SUPPLEMENTARY MATERIAL

Body Fat Estimates from Bioelectrical Impedance Equations in Cardiovascular Risk Assessment: the PREVEND Cohort Study

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Table S1. Bioelectrical impedance analysis equations tested in this study

Source	Population	Formula
For fat mass		
1. BIA 101 AKERN	NA	Unpublished inbuilt equation (default)
2. Heitmann1	35-65 yr, 139 F & M (Danes)	-0.283 * Height^2/R- 0.222 * Height + 0.804 * Weight – 0.283 * (Sex * Weight) + 18.71
For lean body mass		
3. Heitmann2	35-65 yr, 139 F & M (Danes)	0.279 * Height^2/R+ 0.181 * Weight + 0.231 Height + 0.064 * (Sex * Weight) – 0.077 Age – 14.94; M = 1, F = 2
4. Segal1	17-62 yr, 498 F (American)	0.0011 * Height^2 – 0.02090 * R + 0.23199 * Weight – 0.0678 Age + 14.594
5. Segal2	17-62 yr, 1069 M (American)	0.0013 * Height^2 – 0.04394 * R + 0.30520 * Weight – 0.16760 Age + 22.668
6. Segal3	17-62 yr, 1069 M (American)	0.00066360 * Height^2 – 0.02117 * R + 0.62854 * Weight – 0.12380 * Age + 9.333
7. Segal4	17-62 yr, 1069 M (American)	0.00088580 * Height^2 – 0.02999 * R + 0.42688 * Weight – 0.07002 Age + 14.524
8. Segal5	17-62 yr, 498 F (American)	0.00064602 Height^2 – 0.01397 * R + 0.42087 * Weight + 10.435
9. Segal6	17-62 yr, 498 F (American)	0.00091186 * Height^2 – 0.01466 * R + 0.29990 * Weight – 0.07015 * Age + 9.379
10. Van_Loan_Mayclin	18-64 yr, 188 F&M (American)	0.000985 * Height^2 – 0.0238 * R + 0.3736 * Weight – 0.1531 Age – 4.2921 * Sex + 14.595
For fat free mass		
11. Kyle	18-94 yr, 343 F&M (Swiss)	-4.104 + 0.518 * Height^2/R+ 0.231 * Weight + 0.130 * Xc + 4.229 * Sex
12. Aglago1	18-64 yr, 256 F&M (Moroccan)	7.47 + 0.336 + 6.04 * sex + 0.306 * Weight – 0.063 age; M = 1, F = 0
13. Deurenberg	16-83 yr, ~~37 F, 35~~ 661 F&M (Dutch)	0.34 * Height^2/R + 0.1534 * Height + 0.273 * Weight – 0.127 * age + 4.56 * sex – 12.44; M = 1, F = 0
14. Boulier	12-71 yr, 202 F&M (French)	0.40 * Height^2/R + 0.64 * Weight – 0.16 * Age – 2.71 * Sex + 6.37; M = 1, F = 2
15. Chumlea	12-80 yr 734 F&M (American)	M: 0.652 * Height^2/R + 0.262 * Weight + 0.015 * R – 10.678; F: 0.696 * Height2/R + 0.168 * Weight + 0.016 * R – 9.529
16. Gray1	19-74 yr, 25 M (American)	0.00151 * Height^2 – 0.0344 * R + 0.140 * Weight – 0.158 * Age + 20.387
17. Gray2	19-74 yr, 41 F, 53 M (American)	0.00139 * Height^2 – 0.0801 * R + 0.187 * Weight + 39.830
18. Jebb	16-78 yr, 205 F&M (American)	0.348613 * Height^2/R + 0.168998 * Weight + 13.96674
19. Lukaski1	18-50 yr, 67 F (American)	0.821 * Height^2/R + 4.917
20. Lukaski2	18-50 yr, 47 M (American)	0.827 * Height^2/R + 5.21
21. Lukaski3	18-50 yr, 47 M (American)	0.756 * Height^2/R + 0.110 * Weight + 0.107 * Xc – 5.463
22. Rising	22-38 yr, 56 F, 74 M (American)	0.34 * Height^2/R + 0.33 * Weight – 0.14 * Age + 6.18 * Sex + 13.74; M = 1, F = 0

23. Stolarczyk	18-60 yr, 151 F (American)	0.001254 * Height^2 – 0.04904 R + 0.1555 * Weight + 0.1417 Xc – 0.0833 * Age + 20.05
24. Wattanapenpaiboon1	26-86 yr, 66 M (Australian)	0.4936 * Height^2/R + 0.332 * Weight + 6.493
25. Wattanapenpaiboon2	26-86 yr, 130 F (Australian)	0.6483 * Height^2/R + 0.1699 * Weight + 5.091
For total body water		
26. Sun	12-94 yr, 734 F&M (American)	M: 0.45 * Height^2/R + 0.18 * Weight + 1.20; F: 0.45 * Height^2/R + 0.11 * Weight + 3.75
27. Aglago2	18-64 yr, 256 F&M (Moroccan)	5.68 + 0.267* Height^2/R + 4.42 * sex + 0.225 * Weight – 0.052 age; M = 1, F = 0
28. Heitmann3	35-65 yr, 139 F&M (Danes)	0.240 * Height^2/R + 0.172 * Weight + 0.040 (Sex * Weight) + 0.165 * Height – 17.58
29. Kushner	0,02-67 yr, 116 F&M (American)	0.593 * Height^2/R + 0.065 * Weight + 0.04
30. Kushner_Schoeller1	17-66 yr, 40 F&M (American)	0.556 * Height^2/R + 0.0955 * Weight + 1.726
31. Kushner_Schoeller2	17-66 yr, 20 F (American)	0.382 * Height^2/R + 0.105 * Weight + 8.315
32. Kushner_Schoeller3	17-66 yr, 20 M (American)	0.396 * Height^2/R + 0.143 * Weight + 8.399
33. Lukaski_Bolunchuk1	20-73 yr, 28 F & 25 M (American)	0.372 * Height^2/R + 0142 * Weight + 3.05 Sex – 0.069 * Age + 4.98; M = 1, F = 0
34. Lukaski_Bolunchuk2	20-73 yr, 31 F & 26 M (American)	0.374 * Height^2/R + 151 * Weight + 2.94 Sex – 0.083 * Age + 4.65; M = 1, F = 0

Abbreviations: R=resistance, Xc=reactance, M=male, F=female. Height in cm, weight in kg.

Selection (development) of above BIA equations from the validation studies was based on their prediction of the estimation by the BIA equations compared to measurements of reference methods such as densitometry (underwater weighting), dual-energy X-ray absorptiometry, isotope dilution methods and measurement of total body potassium.

Table S2. Body fat estimates from different BIA-BF%-equations, according to sex and CV events

BIA-BF%-equations		Man				Woman			
		Total	Future CV event			Total	Future CV event		
			Without	With	t-value		Without	With	t-value
1.	BIA 101 AKERN	26.9 ± 6.3	26.5 ± 6.2	30.1 ± 5.8	-10.82	36.3 ± 7.3	36.1 ± 7.3	40.2 ± 6.5	-7.41
2.	Heitmann1	33.8 ± 5.1	33.6 ± 5.1	35.2 ± 4.6	-6.02	8.3 ± 6.3	8.2 ± 6.3	10.7 ± 6.0	-4.92
3.	Heitmann2	29.9 ± 5.4	29.6 ± 5.4	32.1 ± 4.6	-9.72	41.6 ± 6.4	41.5 ± 6.4	44.9 ± 5.8	-7.02
4.	Segal1	37.1 ± 5.0	36.8 ± 5.0	39.2 ± 4.2	-9.91	42.2 ± 5.6	42.0 ± 5.6	45.1 ± 5.1	-7.19
5.	Segal2	25.2 ± 5.2	24.9 ± 5.2	27.4 ± 4.3	-10.01	34.4 ± 5.7	34.2 ± 5.7	37.2 ± 5.1	-6.98
6.	Segal3	23.8 ± 3.0	23.5 ± 2.9	25.8 ± 2.3	-17.65	31.3 ± 3.3	31.1 ± 3.2	33.7 ± 2.9	-10.32
7.	Segal4	30.9 ± 3.4	30.7 ± 3.4	32.6 ± 2.8	-12.38	38.5 ± 3.8	38.4 ± 3.8	40.6 ± 3.3	-8.11
8.	Segal5	31.4 ± 3.2	31.3 ± 3.2	32.2 ± 2.9	-5.45	35.7 ± 3.6	35.6 ± 3.6	37.0 ± 3.5	-4.61
9.	Segal6	39.3 ± 4.1	39.0 ± 4.1	41.2 ± 3.3	-11.32	43.9 ± 4.6	43.8 ± 4.6	46.6 ± 4.2	-7.98
10.	Van_loan_mayclin	30.2 ± 4.8	29.8 ± 4.8	33.1 ± 3.6	-15.51	41.9 ± 4.9	41.7 ± 4.8	45.5 ± 4.1	-10.74
11.	Kyle	27.6 ± 5.2	27.4 ± 5.2	29.2 ± 4.9	-6.53	36.6 ± 5.6	36.5 ± 5.7	38.7 ± 5.1	-5.00
12.	Aglago1	31.6 ± 4.1	31.5 ± 4.1	33.0 ± 3.7	-7.45	41.7 ± 3.9	41.6 ± 3.9	43.5 ± 3.4	-6.72
13.	Deurenberg	31.6 ± 5.1	31.2 ± 5.1	34.2 ± 4.1	-12.86	41.6 ± 5.4	41.4 ± 5.4	45.2 ± 4.6	-9.62
14.	Boulier	11.3 ± 4.1	11.0 ± 4.1	13.8 ± 3.6	-13.98	20.3 ± 4.2	20.2 ± 4.2	23.3 ± 3.9	-9.58
15.	Chumlea	27.6 ± 4.8	27.5 ± 4.9	28.8 ± 4.5	-5.37	37.8 ± 6.0	37.7 ± 6.0	39.8 ± 5.6	-4.45
16.	Gray1	35.0 ± 6.8	34.5 ± 6.8	38.6 ± 5.3	-13.60	39.5 ± 7.9	39.3 ± 7.9	44.6 ± 6.8	-9.18
17.	Gray2	28.8 ± 5.6	28.7 ± 5.7	30.1 ± 5.3	-4.89	39.2 ± 6.9	39.1 ± 6.9	40.6 ± 6.5	-2.71
18.	Jebb	39.8 ± 4.6	39.7 ± 4.6	40.5 ± 4.4	-3.21	40.9 ± 5.7	40.8 ± 5.7	42.2 ± 5.4	-3.01
19.	Lukaski1	31.3 ± 7.1	31.1 ± 7.2	32.7 ± 6.7	-4.25	39.7 ± 7.8	39.7 ± 7.8	41.8 ± 7.2	-3.61
20.	Lukaski1	30.5 ± 7.2	30.3 ± 7.2	31.9 ± 6.8	-4.24	38.9 ± 7.9	38.8 ± 7.9	41.1 ± 7.3	-3.61
21.	Lukaski3	29.8 ± 6.2	29.6 ± 6.2	31.6 ± 5.8	-6.30	37.3 ± 6.9	37.2 ± 6.9	39.7 ± 6.2	-4.74
22.	Rising	33.6 ± 4.2	33.3 ± 4.2	35.9 ± 3.5	-12.77	27.2 ± 6.2	27.1 ± 6.2	30.5 ± 5.2	-7.71
23.	Stolarczyk	37.2 ± 5.9	36.8 ± 5.9	40.3 ± 4.9	-12.35	41.8 ± 6.8	41.6 ± 6.8	45.7 ± 6.1	-7.93
24.	Wattanapenpaiboon1	21.3 ± 4.7	21.2 ± 4.7	22.2 ± 4.4	-4.02	25.6 ± 5.3	25.6 ± 5.3	27.0 ± 4.9	-3.48
25.	Wattanapenpaiboon2	27.3 ± 5.8	27.2 ± 5.8	28.5 ± 5.4	-4.19	33.7 ± 6.4	33.7 ± 6.4	35.4 ± 5.9	-3.58
26.	Sun	26.2 ± 5.2	26.1 ± 5.2	27.2 ± 4.9	-4.34	37.7 ± 6.1	37.6 ± 6.1	39.3 ± 5.6	-3.58
27.	Aglago2	29.3 ± 4.4	29.1 ± 4.4	30.8 ± 3.9	-7.81	39.7 ± 4.2	39.6 ± 4.2	41.7 ± 3.6	-6.92
28.	Heitmann3	31.8 ± 4.8	31.7 ± 4.8	33.3 ± 4.3	-6.65	30.7 ± 5.7	30.6 ± 5.7	33.1 ± 5.4	-5.36
29.	Kushner	28.8 ± 6.6	28.7 ± 6.6	30.2 ± 6.3	-4.41	38.2 ± 7.0	38.1 ± 7.0	40.1 ± 6.4	-3.69
30.	Kushner_schoeller1	25.8 ± 6.4	25.6 ± 6.4	27.1 ± 6.1	-4.33	34.1 ± 6.9	34.0 ± 6.9	36.0 ± 6.3	-3.66
31.	Kushner_schoeller2	32.0 ± 5.5	31.9 ± 5.5	33.0 ± 5.3	-3.74	35.7 ± 6.5	35.6 ± 6.5	37.3 ± 6.1	-3.31
32.	Kushner_schoeller3	25.2 ± 5.7	25.1 ± 5.7	26.2 ± 5.4	-3.75	29.0 ± 6.7	29.0 ± 6.7	30.7 ± 6.3	-3.32
33.	Lukaski_bolunchuk1	34.5 ± 5.1	34.2 ± 5.1	36.5 ± 4.5	-8.85	44.8 ± 5.3	44.6 ± 5.3	47.4 ± 4.5	-7.22
34.	Lukaski_bolunchuk2	35.1 ± 5.1	34.8 ± 5.1	37.3 ± 4.5	-9.95	45.4 ± 5.2	45.3 ± 5.2	48.3 ± 4.4	-7.94

Body fat estimates were expressed as percentage of total body weight (mean ± SD). Abbreviations: BIA=bioelectrical impedance analysis, LBM=lean body mass, FFM=fat free mass, TBW=total body water, CV=cardiovascular.

Table S3. Age-adjusted Pearson partial correlation coefficients of body fat estimates with other obesity measures

BIA-BF%-equations		Men			Women		
		BMI	WC	CE	BMI	WC	CE
1.	BIA 101 AKERN	0.630	0.669	0.224	0.821	0.769	0.220
2.	Heitmann1	0.906	0.852	0.376	0.923	0.823	0.258
3.	Heitmann2	0.911	0.855	0.383	0.926	0.824	0.264
4.	Segal1	0.952	0.870	0.413	0.921	0.815	0.241
5.	Segal2	0.861	0.806	0.322	0.738	0.654	0.054
6.	Segal3	0.663	0.571	0.133	0.381	0.289	-0.209
7.	Segal4	0.822	0.761	0.279	0.655	0.569	-0.019
8.	Segal5	0.950	0.888	0.435	0.928	0.837	0.277
9.	Segal6	0.956	0.858	0.405	0.926	0.809	0.236
10.	Van_loan_mayclin	0.918	0.837	0.369	0.767	0.650	0.055
11.	Kyle	0.786	0.811	0.314	0.844	0.776	0.204
12.	Aglago1	0.769	0.808	0.348	0.784	0.740	0.181
13.	Deurenberg	0.826	0.792	0.311	0.813	0.708	0.112
14.	Boulier	0.385	0.423	0.027	0.302	0.260	-0.210
15.	Chumlea	0.656	0.662	0.194	0.831	0.756	0.173
16.	Gray1	0.920	0.831	0.363	0.856	0.744	0.147
17.	Gray2	0.631	0.652	0.191	0.359	0.342	-0.154
18.	Jebb	0.796	0.833	0.378	0.861	0.822	0.309
19.	Lukaski1	0.630	0.670	0.210	0.745	0.701	0.129
20.	Lukaski1	0.632	0.673	0.213	0.748	0.704	0.132
21.	Lukaski3	0.659	0.691	0.202	0.785	0.723	0.129
22.	Rising	0.717	0.756	0.295	0.853	0.813	0.300
23.	Stolarczyk	0.891	0.843	0.343	0.812	0.720	0.108
24.	Wattanapenpaiboon1	0.687	0.728	0.262	0.793	0.750	0.188
25.	Wattanapenpaiboon2	0.646	0.687	0.225	0.760	0.716	0.146
26.	Sun	0.596	0.637	0.182	0.763	0.719	0.149
27.	Aglago2	0.760	0.798	0.337	0.776	0.732	0.171
28.	Heitmann3	0.862	0.803	0.319	0.891	0.781	0.190
29.	Kushner	0.567	0.608	0.158	0.686	0.641	0.066
30.	Kushner_schoeller1	0.601	0.642	0.186	0.719	0.674	0.100
31.	Kushner_schoeller2	0.737	0.776	0.311	0.828	0.786	0.240
32.	Kushner_schoeller3	0.734	0.774	0.308	0.826	0.785	0.237
33.	Lukaski_bolunchuk1	0.676	0.716	0.254	0.720	0.675	0.106
34.	Lukaski_bolunchuk2	0.650	0.690	0.230	0.688	0.642	0.074

Data are presented as age-adjusted Pearson partial correlation coefficients. Abbreviations: BMI=body mass index, WC=waist circumference, CE=creatinine excretion, All *p* value <0.001.

Table S4. Age-adjusted Pearson partial correlation coefficients of obesity measures with CVD risk factors

Obesity measures	Men					Women				
	HDL-c	TG	CRP	SBP	FRS	HDL-c	TG	CRP	SBP	FRS
Body mass index	-0.302	0.249	0.062	0.307	0.140	-0.296	0.237	0.216	0.237	0.098
Waist circumference	-0.310	0.253	0.106	0.314	0.150	-0.326	0.276	0.210	0.241	0.153
Body fat%										
1. BIA 101 AKERN	-0.235	0.182	0.110	0.216	0.120	-0.272	0.222	0.200	0.201	0.081
2. Heitmann1	-0.314	0.255	0.089	0.292	0.168	-0.300	0.248	0.215	0.229	0.105
3. Heitmann2	-0.315	0.257	0.088	0.294	0.170	-0.300	0.245	0.217	0.232	0.108
4. Segal1	-0.323	0.263	0.081	0.307	0.171	-0.299	0.246	0.218	0.232	0.111
5. Segal2	-0.301	0.256	0.097	0.284	0.180	-0.251	0.214	0.202	0.186	0.109
6. Segal3	-0.229	0.229	0.090	0.222	0.194	-0.144	0.136	0.142	0.108	0.095
7. Segal4	-0.287	0.252	0.098	0.272	0.185	-0.227	0.198	0.190	0.168	0.108
8. Segal5	-0.325	0.257	0.082	0.307	0.160	-0.300	0.244	0.216	0.230	0.106
9. Segal6	-0.322	0.265	0.078	0.308	0.174	-0.301	0.248	0.218	0.235	0.113
10. Van_loan_mayclin	-0.314	0.265	0.086	0.298	0.183	-0.258	0.220	0.205	0.201	0.116
11. Kyle	-0.278	0.213	0.110	0.265	0.148	-0.256	0.208	0.203	0.205	0.092
12. Aglago1	-0.284	0.220	0.101	0.252	0.145	-0.258	0.214	0.205	0.191	0.097
13. Deurenberg	-0.292	0.246	0.096	0.269	0.175	-0.271	0.230	0.212	0.208	0.113
14. Boulier	-0.157	0.156	0.099	0.134	0.147	-0.117	0.116	0.133	0.080	0.080
15. Chumlea	-0.242	0.210	0.104	0.217	0.159	-0.275	0.231	0.212	0.204	0.104
16. Gray1	-0.313	0.265	0.086	0.299	0.183	-0.283	0.237	0.215	0.218	0.115
17. Gray2	-0.238	0.208	0.111	0.217	0.158	-0.138	0.127	0.138	0.086	0.079
18. Jebb	-0.292	0.221	0.098	0.260	0.138	-0.276	0.222	0.203	0.206	0.089
19. Lukaski1	-0.239	0.200	0.107	0.210	0.148	-0.250	0.211	0.201	0.179	0.097
20. Lukaski1	-0.240	0.200	0.107	0.211	0.148	-0.251	0.211	0.201	0.180	0.097
21. Lukaski3	-0.241	0.199	0.113	0.224	0.153	-0.249	0.208	0.204	0.191	0.096
22. Rising	-0.268	0.216	0.103	0.237	0.154	-0.272	0.219	0.203	0.206	0.090
23. Stolarczyk	-0.301	0.243	0.102	0.301	0.171	-0.251	0.207	0.205	0.204	0.103
24. Wattanapenpaiboon1	-0.258	0.209	0.106	0.228	0.147	-0.262	0.217	0.204	0.190	0.096
25. Wattanapenpaiboon2	-0.245	0.202	0.107	0.215	0.148	-0.254	0.213	0.202	0.183	0.097
26. Sun	-0.228	0.194	0.107	0.200	0.147	-0.254	0.213	0.202	0.184	0.097
27. Aglago2	-0.281	0.219	0.101	0.250	0.147	-0.256	0.212	0.204	0.189	0.097
28. Heitmann3	-0.300	0.252	0.093	0.280	0.175	-0.294	0.246	0.217	0.224	0.111
29. Kushner	-0.218	0.188	0.107	0.191	0.147	-0.234	0.201	0.194	0.165	0.096
30. Kushner_schoeller1	-0.230	0.195	0.107	0.201	0.148	-0.243	0.206	0.198	0.173	0.097
31. Kushner_schoeller2	-0.274	0.215	0.104	0.243	0.145	-0.270	0.221	0.205	0.198	0.094
32. Kushner_schoeller3	-0.273	0.215	0.104	0.242	0.145	-0.269	0.221	0.205	0.198	0.094
33. Lukaski_bolunchuk1	-0.255	0.209	0.106	0.224	0.152	-0.241	0.204	0.199	0.176	0.097
34. Lukaski_bolunchuk2	-0.246	0.205	0.106	0.216	0.153	-0.232	0.198	0.195	0.169	0.097

Data are presented as age-adjusted Pearson partial correlation coefficients. Abbreviations: HDL-c=high density lipoprotein cholesterol, TG=triglycerides, CRP=C-reactive protein, SBP=systolic blood pressure, FRS=Framingham CVD risk score. All *p* value <0.001.

Table S5A. Differences between body fat estimates and other obesity measures in men

Obesity measures	Regreesion		Comparison with BMI			Comparison with WC		
	HR	SE	D_{HR} ($_{BF\%.\ BMI}$)	*z* value	*p* value	D_{HR} ($_{BF\%.\ WC}$)	*z* value	*p* value
Body mass index	1.34	0.055	-	-	-	-	-	-
Waist circumference	1.56	0.054	-	-	-	-	-	-
Body fat%								
1. BIA 101 AKERN	2.13	0.071	0.46	5.185	**<0.001**	0.31	3.517	**<0.001**
2. Heitmann1	2.29	0.148	0.54	3.416	**0.001**	0.39	2.460	**0.014**
3. Heitmann2	2.08	0.085	0.44	4.368	**<0.001**	0.29	2.887	**0.004**
4. Segal1	1.75	0.065	0.27	3.179	**0.001**	0.12	1.402	0.161
5. Segal2	1.93	0.075	0.37	3.973	**<0.001**	0.22	2.351	**0.019**
6. Segal3	3.97	0.095	1.09	9.938	**<0.001**	0.94	8.585	**<0.001**
7. Segal4	2.48	0.086	0.61	6.060	**<0.001**	0.46	4.589	**<0.001**
8. Segal5	1.41	0.067	0.05	0.567	0.571	-0.10	-1.195	0.232
9. Segal6	1.92	0.068	0.36	4.155	**<0.001**	0.21	2.429	**0.015**
10. Van_loan_mayclin	3.24	0.095	0.88	8.069	**<0.001**	0.73	6.710	**<0.001**
11. Kyle	1.58	0.072	0.16	1.816	0.069	0.01	0.145	0.885
12. Aglago1	1.83	0.085	0.31	3.060	**0.002**	0.16	1.575	0.115
13. Deurenberg	2.48	0.083	0.62	6.212	**<0.001**	0.47	4.708	**<0.001**
14. Boulier	2.87	0.083	0.76	7.704	**<0.001**	0.61	6.205	**<0.001**
15. Chumlea	1.54	0.083	0.14	1.419	0.156	-0.01	-0.100	0.921
16. Gray1	2.10	0.066	0.45	5.225	**<0.001**	0.30	3.480	**0.001**
17. Gray2	1.44	0.075	0.07	0.805	0.421	-0.08	-0.831	0.406
18. Jebb	1.22	0.060	-0.10	-1.195	0.232	-0.25	-3.070	**0.002**
19. Lukaski1	1.31	0.064	-0.02	-0.229	0.819	-0.17	-2.031	**0.042**
20. Lukaski1	1.31	0.064	-0.02	-0.243	0.808	-0.17	-2.046	**0.041**
21. Lukaski3	1.49	0.065	0.11	1.292	0.196	-0.04	-0.489	0.625
22. Rising	2.61	0.086	0.67	6.562	**<0.001**	0.51	5.093	**<0.001**
23. Stolarczyk	1.98	0.064	0.39	4.644	**<0.001**	0.24	2.855	**0.004**
24. Wattanapenpaiboon1	1.29	0.063	-0.04	-0.489	0.625	-0.19	-2.324	**0.020**
25. Wattanapenpaiboon2	1.31	0.064	-0.03	-0.307	0.759	-0.18	-2.120	**0.034**
26. Sun	1.44	0.084	0.07	0.697	0.486	-0.08	-0.820	0.412
27. Aglago2	1.86	0.085	0.33	3.285	**0.001**	0.18	1.792	0.073
28. Heitmann3	1.44	0.060	0.08	0.937	0.349	-0.08	-0.938	0.348
29. Kushner	1.34	0.067	0.00	0.032	0.974	-0.15	-1.727	0.084
30. Kushner_schoeller1	1.33	0.066	-0.01	-0.104	0.917	-0.16	-1.886	0.059
31. Kushner_schoeller2	1.26	0.061	-0.06	-0.791	0.429	-0.22	-2.654	**0.008**
32. Kushner_schoeller3	1.26	0.061	-0.06	-0.775	0.439	-0.21	-2.637	**0.008**
33. Lukaski_bolunchuk1	1.92	0.079	0.36	3.744	**<0.001**	0.21	2.175	**0.030**
34. Lukaski_bolunchuk2	2.09	0.080	0.44	4.582	**<0.001**	0.29	3.035	**0.002**

Data are presented as difference between hazard ratios with z-value. Abbreviation: HR=hazard ratio, SE=standard errors, D=difference, BMI=body mass index, WC=waist circumference. Z-statistic test (z-value) was calculated and each BIA-BF%-equation was compared with the BMI and WC respectively. The z-value calculation was applied as $z=(b[O1] - b[O2])/SE$, and where b[O1] and b[O2] are regression coefficients of the obesity measures, while SE is the standard error of the difference in the coefficients. This was computed as the square root of the sum of the squares of the standard errors for two coefficients

Table S5B. Differences between body fat estimates and other obesity measures in women

Obesity measures	Regreesion		Comparison with BMI			Comparison with WC		
	HR	SE	D_{HR} ($_{BF\%.\ BMI}$)	*z* value	*p* value	D_{HR} ($_{BF\%.\ WC}$)	*z* value	*p* value
Body mass index	1.52	0.073	-	-	-	-	-	-
Waist circumference	1.35	0.058	-	-	-	-	-	-
Body fat%								
1. BIA 101 AKERN	1.89	0.34	0.095	3.026	**0.002**	0.22	1.847	0.065
2. Heitmann1	2.42	0.58	0.181	3.056	**0.002**	0.47	2.384	**0.017**
3. Heitmann2	2.06	0.42	0.112	3.372	**0.001**	0.31	2.310	**0.021**
4. Segal1	1.81	0.30	0.089	2.774	**0.006**	0.18	1.555	0.120
5. Segal2	2.02	0.40	0.111	3.236	**0.001**	0.29	2.176	**0.030**
6. Segal3	3.12	0.84	0.118	6.346	**<0.001**	0.72	5.179	**<0.001**
7. Segal4	2.46	0.60	0.124	4.392	**<0.001**	0.49	3.373	**0.001**
8. Segal5	1.53	0.12	0.092	1.132	0.258	0.01	0.062	0.951
9. Segal6	1.96	0.37	0.093	3.427	**0.001**	0.26	2.193	**0.028**
10. Van_loan_mayclin	3.80	1.03	0.146	6.599	**0.000**	0.92	5.635	**<0.001**
11. Kyle	1.63	0.19	0.105	1.581	0.114	0.07	0.579	0.562
12. Aglago1	2.35	0.55	0.144	3.554	**<0.001**	0.44	2.700	**0.007**
13. Deurenberg	2.77	0.72	0.123	5.276	**<0.001**	0.60	4.207	**<0.001**
14. Boulier	3.00	0.80	0.123	5.862	**<0.001**	0.68	4.762	**<0.001**
15. Chumlea	1.56	0.14	0.105	1.210	0.226	0.03	0.228	0.820
16. Gray1	2.04	0.41	0.089	3.882	**<0.001**	0.30	2.571	**0.010**
17. Gray2	1.30	-0.04	0.098	-0.333	0.739	-0.15	-1.258	0.208
18. Jebb	1.25	-0.07	0.076	-0.761	0.447	-0.19	-1.784	0.074
19. Lukaski1	1.38	0.02	0.093	0.202	0.840	-0.09	-0.788	0.431
20. Lukaski1	1.38	0.02	0.093	0.188	0.851	-0.10	-0.803	0.422
21. Lukaski3	1.51	0.11	0.093	1.005	0.315	-0.01	-0.048	0.962
22. Rising	1.81	0.30	0.090	2.764	**0.006**	0.18	1.552	0.121
23. Stolarczyk	1.88	0.33	0.088	3.135	**0.002**	0.21	1.873	0.061
24. Wattanapenpaiboon1	1.33	-0.02	0.087	-0.175	0.861	-0.13	-1.181	0.238
25. Wattanapenpaiboon2	1.37	0.01	0.091	0.118	0.906	-0.10	-0.879	0.380
26. Sun	1.46	0.08	0.112	0.652	0.515	-0.03	-0.252	0.801
27. Aglago2	2.36	0.56	0.142	3.644	**<0.001**	0.44	2.772	**0.006**
28. Heitmann3	1.50	0.11	0.078	1.086	0.277	-0.01	-0.095	0.924
29. Kushner	1.43	0.06	0.101	0.476	0.634	-0.06	-0.480	0.631
30. Kushner_schoeller1	1.40	0.04	0.097	0.335	0.738	-0.08	-0.640	0.522
31. Kushner_schoeller2	1.30	-0.04	0.081	-0.388	0.698	-0.15	-1.413	0.158
32. Kushner_schoeller3	1.30	-0.04	0.081	-0.372	0.710	-0.15	-1.396	0.163
33. Lukaski_bolunchuk1	2.20	0.49	0.125	3.538	**<0.001**	0.37	2.565	**0.010**
34. Lukaski_bolunchuk2	2.40	0.58	0.128	4.113	**<0.001**	0.46	3.134	**0.002**

Data are presented as difference between hazard ratios with z-value. Abbreviation: HR=hazard ratio, SE=standard errors, D=difference, BMI=body mass index, WC=waist circumference. Z-statistic test (z-value) was calculated and each BIA-BF%-equation was compared with the BMI and WC respectively. The z-value calculation was applied as z=(b[O1] − b[O2])/SE, and where b[O1] and b[O2] are regression coefficients of the obesity measures, while SE is the standard error of the difference in the coefficients. This was computed as the square root of the sum of the squares of the standard errors for two coefficients

Table S6. Model CV event prediction C-index for various BIA-BF%-equations

Man	C-index (95%CI)	*p* value	C-Index changes (95%CI)	*p* value
Base model	0.700 (0.678; 0.723)	**<0.0001**	-	-
Extended models				
Base + BIA 101 AKERN	0.722 (0.700; 0.745)	**<0.0001**	0.022 (0.009; 0.034)	**0.0009**
Base + Heitmann1	0.705 (0.682; 0.727)	**<0.0001**	0.005 (-0.002; 0.011)	**0.014**
Base + Heitmann2	0.713 (0.691; 0.735)	**<0.0001**	0.013 (0.002; 0.024)	**0.026**
Base + Segal1	0.713 (0.691; 0.736)	**<0.0001**	0.013 (0.003; 0.024)	**0.013**
Base + Segal2	0.713 (0.691; 0.736)	**<0.0001**	0.013 (0.003; 0.024)	**0.023**
Base + Segal3	0.743 (0.722; 0.765)	**<0.0001**	0.043 (0.026; 0.061)	**<0.0001**
Base + Segal4	0.720 (0.698; 0.743)	**<0.0001**	0.021 (0.007; 0.033)	**0.002**
Base + Segal5	0.704 (0.682; 0.727)	**<0.0001**	0.004 (-0.002; 0.010)	0.192
Base + Segal6	0.717 (0.695; 0.740)	**<0.0001**	0.017 (0.006; 0.029)	**0.003**
Base + Van_loan_mayclin	0.731 (0.709; 0.753)	**<0.0001**	0.031 (0.015; 0.047)	**<0.0001**
Base + Kyle	0.707 (0.684; 0.729)	**<0.0001**	0.007 (-0.002; 0.016)	0.134
Base + Aglago1	0.707 (0.684; 0.730)	**<0.0001**	0.007 (-0.001; 0.015)	0.087
Base + Deurenberg	0.722 (0.700; 0.745)	**<0.0001**	0.022 (0.010; 0.034)	**0.0002**
Base + Chumlea	0.703 (0.681; 0.726)	**<0.0001**	0.003 (-0.002; 0.008)	0.215
Base + Gray1	0.724 (0.702; 0.746)	**<0.0001**	0.024 (0.011; 0.037)	**0.0002**
Base + Gray2	0.703 (0.680; 0.725)	**<0.0001**	0.003 (-0.002; 0.008)	0.324
Base + Jebb	0.701 (0.680; 0.723)	**<0.0001**	0.001 (-0.003; 0.005)	0.586
Base + Lukaski1	0.702 (0.679; 0.724)	**<0.0001**	0.002 (-0.003; 0.006)	0.470
Base + Lukaski2	0.702 (0.680; 0.724)	**<0.0001**	0.002 (-0.003; 0.006)	0.492
Base + Lukaski3	0.706 (0.683; 0.728)	**<0.0001**	0.006 (-0.003; 0.014)	0.200
Base + Rising	0.723 (0.700; 0.745)	**<0.0001**	0.023 (0.007; 0.039)	**0.004**
Base + Stolarczyk	0.723 (0.700; 0.745)	**<0.0001**	0.023 (0.008; 0.034)	**0.002**
Base + Wattanapenpaiboon1	0.701 (0.680; 0.724)	**<0.0001**	0.001 (-0.004; 0.006)	0.561
Base + Wattanapenpaiboon2	0.702 (0.679; 0.724)	**<0.0001**	0.002 (-0.004; 0.007)	0.542
Base + Sun	0.702 (0.679; 0.724)	**<0.0001**	0.002 (-0.002; 0.006)	0.402
Base + Aglago2	0.708 (0.685; 0.730)	**<0.0001**	0.008 (-0.002; 0.018)	0.136
Base + Heitmann3	0.706 (0.683; 0.728)	**<0.0001**	0.005 (-0.002; 0.014)	0.141
Base + Kushner	0.702 (0.679; 0.725)	**<0.0001**	0.002 (-0.003; 0.007)	0.420
Base + Kushner_schoeller1	0.702 (0.679; 0.724)	**<0.0001**	0.002 (-0.002; 0.006)	0.399
Base + Kushner_schoeller2	0.701 (0.679; 0.724)	**<0.0001**	0.001 (-0.003; 0.005)	0.526
Base + Kushner_schoeller3	0.701 (0.679; 0.724)	**<0.0001**	0.001 (-0.002; 0.005)	0.508
Base + Lukaski_bolunchuk1	0.710 (0.687; 0.732)	**<0.0001**	0.010 (-0.001; 0.022)	0.085
Base + Lukaski_bolunchuk2	0.713 (0.691; 0.736)	**<0.0001**	0.013 (0.016; 0.025)	**0.026**
Woman				
Base model	0.751 (0.718; 0.784)	**<0.0001**	-	-
Extended models	-		-	-
Base + Van_loan_mayclin	0.774 (0.742; 0.806)	**<0.0001**	0.023 (0.006; 0.041)	**0.010**

Data are presented as C-indexes with 95%CIs and changes between base and extended model with 95%CI. Base model: Framingham CVD risk score including age, total and HDL cholesterol level, current smoking status, systolic blood pressure, anti-hypertensive medication use and diabetes. Data are presented if the equations remained significant after adjustments for age, Framingham CVD risk score and creatinine excretion - a marker of muscle mass.

Table S7. Risk reclassification improvement for CV event by obesity measures

Man	NRI (95%CI)	*p* value	IDI (95%CI)	*p* value
Base + BMI	0.149 (0.072; 0.202)	**0.007**	0.003 (0.001; 0.009)	**0.013**
Base + WC	0.183 (0.094; 0.252)	**<0.0001**	0.009 (0.003; 0.018)	**0.0001**
Base + BIA 101 AKERN	0.149 (0.068; 0.210)	**0.0001**	0.003 (0.000; 0.009)	**0.0001**
Base + Heitmann1	0.175 (0.106; 0.244)	**<0.0001**	0.005 (0.001; 0.013)	**<0.0001**
Base + Heitmann2	0.235 (0.172; 0.305)	**<0.0001**	0.013 (0.006; 0.024)	**<0.0001**
Base + Segal1	0.225 (0.157; 0.278)	**<0.0001**	0.013 (0.005; 0.022)	**<0.0001**
Base + Segal2	0.216 (0.153; 0.283)	**<0.0001**	0.014 (0.007; 0.024)	**<0.0001**
Base + Segal3	0.322 (0.249; 0.379)	**<0.0001**	0.043 (0.029; 0.060)	**<0.0001**
Base + Segal4	0.288 (0.208; 0.341)	**<0.0001**	0.021 (0.011; 0.035)	**<0.0001**
Base + Segal5	0.173 (0.098; 0.238)	**0.007**	0.004 (0.001; 0.011)	**0.0001**
Base + Segal6	0.236 (0.164; 0.312)	**<0.0001**	0.016 (0.007; 0.027)	**<0.0001**
Base + Van_loan_mayclin	0.298 (0.228; 0.360)	**<0.0001**	0.031 (0.019; 0.045)	**<0.0001**
Base + Kyle	0.186 (0.106; 0.250)	**<0.0001**	0.007 (0.002; 0.016)	**<0.0001**
Base + Aglago1	0.193 (0.120; 0.268)	**0.007**	0.009 (0.003; 0.019)	**0.007**
Base + Deurenberg	0.309 (0.237; 0.369)	**<0.0001**	0.024 (0.013; 0.038)	**<0.0001**
Base + Chumlea	0.166 (0.104; 0.239)	**0.007**	0.005 (0.001; 0.014)	**0.007**
Base + Gray1	0.293 (0.220; 0.353)	**<0.0001**	0.024 (0.014; 0.035)	**<0.0001**
Base + Gray2	0.149 (0.073; 0.221)	**0.007**	0.005 (0.001; 0.012)	**0.007**
Base + Jebb	0.128 (-0.152; 0.202)	0.166	0.002 (0.000; 0.008)	0.093
Base + Lukaski1	0.158 (0.002; 0.225)	**0.047**	0.004 (0.000; 0.011)	**0.020**
Base + Lukaski2	0.160 (-0.012; 0.224)	0.066	0.004 (0.000; 0.010)	**0.033**
Base + Lukaski3	0.179 (0.103; 0.245)	**0.007**	0.007 (0.002; 0.017)	**0.007**
Base + Rising	0.298 (0.218; 0.361)	**<0.0001**	0.025 (0.013; 0.041)	**<0.0001**
Base + Stolarczyk	0.260 (0.182; 0.330)	**<0.0001**	0.021 (0.011; 0.034)	**<0.0001**
Base + Wattanapenpaiboon1	0.135 (0.01; 0.209)	**0.040**	0.003 (0.00; 0.011)	**0.033**
Base + Wattanapenpaiboon2	0.146 (0.043; 0.212)	**0.013**	0.004 (0.000; 0.010)	**0.013**
Base + Sun	0.160 (0.059; 0.230)	**0.033**	0.004 (0.000; 0.011)	**0.033**
Base + Aglago2	0.203 (0.126; 0.269)	**<0.0001**	0.010 (0.004; 0.021)	**<0.0001**
Base + Heitmann3	0.177 (0.107; 0.234)	**<0.0001**	0.007 (0.002; 0.013)	**<0.0001**
Base + Kushner	0.157 (-0.005; 0.225)	0.053	0.004 (0.000; 0.011)	**0.040**
Base + Kushner_schoeller1	0.160 (-0.05; 0.225)	0.073	0.004 (0.00; 0.011)	0.053
Base + Kushner_schoeller2	0.136 (-0.043; 0.193)	0.060	0.003 (0.000; 0.009)	**0.033**
Base + Kushner_schoeller3	0.133 (-0.08; 0.204)	0.080	0.003 (0.00; 0.008)	**0.047**
Base + Lukaski_bolunchuk1	0.197 (0.128; 0.258)	**<0.0001**	0.013 (0.005; 0.024)	**<0.0001**
Base + Lukaski_bolunchuk2	0.222 (0.156; 0.290)	**<0.0001**	0.016 (0.008; 0.028)	**<0.0001**
Woman				
Base + BMI	0.122 (-0.006; 0.215)	**0.066**	0.001 (0.000; 0.008)	0.199
Base + WC	0.053 (-0.057; 0.157)	**0.246**	0.001 (0.000; 0.006)	0.279
Base + Van_loan_mayclin	0.248 (0.157; 0.343)	**0.0001**	0.002 (0.002; 0.023)	**0.0001**

Data are presented as category-free NRI with 95%CI and IDI with 95%CI showing improvement in risk prediction between the base model and extended models. Abbreviation: BMI=body mass index, WC=waist circumference. Base model: Framingham risk score including age, HDL cholesterol, smoking status, systolic blood pressure and treatment of hypertension and diabetes. Data are presented if the measures remained significant after adjustments for age, Framingham CVD risk score and creatinine excretion - a marker of muscle mass.

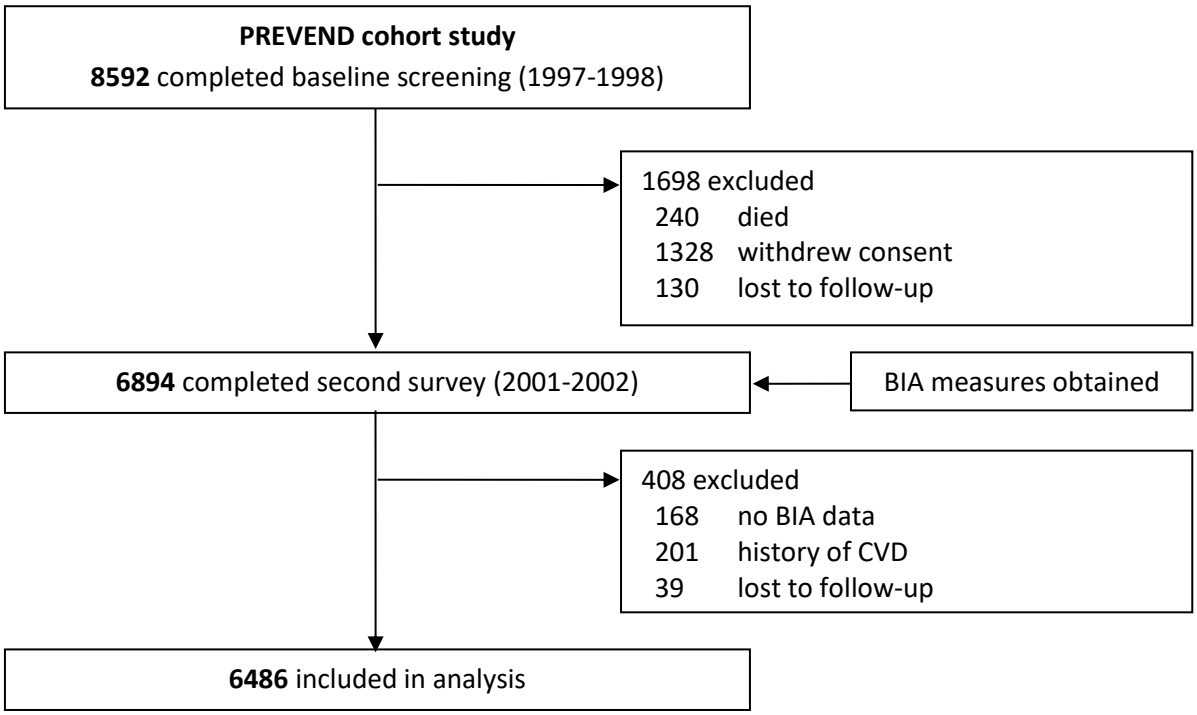

Figure S1. Flow chart of study population.

BIA=Bio-electrical impedance analysis

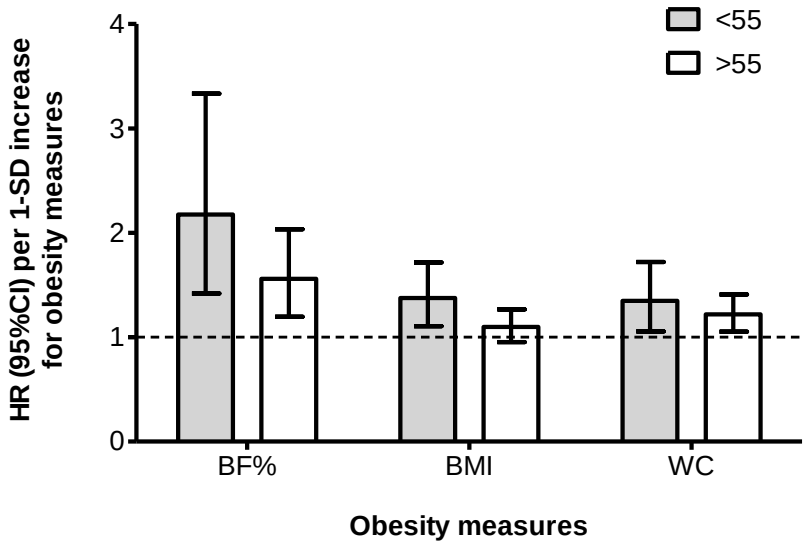

Figure S2. Associations between obesity measures and CV event by age categories.

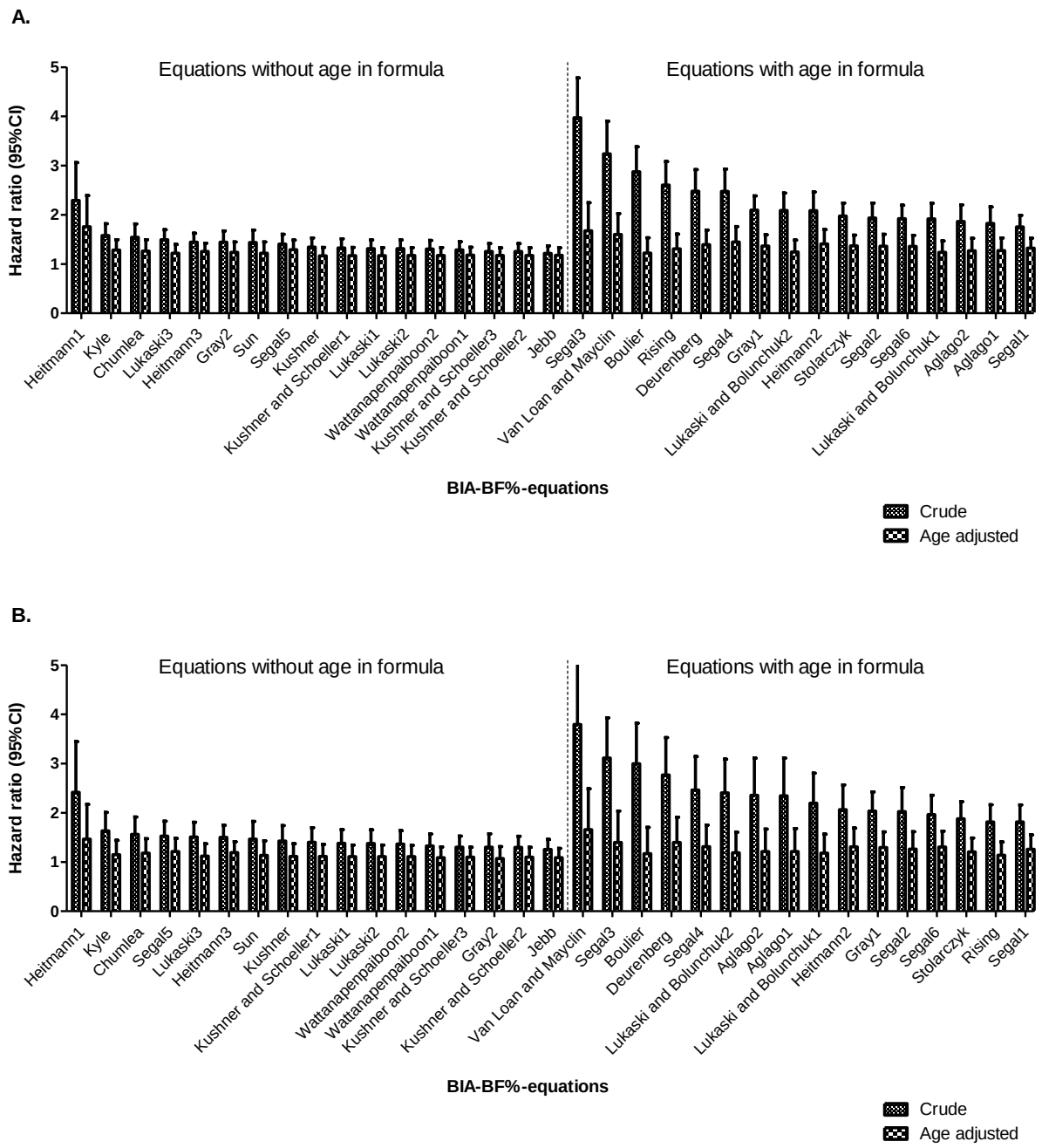

Figure S3. Comparison between equations with and without age-incorporation (A) Men. (B) Women.