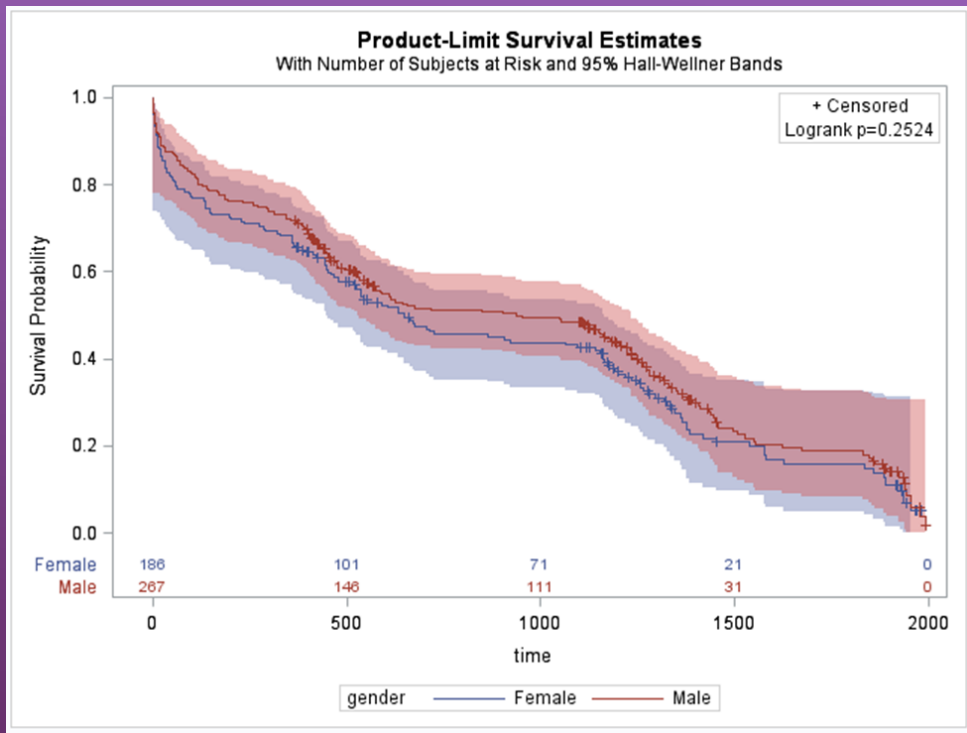
IMPORTANCE

- ▶ Estimate time to event of interest in this case death.
- ▶ Compare time to event for 2 or more groups.
- ▶ Analyse the relationship between covariates and time to event.

SURVIVAL ANALYSIS

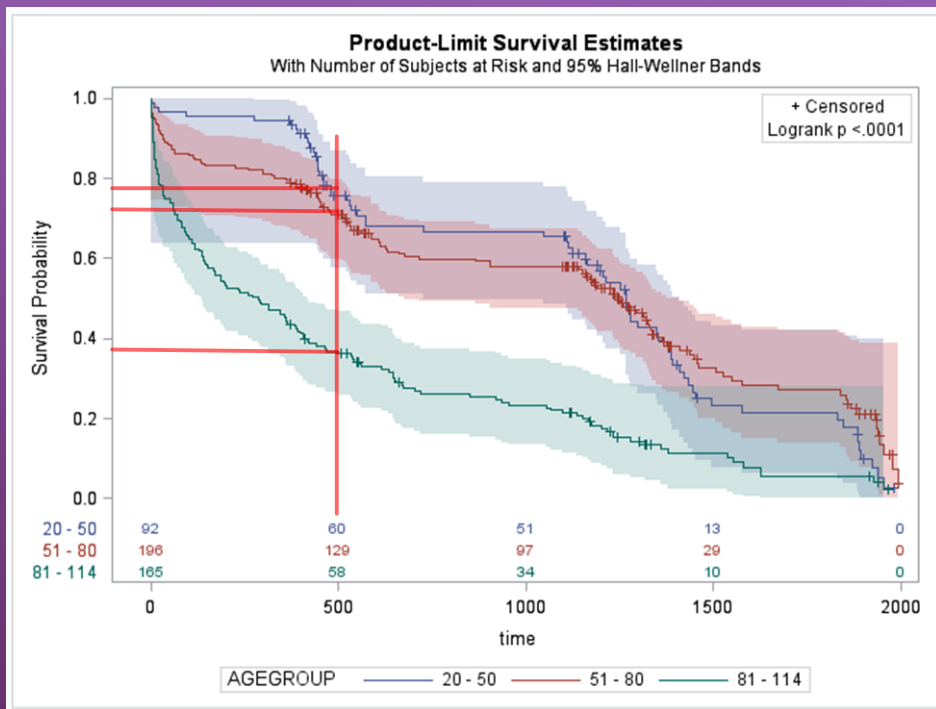


SURVIVAL ANALYSIS



COMPARING GENDER

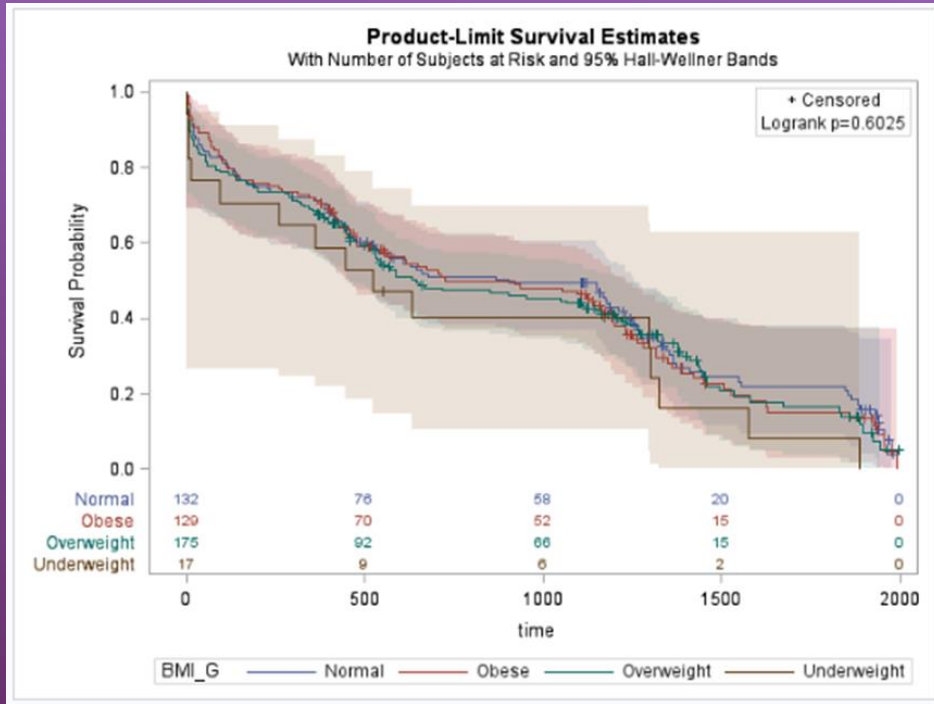
There is no significant difference in the survival curves of the 2 genders.



COMPARING AGE GROUPS

The P-value indicates that at least one age-group is significantly different from the rest of the age-groups

This gives us a unique opportunity to compare the survival probability for the different age groups on the same day.



COMPARING BMI

For the four different BMI classification there is no significant difference in their survival curves. Contrary to the popular opinion that weight increases the risk of death this population shows evidence otherwise.

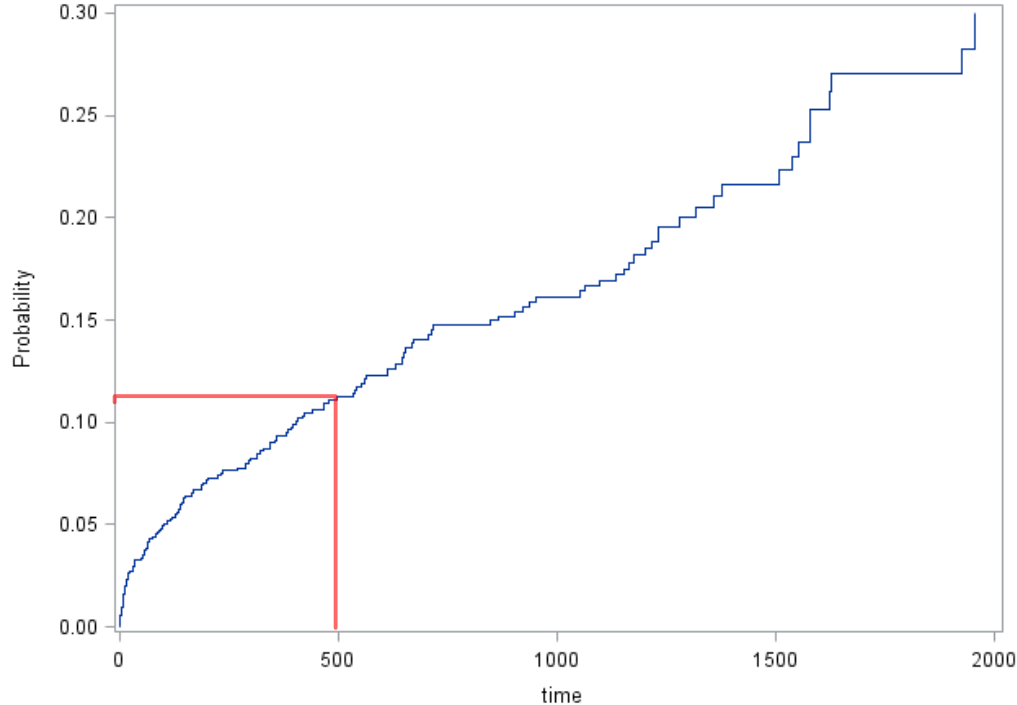
Life Table Survival Estimates															
Interval		Number Failed	Number Censored	Effective Sample Size	Conditional Probability of Failure	Conditional Probability Standard Error	Survival	Failure	Survival Standard Error	Median Residual Lifetime	Median Standard Error	Evaluated at the Midpoint of the Interval			
[Lower,	Upper)											PDF	PDF Standard Error	Hazard	Hazard Standard Error
0	100	88	0	453.0	0.1943	0.0186	1.0000	0	0	703.2	226.5	0.00194	0.000186	0.002152	0.000228
100	200	26	0	365.0	0.0712	0.0135	0.8057	0.1943	0.0186	1111.3	29.6235	0.000574	0.000109	0.000739	0.000145
200	300	13	0	339.0	0.0383	0.0104	0.7483	0.2517	0.0204	1051.6	28.5489	0.000287	0.000078	0.000391	0.000108
300	400	21	7	322.5	0.0651	0.0137	0.7196	0.2804	0.0211	971.8	28.1476	0.000469	0.000100	0.000673	0.000147
400	500	34	17	289.5	0.1174	0.0189	0.6728	0.3272	0.0221	905.0	29.5816	0.000790	0.000130	0.001248	0.000214
500	600	22	16	239.0	0.0921	0.0187	0.5938	0.4062	0.0233	864.1	28.7336	0.000547	0.000113	0.000965	0.000205
600	700	15	1	208.5	0.0719	0.0179	0.5391	0.4609	0.0239	807.3	40.4207	0.000388	0.000098	0.000746	0.000193
700	800	4	0	193.0	0.0207	0.0103	0.5003	0.4997	0.0242	749.2	38.9899	0.000104	0.000052	0.000209	0.000105
800	900	2	0	189.0	0.0106	0.00744	0.4900	0.5100	0.0242	660.5	38.5838	0.000052	0.000037	0.000106	0.000075
900	1000	5	0	187.0	0.0267	0.0118	0.4848	0.5152	0.0242	566.1	38.3791	0.000130	0.000058	0.000271	0.000121
1000	1100	4	1	181.5	0.0220	0.0109	0.4718	0.5282	0.0243	480.1	37.9147	0.000104	0.000052	0.000223	0.000111
1100	1200	18	25	164.5	0.1094	0.0243	0.4614	0.5386	0.0243	391.4	38.9479	0.000505	0.000115	0.001158	0.000272
1200	1300	22	14	127.0	0.1732	0.0336	0.4109	0.5891	0.0244	361.0	52.2696	0.000712	0.000144	0.001897	0.000403
1300	1400	18	13	91.5	0.1967	0.0416	0.3397	0.6603	0.0244	517.4	34.7697	0.000668	0.000149	0.002182	0.000511
1400	1500	11	4	65.0	0.1692	0.0465	0.2729	0.7271	0.0242	482.8	33.1376	0.000462	0.000133	0.001849	0.000555
1500	1600	8	0	52.0	0.1538	0.0500	0.2267	0.7733	0.0238	417.3	18.9804	0.000349	0.000119	0.001667	0.000587

LIFE TABLE

The survival table shows survival probability for 100 day intervals.

From the table it can be shown that the probability of surviving the first 400 days of the study is 67.28% while 1500 days is 27.29%

Cumulative Incidence Function for Reference Setting



COMPETING RISKS C.I.F CURVE

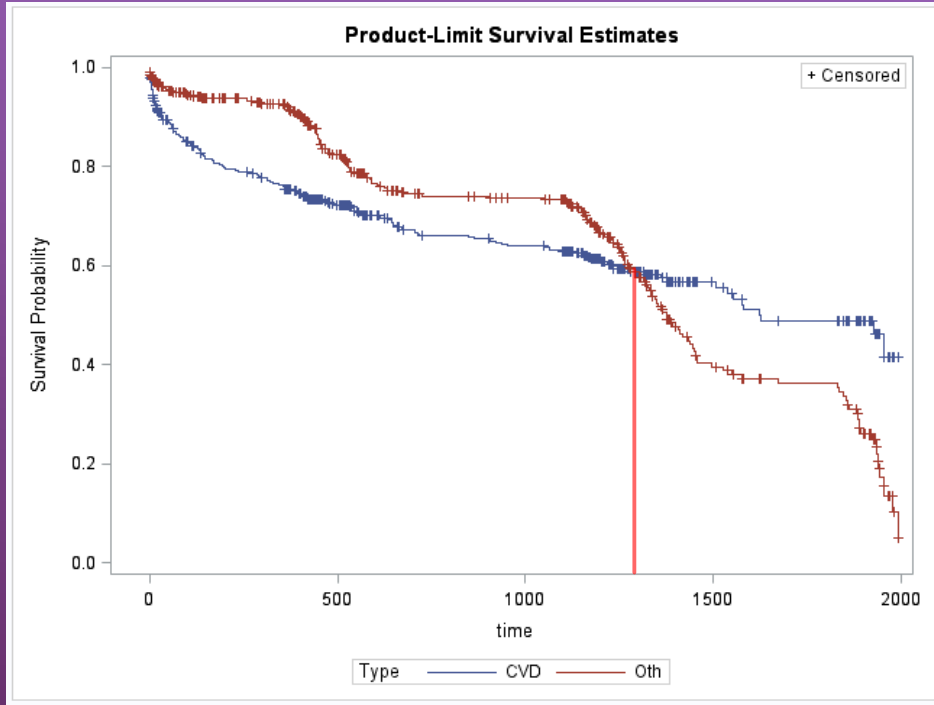
This is the cumulative incremental curve and it is a step function that increases every time a CVD event occurs.

It indicates the probability of the desired event occurring before a specified time.

From the chart we see that the probability of dying from CVD during the 1st 500 days of the study is 12%

COMPETING RISKS SURVIVAL CURVES

In the initial stages of the study the rate of deaths due to CVD is higher compared to the competing alternative, this trend is change at around day 1000 of the study where the rate of death due to other events increase and actually takes the lead on around day 1300 of the study.



Type 3 Tests			
Effect	DF	Wald Chi-Square	Pr > ChiSq
age	1	207.2290	<.0001
gender	1	0.8563	0.3548
bmi	1	17.9887	<.0001

COMPETING RISK HAZARD RATIO

The first table shows that gender is the only covariate that is not significant.

From the cause specific table, the hazard of death due to CVD for male patients is about 1.6 times that of female patient

Cause-Specific Hazards: Hazard Ratios for gender			
Description	Point Estimate	95% Wald Confidence Limits	
gender Female vs Male	0.865	0.636	1.176
gender Male vs Female	1.156	0.850	1.573

- ▶ Competing risks is an important concept that allows us to compare the risk of dying from CVD compared to other causes of death.
- ▶ The data is comprised of very many people of old age so that might be a contributing factor to the high rate of death due to other causes later in the study.
- ▶ There is room for improvement by getting a sample of data that represents a larger part of the society.

CONCLUSION

Three yellow wavy lines, resembling flames or stylized waves, are positioned behind the text.

THANK YOU