

SUPPLEMENT 2

Table S1: Goodness of fit tests for the final model (Model 3, completely adjusted model) for the inclusion of deign variables based on quantiles of risk using the added variables version of the Gronnesby and Borgan test . The number of quantiles is computed according to the formula specified by May and Hosmer. The values are from the chi-square score test (p-values in paranthesis).

	CHD	CVD	HF	AF
SVIED	7.98 (0.25)	11.07 (0.27)	7.87 (0.02)	5.73 (0.13)
SVIES	9.22 (0.16)	16.77 (0.05)	7.79 (0.05)	4.39 (0.22)
SDIED	10.32 (0.11)	19.48 (0.02)	6.78 (0.03)	4.35 (0.23)
SDIES	8.32 (0.22)	7.71 (0.56)	6.99 (0.03)	4.95 (0.18)

Table S2: Population characteristics by LV chamber shape characterized by quintiles of the sphericity index at end -systole.

Parameters	Quintile 1 (Low Sphericity/High Conicity) (n=984)	Quintiles 2-4 (Reference) (n=2925)	Quintile 5 (High Sphericity) (n=970)
Age (years)	63±10*	61±10	60±10*¥
Gender (% males)	45	48.6	47.4
Race (Ca, Ch, AA, Hi)	35/17/28/21*	38/13/26/23	45/9/25/21*¥
Body mass Index (kg/m ²)	27.8±5	27.7±4.8	27.8±5.3
Smoking Status (Yes/Former)	12/36	12/35	15/37*
Systolic blood pressure (mmHg)	130±21*	125±21	123±22*¥
Hypertension medication use (%)	42*	36	28*¥
Diabetes (% IFG/Untreated/Treated)	15/2/12	13/2/9	11/2/7*¥
Cholesterol (mg/dL)	196±37	194±34	193±37
HDL (mg/dL)	51±15	51±15	52±16*
Heart rate (bpm)	64±10*	62±9	63±10¥
Beta-blocker use (%)	9.4	8.8	6.8¥
ACE inhibitor use (%)	13.5*	10.6	9.4¥
Log(NT-proBNP) (pg/mL)	3.97±1.21*	3.84±1.17	3.92±1.17
Presence of coronary calcium (%)	53.7*	48.8	42.6*¥
Framingham CVD risk (Circ 2008)	15.7±9.8*	13.7±9.4	12.7±9.3*¥
LV mass index (g/m ²)	78.5±16.2	77.7±15.4	78.4±18.2
Mass/Volume ratio (g/ml)	1.33±0.30*	1.15±0.21	1.04±0.18*¥
LV end-diastolic volume index (ml/m ²)	60.3±11.3*	68.1±11.6	76.1±15.6*¥
LV ejection fraction (%)	74±6*	69±7	64±8*¥
Sphericity volume index at ED (ratio)	0.22±0.05*	0.28±0.05	0.37±0.08*¥
Sphericity volume index at ES (ratio)	0.09±0.02*	0.15±0.02	0.24±0.05*¥
Heart failure (%)	3.92*	1.84	5.23*
Atrial Fibrillation (%)	4.85	3.82	4.86*
Coronary heart disease (%)	9.15*	5.49	5.23¥
Stroke (%)	2.72	2.31	2.82
All Cardiovascular Disease (%)	11.57*	8.01	7.75¥

Ca – Caucasian; Ch – Chinese American; AA – African American; Hi – Hispanic; IFG – impaired fasting glucose; NT-proBNP – N-terminal prohormone of brain natriuretic peptide; CVD – cardiovascular disease; LV – left ventricle; ED- end-diastole; ES – end-systole. * - p<0.05 in comparison with mean group (quintiles 2-4). ¥ - p<0.05 in comparison with low sphericity group (quintile 1).

Table S3: Association, presented as hazard ratios (95% confidence intervals), of sphericity indices at end-diastole and end-systole, for coronary heart disease and all cardiovascular disease as endpoints using Cox regression models.

	Coronary heart disease (n=302)				All cardiovascular disease (n=421)			
	Unadjusted	Model 1	Model 2	Model 3	Unadjusted	Model 1	Model 2	Model 3
SDIED								
Low Sphericity/High Conicity	2.00 (1.55, 2.59)	1.63 (1.25, 2.11)	1.48 (1.09, 2.01)	1.43 (1.09, 1.89)	1.82 (1.47, 2.27)	1.50 (1.20, 1.87)	1.28 (1.01, 1.62)	1.29 (1.01, 1.63)
High Sphericity	1.17 (0.87, 1.59)	1.37 (1.01, 1.86)	1.43 (1.09, 1.89)	1.47 (1.08, 2.00)	1.13 (0.88, 1.45)	1.26 (0.97, 1.62)	1.36 (1.05, 1.76)	1.33 (1.03, 1.73)
SDIES								
Low Sphericity/High Conicity	1.66 (1.28, 2.15)	1.56 (1.20, 2.03)	1.44 (1.09, 1.89)	1.44 (1.09, 1.89)	1.50 (1.20, 1.88)	1.32 (1.05, 1.65)	1.22 (0.94, 1.58)	1.23 (0.97, 1.56)
High Sphericity	1.05 (0.78, 1.42)	1.12 (0.82, 1.52)	1.25 (0.92, 1.88)	1.24 (0.91, 1.70)	0.95 (0.73, 1.22)	1.08 (0.83, 1.39)	1.21 (0.95, 1.53)	1.17 (0.90, 1.52)

SDIED: Sphericity Dimension Index at ED. SDIES: Sphericity Dimension Index at ES.

Covariates:

Model 1: Age, gender, race, BMI, smoking status, hypertension medication, systolic blood pressure, diabetes/ impaired fasting glucose, total and HDL cholesterol, use of beta-blockers or ACE inhibitors, heart rate.

Model 2: Model 1 + calcium score and LV mass/volume ratio.

Table S4: Association, presented as hazard ratios (95% confidence intervals), of sphericity indices at end-diastole and end-systole, for heart failure and atrial fibrillation as endpoints using Cox regression models.

	Heart failure (n=142)				Atrial fibrillation (n=203)			
	Unadjusted	Model 1	Model 2	Model 3	Unadjusted	Model 1	Model 2	Model 3
SDIED								
Low Sphericity/High Conicity	1.88 (1.26, 2.80)	1.37 (0.91, 2.05)	1.21 (0.76, 1.90)	1.35 (0.83, 2.17)	1.17 (0.82, 1.67)	0.99 (0.69, 1.43)	0.89 (0.60, 1.31)	0.88 (0.59, 1.32)
High Sphericity	2.04 (1.39, 3.00)	2.46 (1.66, 3.65)	2.39 (1.52, 3.73)	2.32 (1.48, 3.63)	1.60 (1.17, 2.20)	1.67 (1.20, 2.31)	1.84 (1.29, 2.63)	1.88 (1.31, 2.70)
SDIES								
Low Sphericity/High Conicity	1.81 (1.20, 2.73)	1.63 (1.07, 2.46)	1.61 (1.00, 2.57)	1.74 (1.07, 2.83)	1.34 (0.95, 1.89)	1.14 (0.80, 1.62)	1.06 (0.72, 1.55)	1.06 (0.72, 1.55)
High Sphericity	2.48 (1.71, 3.61)	2.82 (1.93, 4.13)	2.21 (1.41, 3.46)	2.03 (1.27, 3.26)	1.53 (1.10, 2.11)	1.54 (1.11, 2.16)	1.67 (1.15, 2.43)	1.64 (1.11, 2.42)

SDIED: Sphericity Dimension Index at ED. SDIES: Sphericity Dimension Index at ES.

Covariates:

Model 1: Age, gender, race, BMI, smoking status, hypertension medication, systolic blood pressure, diabetes/ impaired fasting glucose, total and HDL cholesterol, use of beta-blockers or ACE inhibitors, heart rate.

Model 2: Model 1 + LV mass index, NT-proBNP, and ejection fraction.

Figure S1: Spline plots showing the hazard rates (CHD and HF) over the range of sphericity volume index at end-diastole and end-systole with the blue lines indicating the 20th and 80th percentile cut-offs used in analysis.

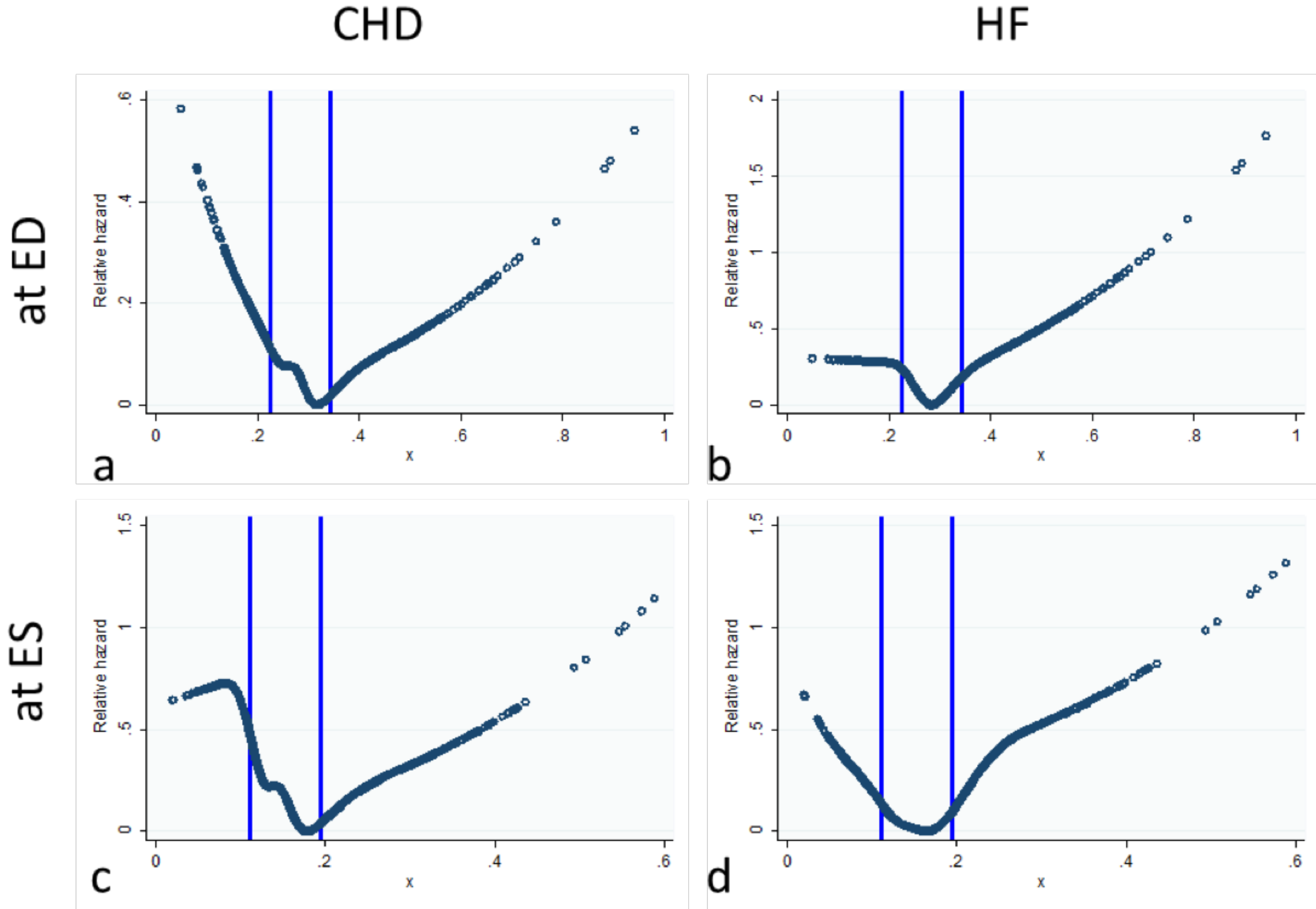


Figure S2: Plots showing the observed (solid line) vs. expected (dashed line) events across quantiles of risk from the Gronnesby and Borgan test. Goodness of fit tests are those from the final model (Model 3, completely adjusted model) for each of the 4 endpoints – coronary heart disease (CHD), all cardiovascular disease (CVD), heart failure (HF), and atrial fibrillation (AF). The number of quantiles is computed according to the formula specified by May and Hosmer. (a) Sphericity Volume Index at End-Diastole as the predictor, (b) Sphericity Volume Index at End-Systole as the predictor.

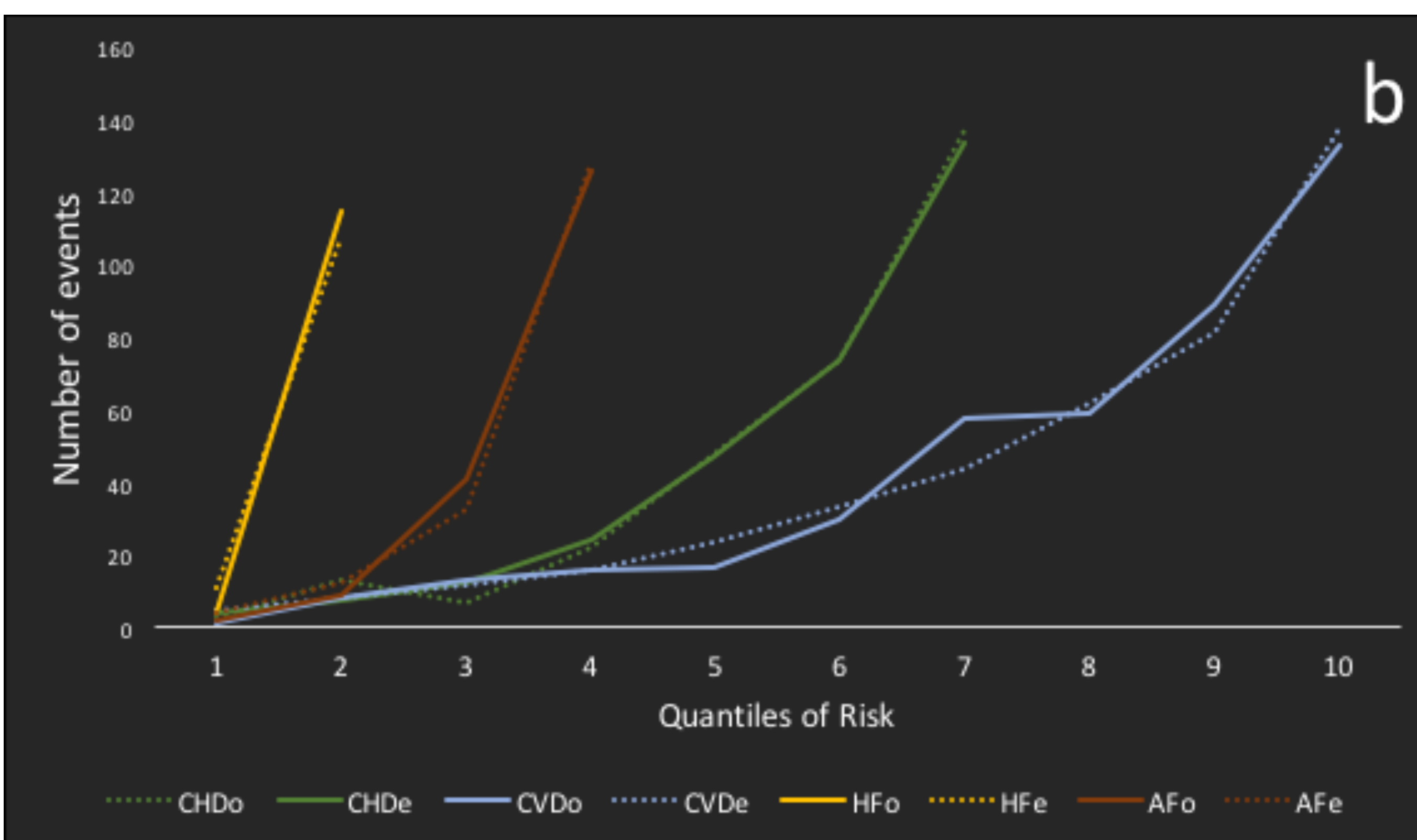
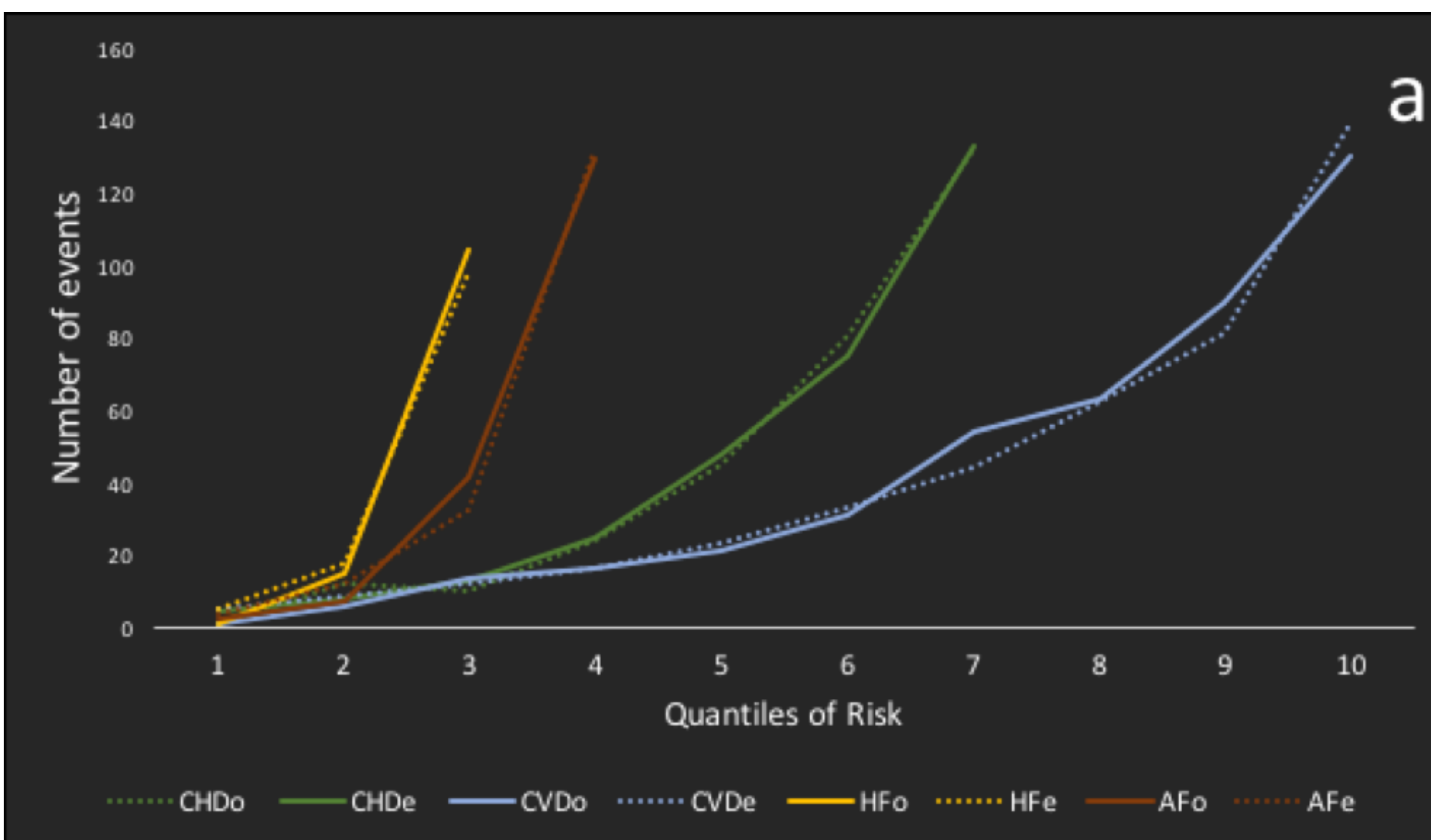
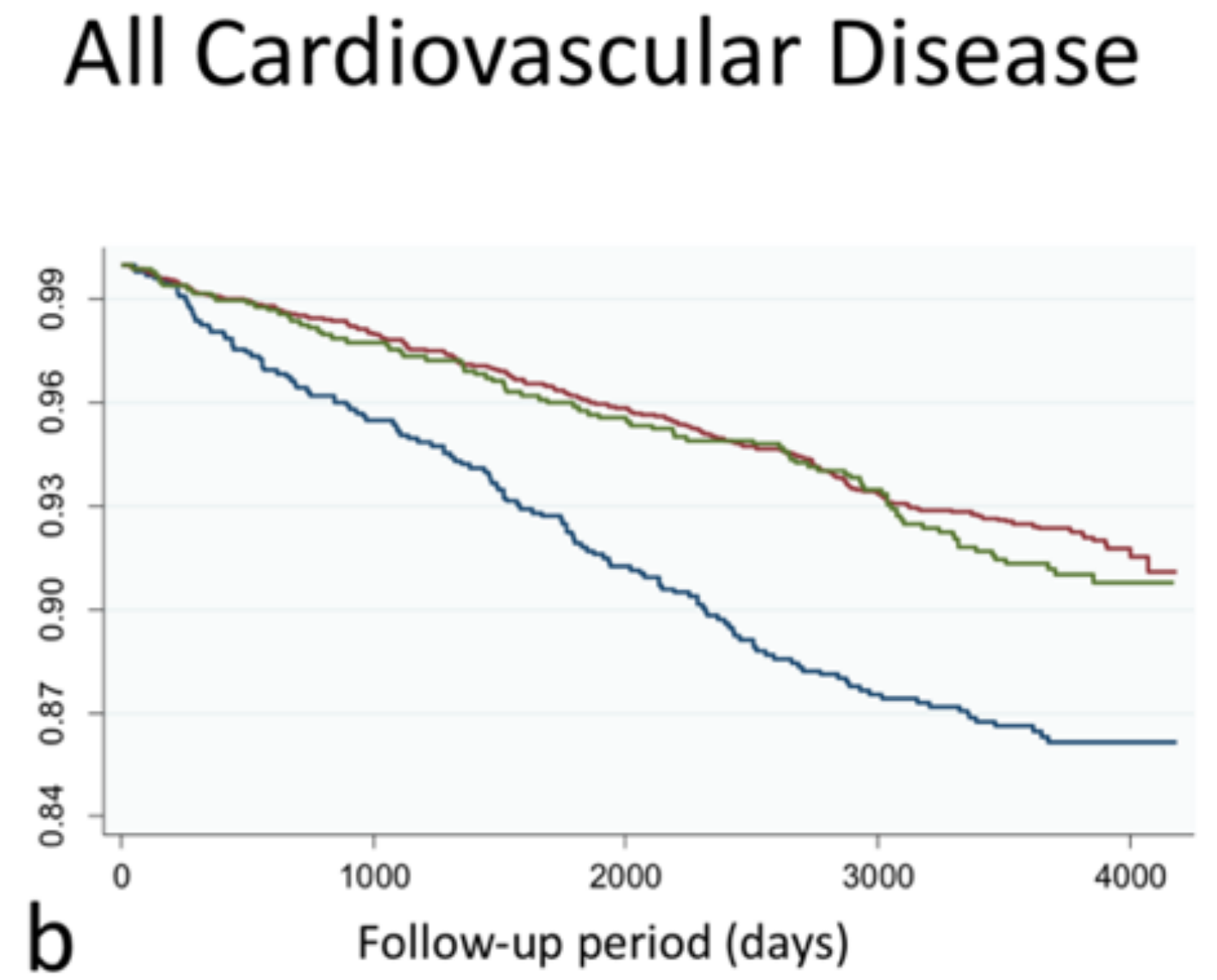
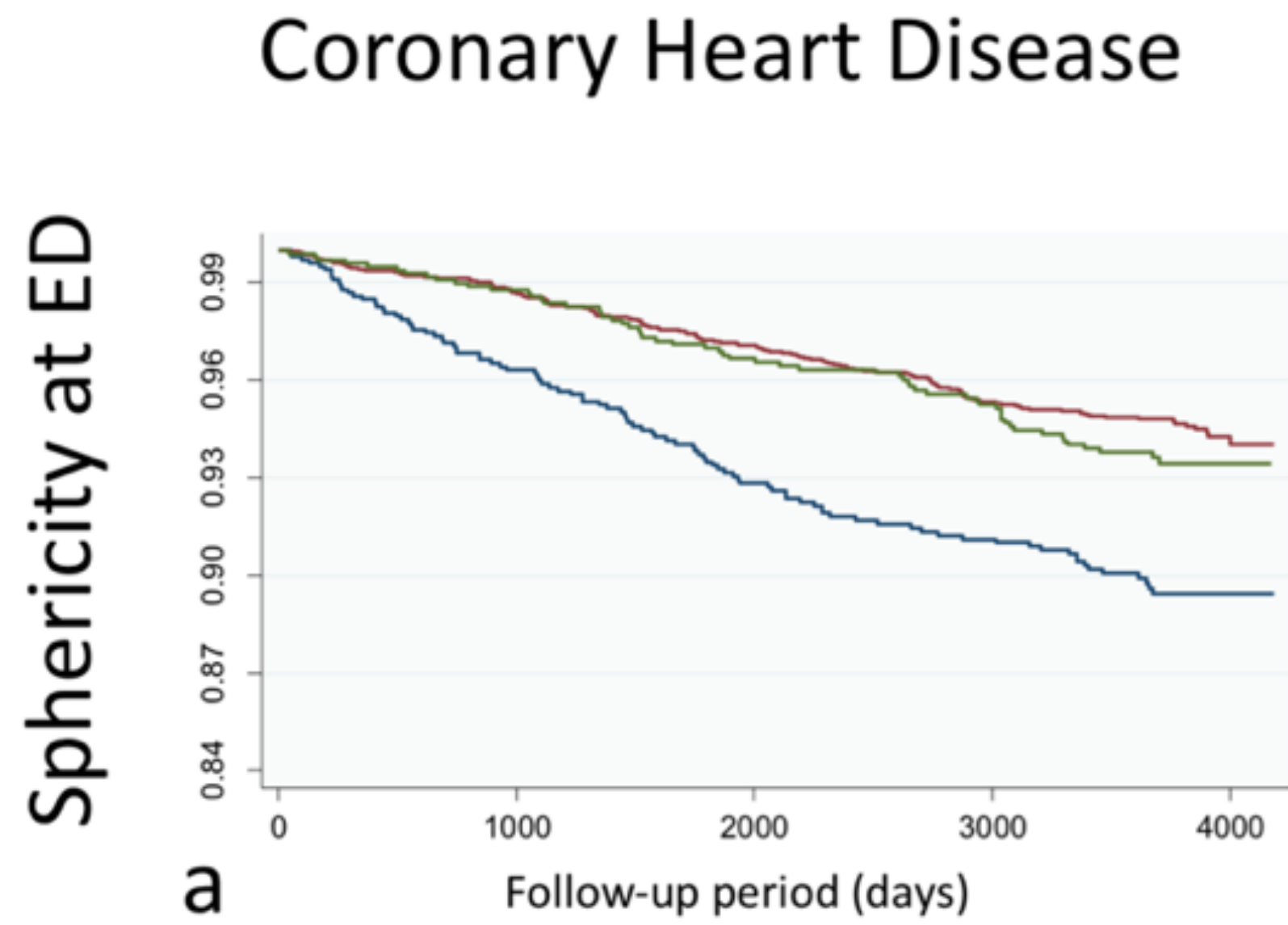
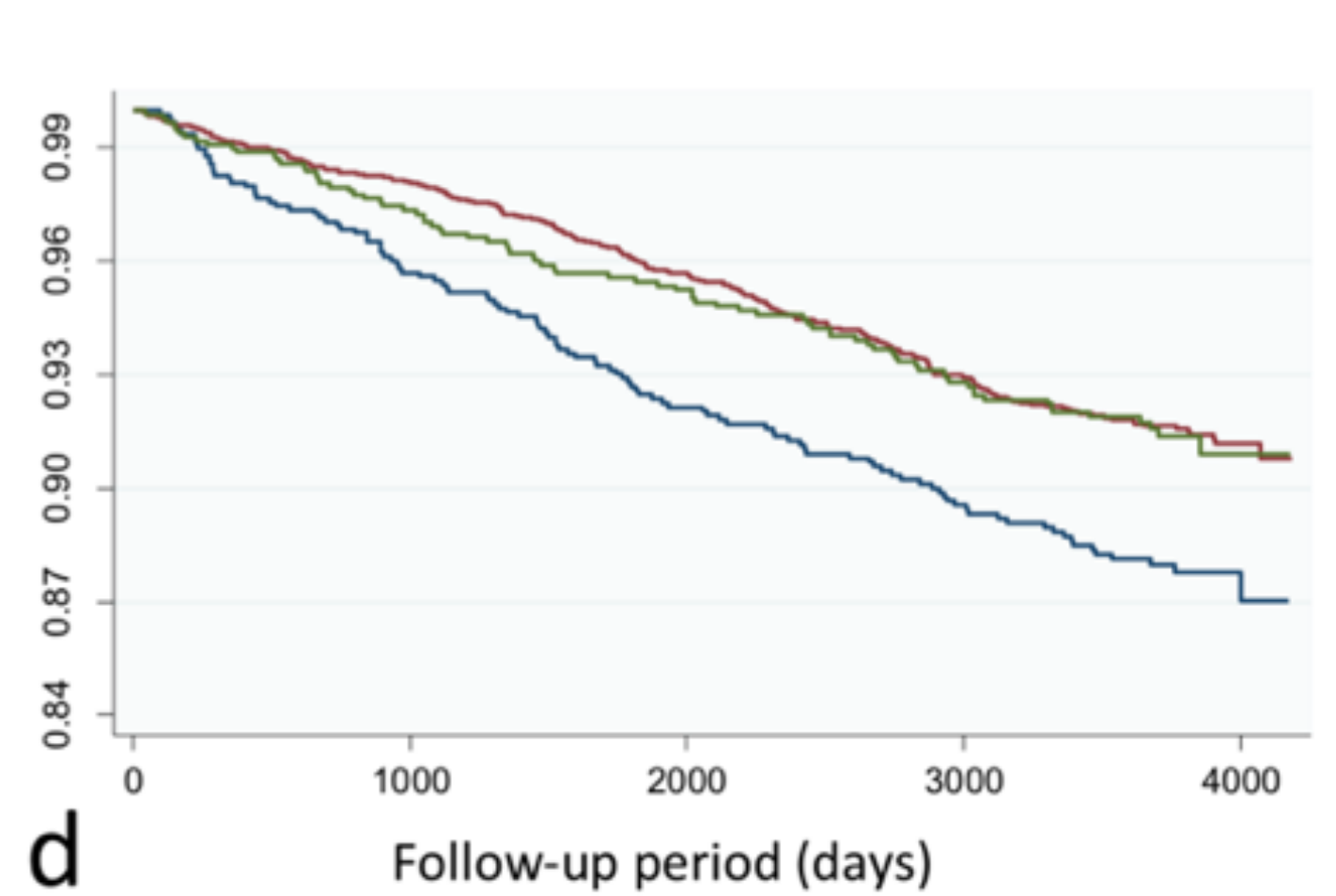
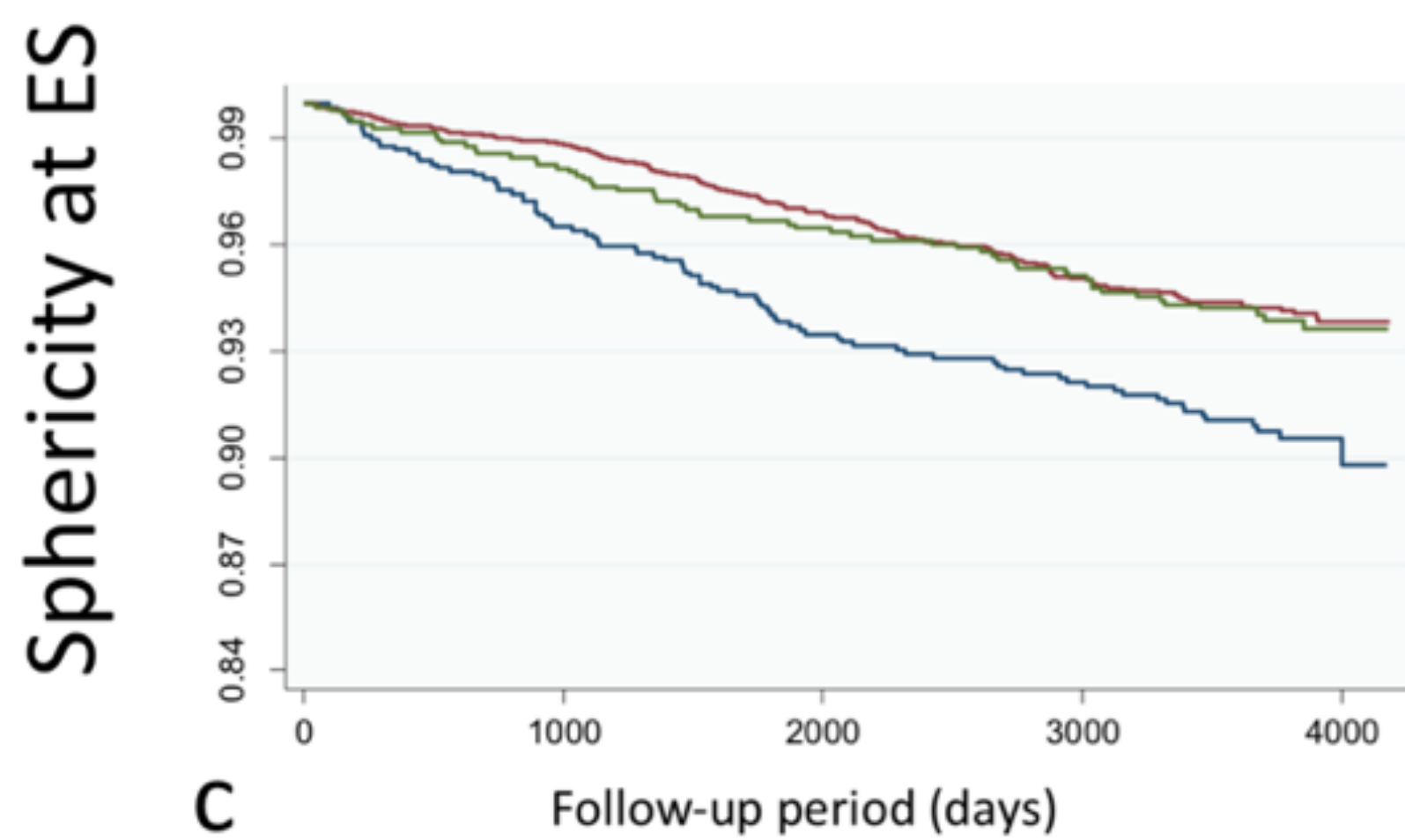


Figure S3: Kaplan–Meier survival curves for coronary heart disease (a), and cardiovascular disease (n) as end-points across the low sphericity or high conicity (blue), high sphericity (green) and the reference (red) groups of the sphericity dimension index at end-diastole. Corresponding survival curves for categories of the sphericity dimension index at end-systole are shown in (c and d). Individuals were free of all cardiovascular disease at baseline. $p < 0.05$ for low vs reference groups.



Numbers at Risk					
Low	992	911	830	781	103
Ref	2977	2842	2650	2515	400
High	993	958	895	856	224

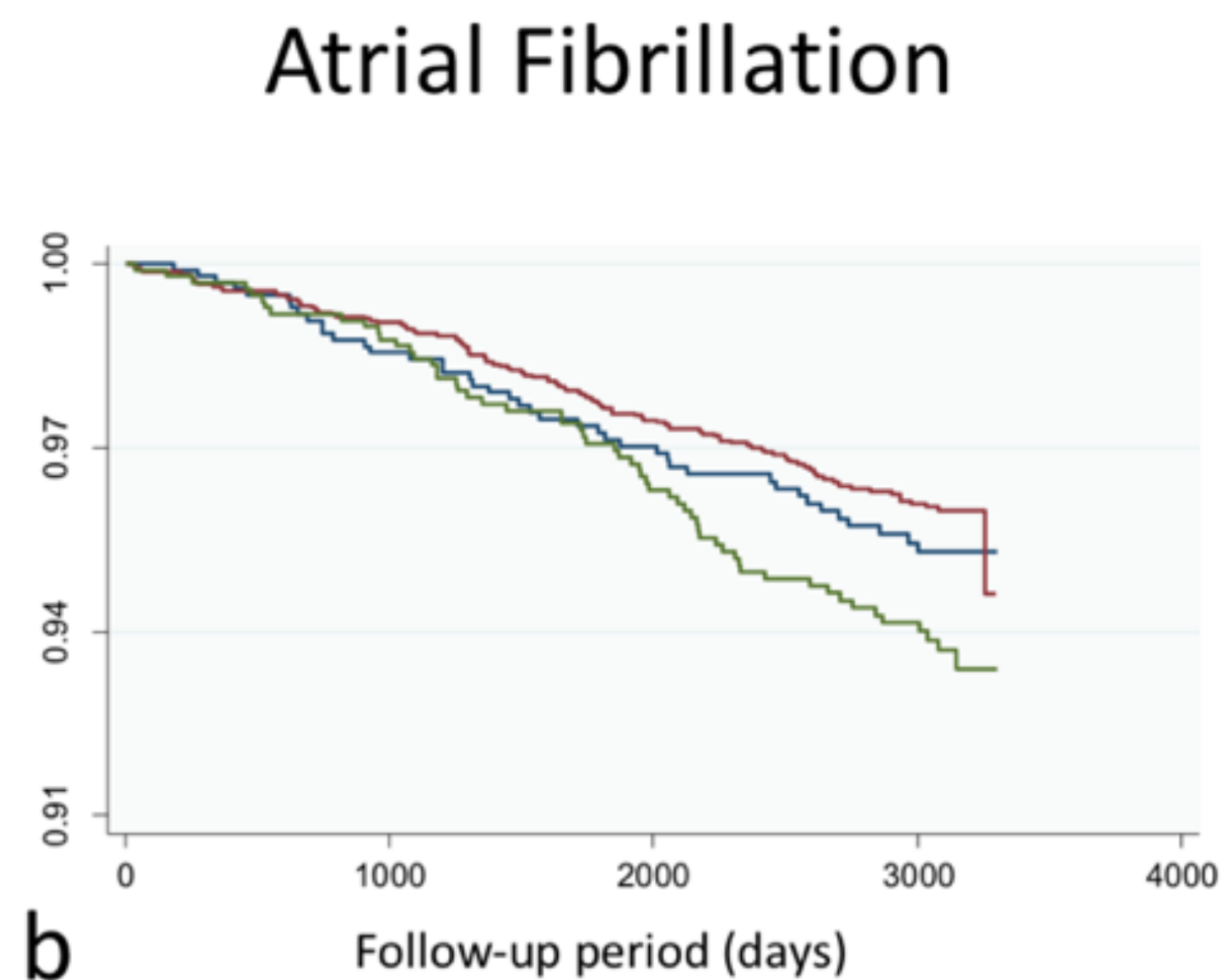
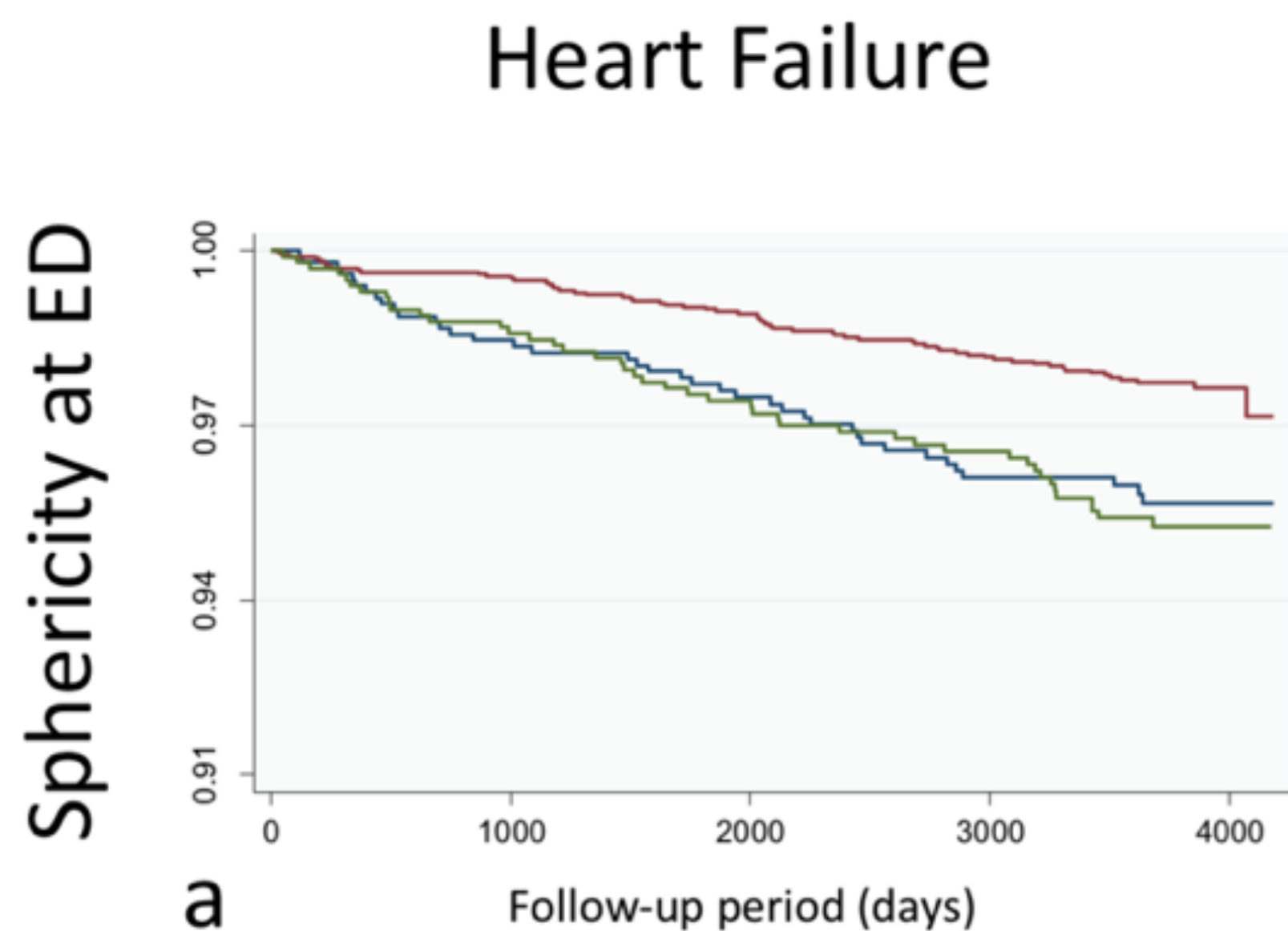
Numbers at Risk					
Low	992	906	822	761	100
Ref	2977	2824	2621	2475	396
High	994	952	889	845	220



Numbers at Risk					
Low	991	920	841	797	114
Ref	2977	2846	2656	2515	401
High	993	944	877	839	211

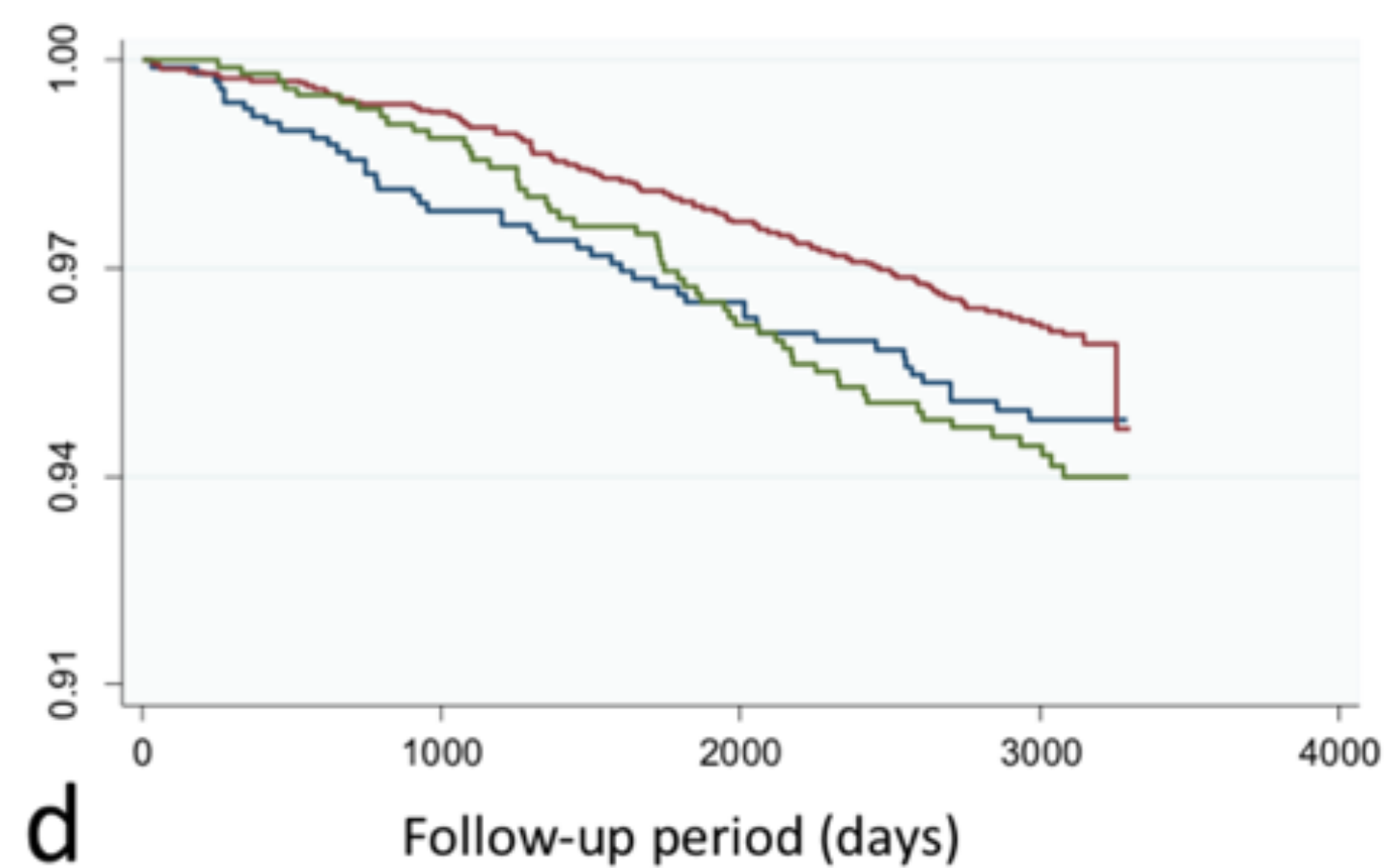
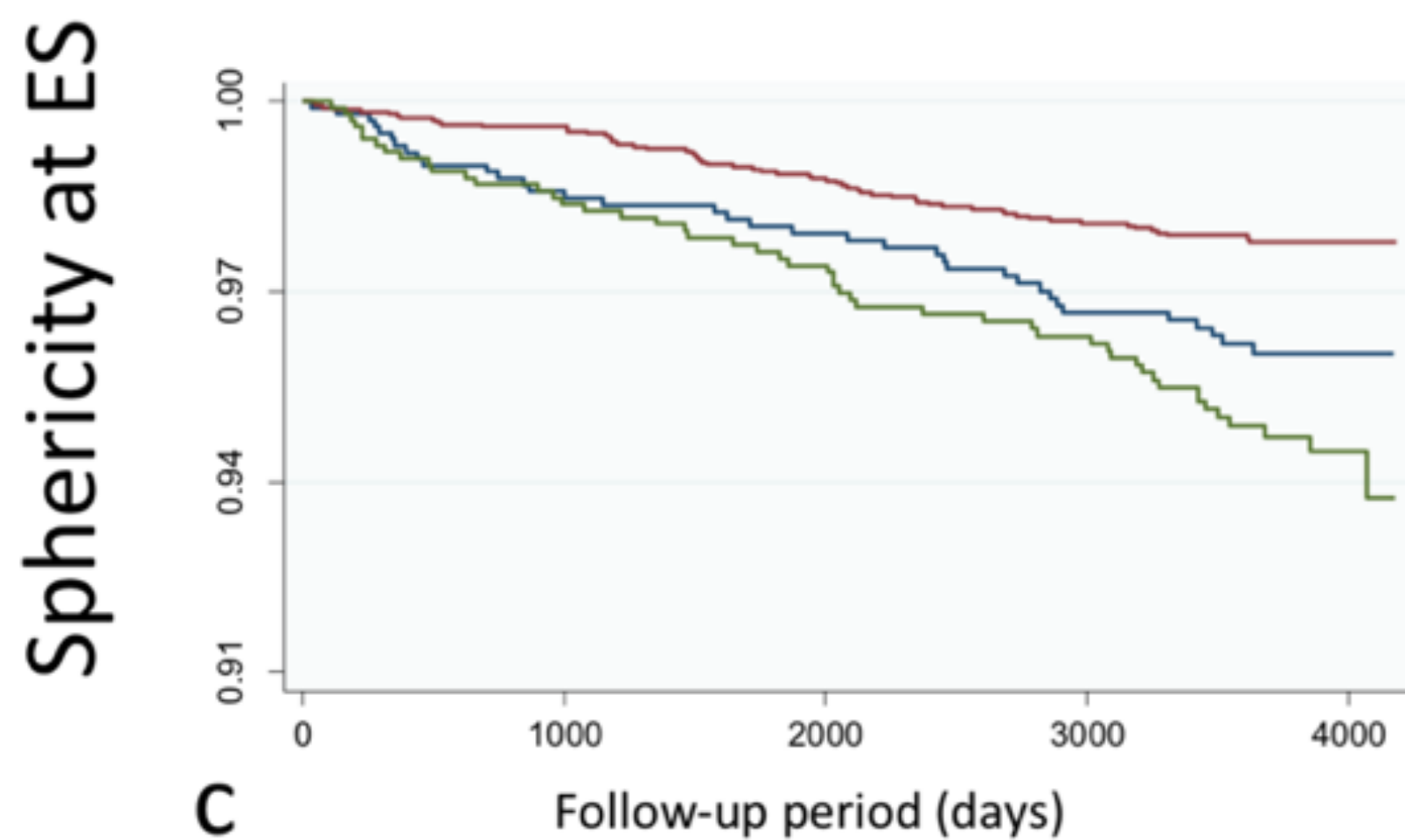
Numbers at Risk					
Low	991	915	832	781	110
Ref	2977	2826	2629	2473	394
High	994	940	870	826	211

Figure S4: Kaplan–Meier survival curves for heart failure (a), and atrial fibrillation (n) as end-points across the low sphericity or high conicity (blue), high sphericity (green) and the reference (red) groups of the sphericity dimension index at end-diastole. Corresponding survival curves for categories of the sphericity dimension index at end-systole are shown in (c and d). Individuals were free of atrial fibrillation and heart failure at baseline. $p < 0.05$ for low vs reference groups in (c). $p < 0.05$ for high vs reference groups in (a), (b) and (c).



Numbers at Risk					
Low	991	930	869	821	108
Ref	2977	2865	2691	2575	411
High	994	957	902	869	230

Numbers at Risk					
Low	988	930	859	649	0
Ref	2953	2829	2623	1980	0
High	982	948	881	709	0



Numbers at Risk					
Low	990	939	877	832	117
Ref	2977	2865	2701	2587	411
High	994	947	883	845	220

Numbers at Risk					
Low	982	925	853	645	0
Ref	2954	2834	2639	2002	0
High	986	947	870	690	0