CLASSIFICATION AND THE SURVIVAL ANALYSES IN THE ARTREAT PROJECT

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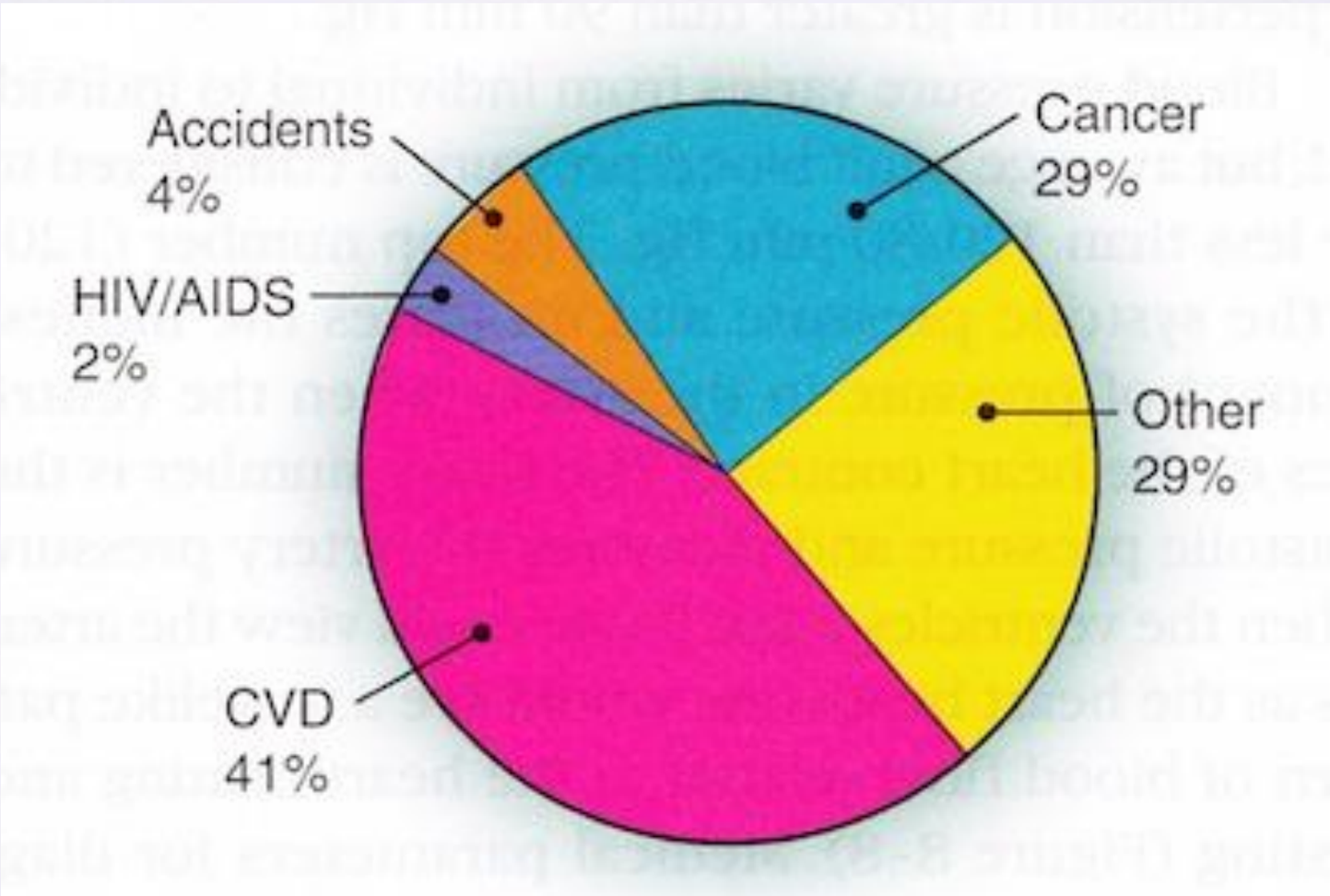
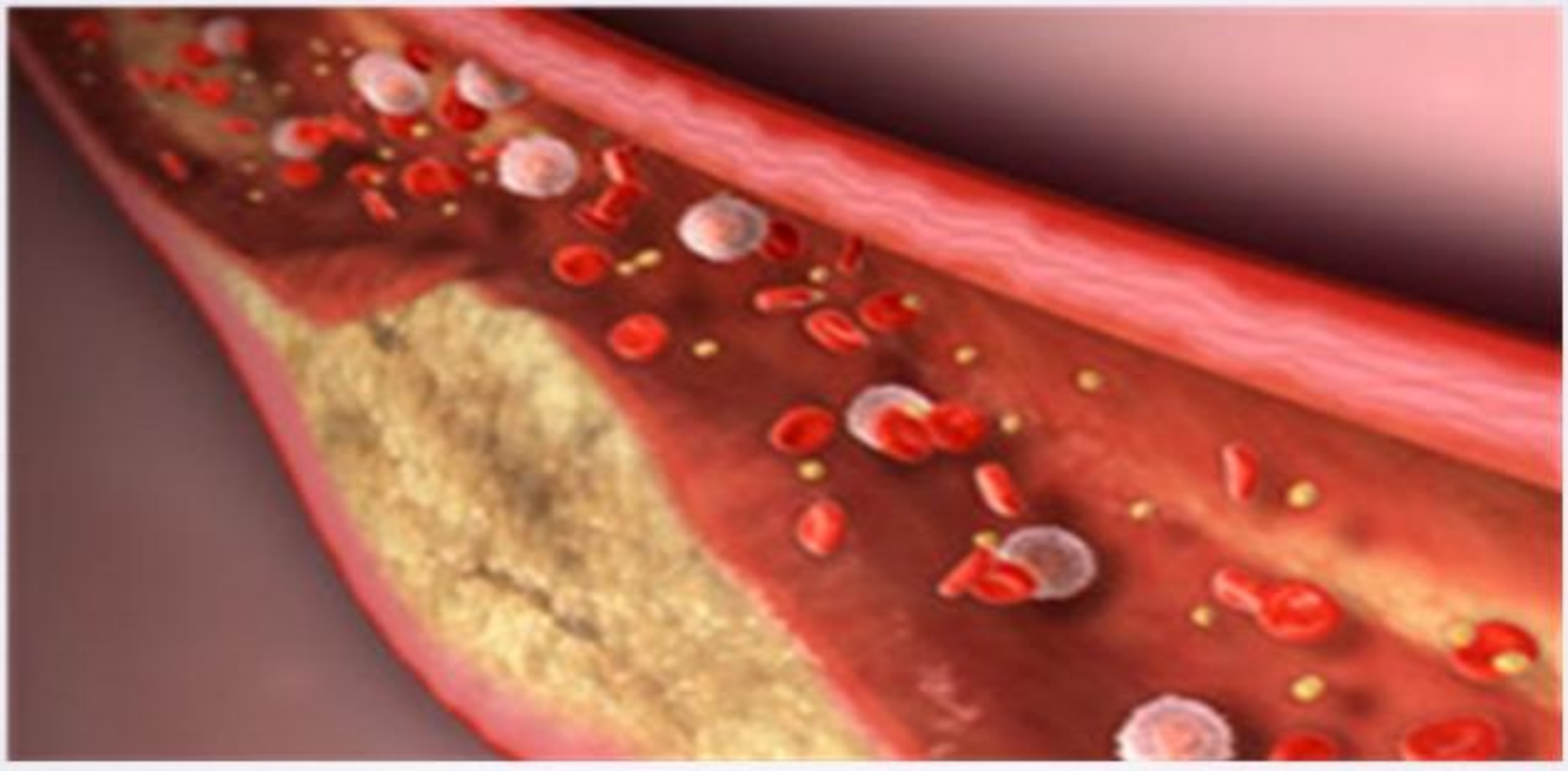
ATHEROSCLEROSIS

- Why is atherosclerosis important?
- It is a CVD (Cardiovascular Disease)



ATHEROSCLEROSIS

- Atherosclerosis is the condition
  in which an artery wall thickens as the result
  of a build-up of fatty materials such as cholesterol

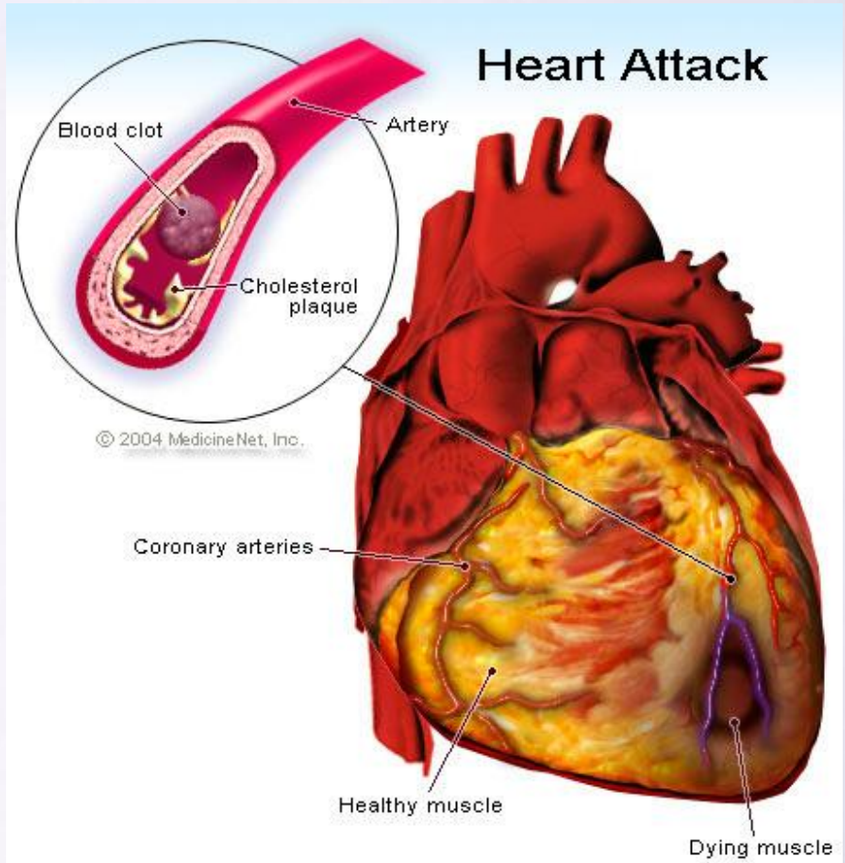


ATHEROSCLEROSIS

- Etiology: Injury to the artery wall initially patched by LDL plasma proteins
  - LDL plasma proteins invite white blood cells which cause an inflamatory response and finalize the patching of injured arterial walls
  - Cholesterol and triglycerides attached to the LDL proteins are not removed by HDL
  - The cholesterol oxydizes and hardens, stiffening the arterial wall,
    - Ireversible hardening or arteries

ATHEROSCLEROSIS

- Atherosclerosis is chronic and cumulative
- How atherosclerosis affects the organism?
  - obstruction of blood flow causing slow tissue death.
  - plaque ruptures forming thrombus
    - complete blockage?
    - tissue death within 5 minutes.



*The tissue involved is that which is fed by the blocked artery. *This thrombus related tissue death is what we call and infarction. This same process within the blood vessels of the brain is called a stroke.

ATHEROSCLEROSIS

- Why is atherosclerosis interesting for research?
  - **affects the entire artery tree**,
    - the coronary
    - Renal
    - Femoral
    - Cerebral
    - Carotid arteries.

THE ARTREAT PROJECT

- ARTreat targets at providing a computational model of the cardiovascular system, to improve prediction for the atherosclerosis progression and propagation into life-threatening events.

- An FP7 Large-scale Integrating Project (IP)

- 16 partners

- Funding: 10,000,000 €

ARTREAT GOALS

- ARTreat provides a **three-level patient model** describing the 3d arterial tree anatomy, the patient-specific blood flow and blood particle dynamics and the biological processes that lead to the creation and progression of atherosclerotic plaques.
- Provide patient specific model of arterial tree for clinical decision support and training
- Etiology of Atherosclerosis (e.g. genetic, fatty intake etc.)

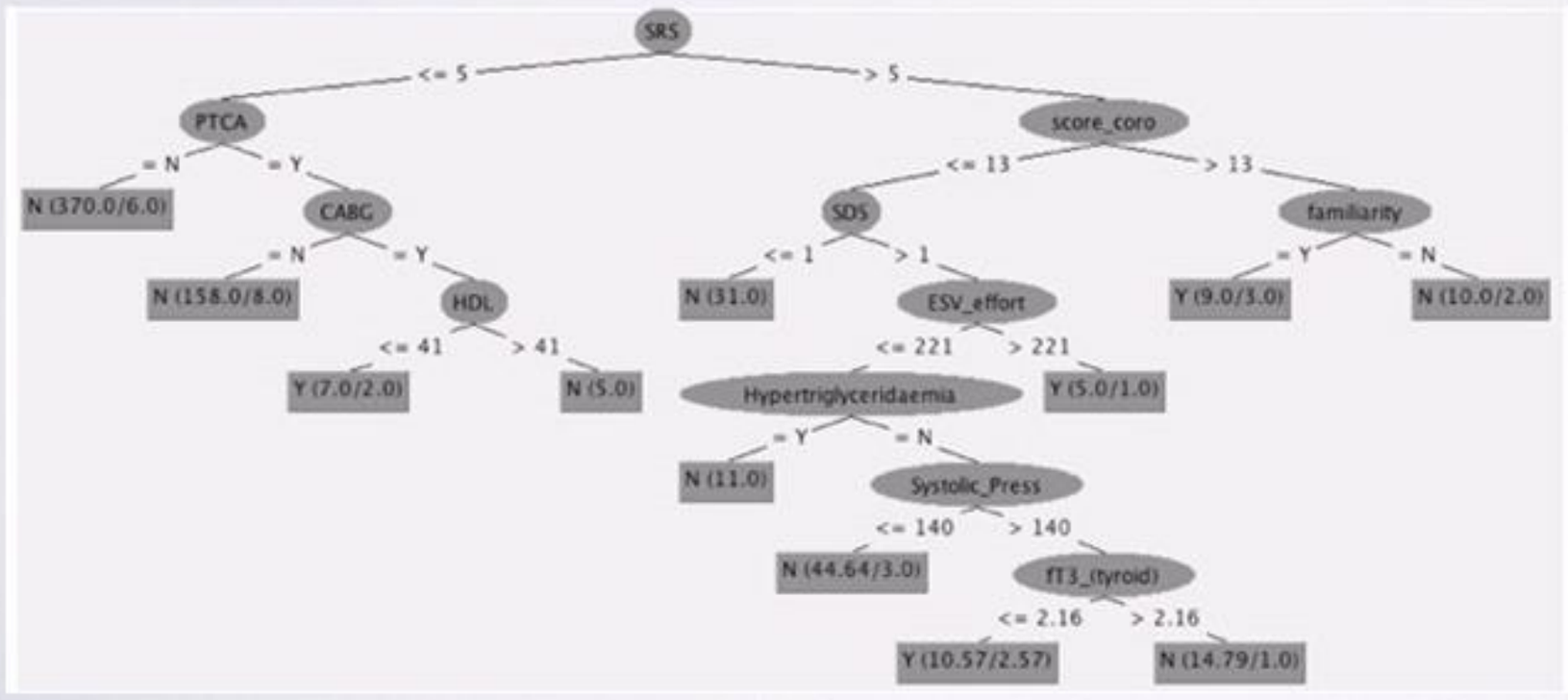
THE DATA

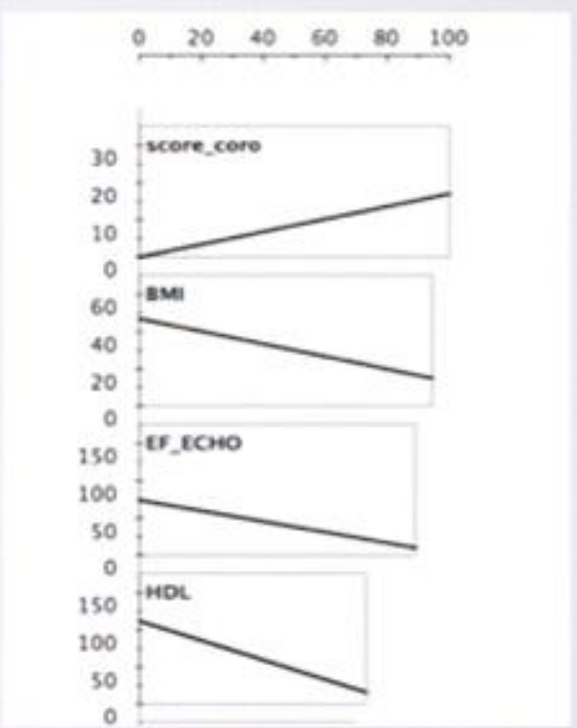
- 3000 patients with 97 attributes
- 450 patients with genetic profiles
- 400 patients with repeated angiographies
- 600 patients with scintigraphies

V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX
datcor1	vessels	DA	DA P	DA M	DA D	I	S	D	CX	CX P	CX M	CX D	MO	DP	DX	DX P	DX M	DX D	R.VDX	MA	DP	TC	hr	pressmin	pressmax	creatinine	colesterol	hdl
11/19/82	2	75													75													
1/19/83	3	75							75				50		50								60	80	120	1.1	284	
12/13/79	2	90													100								64	80	115	1.0	230	
2/4/83	1	100	100																				60	70	110	1.2	179	
1/14/83	1	90	90																				95	80	110	0.6	144	
5/6/79	2	90						90							75								64	82	142	1.0	220	
11/3/03	3	100							100	100					100	100							70	70	110	1.59	139	33
2/16/83	1														90	75	90						65	70	104	1.4	270	
2/16/83	0																						66	85	120	1.0	230	
4/22/83	2	90													90								70	75	115	1.1	223	
3/2/83	3	90	90						75				75		50	50							60	100	170	1.4	248	
3/6/03	4	50		50					90	90			75		100		100					50	48	90	170	1.08	236	53
3/30/83	3	90							90				90		90		90				75		84	90	140	1.5	238	
4/20/83	2	100					90		50	50													74	80	130	1.7	207	
5/15/79	3	100							90				100		75	75							68	78	118	0.6	415	
11/14/07	3	90				90		50	75	100			100		50	50		50					64	80	140	1.49	142	29
4/27/83	3	90	90						75	75					75	75		75					62	82	140	1.1	320	
3/9/83	4																					100	70	80	110	1.1	215	
5/4/83	1	90																					64	80	120	0.9	225	
5/13/83	0																						58	90	118	1.2	201	
6/8/83	1														100								60	85	130	1.0	171	
7/13/83	0																						62	85	125	1.2	223	
7/15/83	2	100							90														54	80	120	1.1	189	
5/11/83	3	100							75						100								58	80	140	1.3	209	
4/22/08	4	100							100						100							100	64	70	135	1.1	140	45
10/5/83	2	100													100		100						62	70	110	1.0	294	
10/28/83	2	90													75								78	85	122	0.9	239	
11/11/83	1								75														76	80	120	0.9	250	
2/8/84	3	75		75				100	100						90		90				90		66	92	135	1.0	195	
12/16/83	3	50							100						100		50	100					76	100	155	1.0	271	
12/2/83	1														50		50						70	75	115	1.1	326	
11/16/83	4	90	75	75	90				90						75	75						75	70	86	130	0.9	235	
1/23/84	1														90	50	90						72	80	120	0.9	218	
10/9/02	1	100		100																			60	80	140	0.92	149	44
3/12/84	2	50	50			75		50					50		100		100		75				58	80	120	1.2	224	
3/23/84	0																						72	88	138	0.8	307	
2/27/84	1							75	100			100	90										64	70	110	1.1	257	
3/7/84	1	50			50	90	90	90															76	75	124	1.3	189	
3/28/84	3	100							90						75								78	78	118	1.0	208	
3/28/84	4	90		90																		50	80	90	140	1.4	217	

CLASSIFICATION: HARD EVENTS

- Divide patients into:
  those who had an event vs. those who did not
  (group patients with similar anamnesis together)





CLASSIFICATION: HARD EVENTS

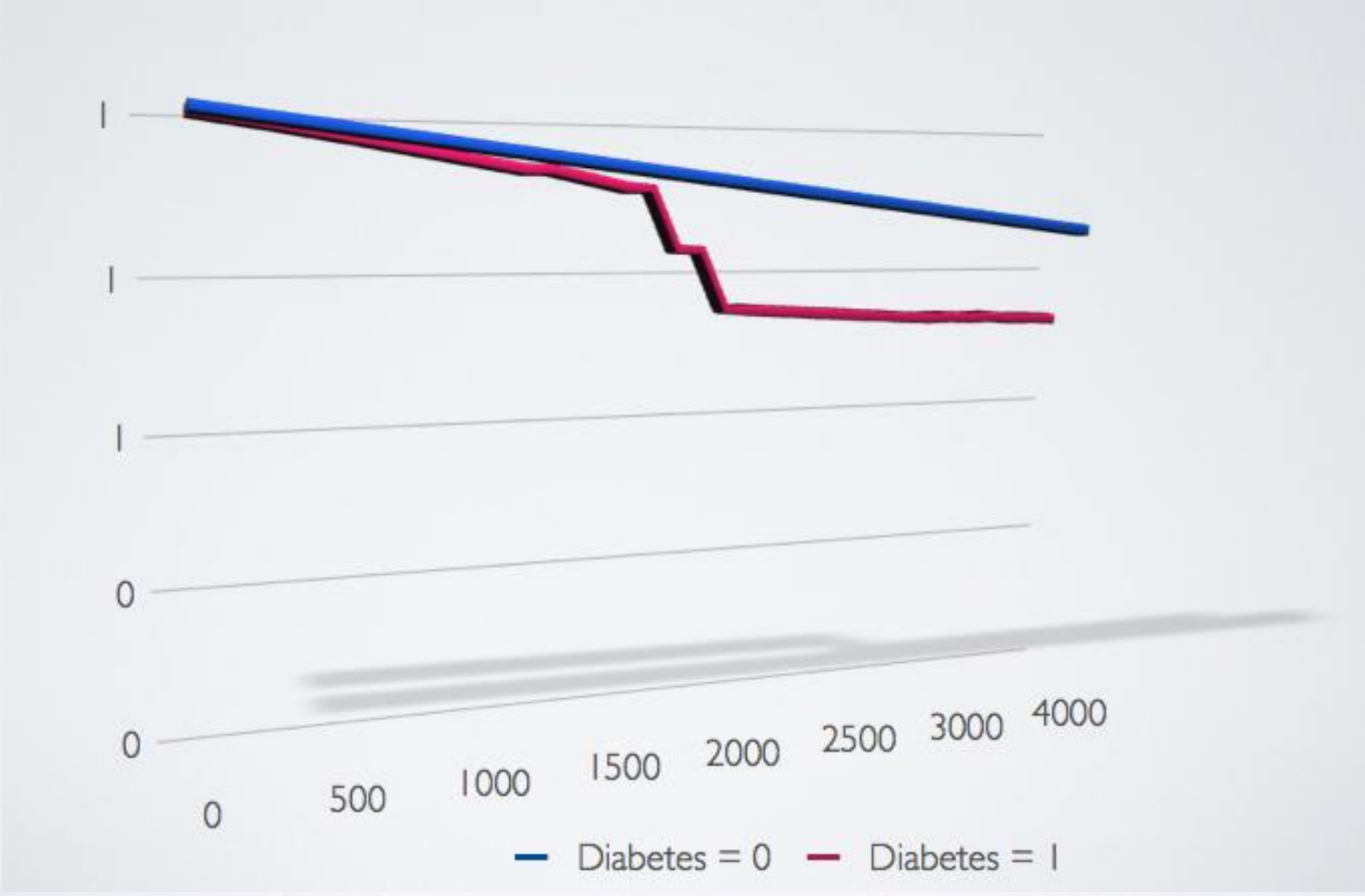
- Interventions in most severe cases
  change patient characteristics (they change the anamnesis)
- Hard event classification became meaningless
- A *MACE study (Major Adverse Cardiac Events)
- Better results, still not sufficient

*objective measures of acute and/or adverse cardiovascular events which are used to assess the effects of various interventions (e.g., rotablation, angioplasty, stenting) or therapeutics on outcomes, in the context of a clinical trial.

SURVIVAL ANALYSES

- Type of problems:
  - Study over a period of time
  - In the course of study an event either happens or not
  - Not just about if, but also when

THE KAPLAN-MEIER ESTIMATOR



an estimator for estimating the survival function from lifetime data.

COX REGRESSION

- Proportional Hazards assumption
- Omits the underlying hazard function
- Gives only a Hazard Ratio
- Relatively Simple, and often sufficient
- Easy to add time varying predictors and covarities

END

Thank You