

**Online-only Supplementary Data**

Sex-age-specific association of body mass index with all-cause mortality among 12.8 million  
Korean adults : a prospective cohort study

**Sang-Wook Yi**, MD, PhD, Department of Preventive Medicine and Public Health, Catholic Kwandong University College of Medicine, Republic of Korea; **Heechoul Ohrr**, MD, PhD, Department of Preventive Medicine, Graduate School of Public Health, Yonsei University, Republic of Korea; **Soon-Ae Shin**, PhD, Big Data Steering Department, National Health Insurance Service, Seoul, Republic of Korea; **Jee-Jeon Yi**, PhD, Institute for Occupational and Environmental Health, Catholic Kwandong University, Republic of Korea

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Correspondence: Sang-Wook Yi, MD, PhD, Department of Preventive Medicine and Public Health, Catholic Kwandong University College of Medicine, Bumil-ro 579, Gangneung, Gangwon-do, 210-701, Republic of Korea; Tel: +82-33-649-7468; Fax +82-33-641-1074-mail: [flyhigh@cku.ac.kr](mailto:flyhigh@cku.ac.kr)

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**Table S1. Characteristics of Korean participants at health exams managed by NHIS during 2001-2004.**

Variables	Classification	All participants (n=12,832,637)	Never-smokers (n=7,436,748)	Participants with no known illness <sup>a</sup> (n=10,741,411)	Never-smokers with no known illness <sup>a</sup> (n=6,165,978)	Survivors after 5 years of follow-up <sup>b</sup> (n=12,561,289)	Never-smoker survivors after 5 years of follow-up <sup>b</sup> (n=7,292,310)
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
BMI (kg/m <sup>2</sup> )	Mean (SD)	23.5 (3.2)	23.4 (3.2)	23.4 (3.1)	23.2 (3.2)	23.5 (3.2)	23.4 (3.2)
Age (years)	Mean (SD)	44.4 (14.2)	46.0 (14.7)	42.7 (13.6)	44.0 (14.2)	44.0 (13.9)	45.6 (14.5)
Sex	Men	7,300,575 (56.9)	2,523,287 (33.9)	6,173,507 (57.5)	2,098,479 (34.0)	7,116,052 (56.7)	2,451,979 (33.6)
	Women	5,532,062 (43.1)	4,913,461 (66.1)	4,567,904 (42.5)	4,067,499 (66.0)	5,445,237 (43.3)	4,840,331 (66.4)
Known illness <sup>c</sup>	No	10,741,411 (83.7)	6,165,978 (82.9)	10,741,411 (100.0)	6,165,978 (100.0)	10,568,440 (84.1)	6,077,755 (83.3)
	Yes	1,985,759 (15.5)	1,270,770 (17.1)	0 (0.0)	0 (0.0)	1,888,618 (15.0)	1,214,555 (16.7)
	Missing	105,467 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)	104,231 (0.8)	0 (0.0)
Smoking status <sup>c</sup>	Current smoker	3,657,466 (28.5)	0 (0.0)	3,204,403 (29.8)	0 (0.0)	3,570,546 (28.4)	0 (0.0)
	Never-smoker	7,436,748 (58.0)	7,436,748 (100.0)	6,165,978 (57.4)	6,165,978 (100.0)	7,292,310 (58.1)	7,292,310 (100.0)
	Former smoker	1,100,650 (8.6)	0 (0.0)	885,478 (8.2)	0 (0.0)	1,073,612 (8.5)	0 (0.0)
	Missing	637,773 (5.0)	0 (0.0)	485,552 (4.5)	0 (0.0)	624,821 (5.0)	0 (0.0)
Age (years) (10 groups)	18-34	3,732,998 (29.1)	1,896,608 (25.5)	3,496,103 (32.5)	1,813,174 (29.4)	3,724,727 (29.7)	1,893,601 (26.0)
	35-39	1,242,617 (9.7)	542,846 (7.3)	1,131,091 (10.5)	502,606 (8.2)	1,237,269 (9.8)	541,215 (7.4)
	40-44	2,017,480 (15.7)	1,185,116 (15.9)	1,780,732 (16.6)	1,054,824 (17.1)	2,004,187 (16.0)	1,179,735 (16.2)
	45-49	1,413,387 (11.0)	833,882 (11.2)	1,198,024 (11.2)	712,907 (11.6)	1,398,984 (11.1)	828,123 (11.4)
	50-54	1,306,826 (10.2)	837,666 (11.3)	1,029,178 (9.6)	659,297 (10.7)	1,285,962 (10.2)	828,512 (11.4)
	55-59	843,953 (6.6)	549,779 (7.4)	625,657 (5.8)	404,696 (6.6)	823,513 (6.6)	540,194 (7.4)
	60-64	1,022,354 (8.0)	708,172 (9.5)	695,760 (6.5)	475,817 (7.7)	981,333 (7.8)	686,976 (9.4)
	65-69	569,545 (4.4)	396,472 (5.3)	363,270 (3.4)	248,477 (4.0)	531,021 (4.2)	375,673 (5.2)
	70-74	428,365 (3.3)	304,272 (4.1)	259,584 (2.4)	180,918 (2.9)	380,714 (3.0)	276,368 (3.8)
	75-99	255,112 (2.0)	181,935 (2.4)	162,012 (1.5)	113,262 (1.8)	193,579 (1.5)	141,913 (1.9)
BMI (kg/m <sup>2</sup> ) (18 groups)	<16.0	24,949 (0.2)	16,505 (0.2)	20,015 (0.2)	13,682 (0.2)	21,582 (0.2)	14,735 (0.2)
	16.0-17.4	173,454 (1.4)	116,738 (1.6)	150,150 (1.4)	104,238 (1.7)	164,330 (1.3)	112,318 (1.5)
	17.5-18.9	656,921 (5.1)	425,489 (5.7)	578,157 (5.4)	383,603 (6.2)	636,293 (5.1)	415,828 (5.7)
	19.0-19.9	839,267 (6.5)	519,293 (7.0)	737,859 (6.9)	463,947 (7.5)	817,884 (6.5)	509,063 (7.0)
	20.0-20.9	1,157,683 (9.0)	698,362 (9.4)	1,009,462 (9.4)	614,910 (10.0)	1,130,797 (9.0)	685,326 (9.4)
	21.0-21.9	1,391,331 (10.8)	821,328 (11.0)	1,197,071 (11.1)	707,858 (11.5)	1,360,861 (10.8)	805,789 (11.0)
	22.0-22.9	1,561,228 (12.2)	906,625 (12.2)	1,323,758 (12.3)	764,352 (12.4)	1,528,973 (12.2)	889,610 (12.2)
	23.0-23.9	1,596,703 (12.4)	903,122 (12.1)	1,335,894 (12.4)	746,036 (12.1)	1,565,585 (12.5)	886,327 (12.2)
	24.0-24.9	1,546,517 (12.1)	873,227 (11.7)	1,275,017 (11.9)	705,135 (11.4)	1,518,276 (12.1)	857,472 (11.8)
	25.0-25.9	1,253,411 (9.8)	682,928 (9.2)	1,024,516 (9.5)	542,812 (8.8)	1,231,336 (9.8)	670,445 (9.2)
	26.0-26.9	947,453 (7.4)	524,193 (7.0)	764,319 (7.1)	408,446 (6.6)	931,010 (7.4)	514,661 (7.1)
	27.0-27.9	656,190 (5.1)	364,719 (4.9)	523,469 (4.9)	279,185 (4.5)	644,640 (5.1)	357,847 (4.9)
	28.0-28.9	414,763 (3.2)	234,129 (3.1)	326,818 (3.0)	175,877 (2.9)	407,619 (3.2)	229,609 (3.1)
	29.0-29.9	258,627 (2.0)	144,412 (1.9)	202,730 (1.9)	107,230 (1.7)	254,101 (2.0)	141,645 (1.9)
	30.0-31.4	199,772 (1.6)	112,737 (1.5)	155,233 (1.4)	82,636 (1.3)	196,332 (1.6)	110,544 (1.5)
31.5-32.9	88,376 (0.7)	53,117 (0.7)	67,133 (0.6)	37,901 (0.6)	86,860 (0.7)	52,073 (0.7)	
33.0-34.9	41,896 (0.3)	25,101 (0.3)	31,693 (0.3)	17,804 (0.3)	41,186 (0.3)	24,629 (0.3)	
35.0-50.0	24,096 (0.2)	14,723 (0.2)	18,117 (0.2)	10,326 (0.2)	23,624 (0.2)	14,389 (0.2)	
BMI (kg/m <sup>2</sup> ) (11 groups)	<17.5	198,403 (1.5)	133,243 (1.8)	170,165 (1.6)	117,920 (1.9)	185,912 (1.5)	127,053 (1.7)
	17.5-18.9	656,921 (5.1)	425,489 (5.7)	578,157 (5.4)	383,603 (6.2)	636,293 (5.1)	415,828 (5.7)
	19.0-20.4	1,372,534 (10.7)	842,390 (11.3)	1,204,020 (11.2)	749,629 (12.2)	1,338,487 (10.7)	826,029 (11.3)
	20.5-21.9	2,015,747 (15.7)	1,196,593 (16.1)	1,740,372 (16.2)	1,037,086 (16.8)	1,971,055 (15.7)	1,174,149 (16.1)
	22.0-23.4	2,352,681 (18.3)	1,366,395 (18.4)	1,987,110 (18.5)	1,145,592 (18.6)	2,304,691 (18.3)	1,340,779 (18.4)
	23.5-24.9	2,351,767 (18.3)	1,316,579 (17.7)	1,947,559 (18.1)	1,069,931 (17.4)	2,308,143 (18.4)	1,292,630 (17.7)
	25.0-26.4	1,772,396 (13.8)	968,868 (13.0)	1,444,539 (13.4)	766,602 (12.4)	1,741,378 (13.9)	951,246 (13.0)
	26.5-27.9	1,084,658 (8.5)	602,972 (8.1)	867,765 (8.1)	463,841 (7.5)	1,065,608 (8.5)	591,707 (8.1)
	28.0-29.4	578,069 (4.5)	320,423 (4.3)	456,274 (4.2)	240,676 (3.9)	568,118 (4.5)	314,260 (4.3)
	29.5-30.9	248,943 (1.9)	144,574 (1.9)	192,935 (1.8)	106,004 (1.7)	244,597 (1.9)	141,788 (1.9)
	31.0-50.0	200,518 (1.6)	119,222 (1.6)	152,515 (1.4)	85,094 (1.4)	197,007 (1.6)	116,841 (1.6)
BMI (kg/m <sup>2</sup> ) (5 groups)	<18.5	562,423 (4.4)	370,567 (5.0)	490,312 (4.6)	332,105 (5.4)	537,692 (4.3)	358,576 (4.9)
	18.5-24.9	8,385,630 (65.3)	4,910,122 (66.0)	7,137,071 (66.4)	4,171,656 (67.7)	8,206,889 (65.3)	4,817,892 (66.1)
	25.0-29.9	3,530,444 (27.5)	1,950,381 (26.2)	2,841,852 (26.5)	1,513,550 (24.5)	3,468,706 (27.6)	1,914,207 (26.2)
	30.0-34.9	330,044 (2.6)	190,955 (2.6)	254,059 (2.4)	138,341 (2.2)	324,378 (2.6)	187,246 (2.6)
	35.0-50.0	24,096 (0.2)	14,723 (0.2)	18,117 (0.2)	10,326 (0.2)	23,624 (0.2)	14,389 (0.2)

BMI, body mass index; NHIS, National Health Insurance Service of Korea; SD, standard deviation

<sup>a</sup> Participants self-reported pre-existing illness either cured or not through questionnaire at enrollment.

<sup>b</sup> Those excluding the first 5-year of deaths

<sup>c</sup> Participants self-reported smoking status and known pre-existing illness either cured or not (including cardiovascular disease, cancer, liver disease, diabetes, a respiratory disease, or other diseases) through questionnaire.

**Table S2. Death rate<sup>a</sup> and hazard ratio<sup>b</sup> of death associated with body mass index according to sex and age<sup>c</sup> among all participants (n=12,832,637).**

Table S2		Men (n=7,300,575)					Women (n=5,532,062)					
Age group <sup>c</sup>	BMI <sup>d</sup> at baseline	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	
18-34 years	<16	20,944	23	70	0.005	1.81 (1.19, 2.73)	99,281	28	23	0.921	1.02 (0.69, 1.52)	
	16.0-17.4	222,633	228	119	<0.001	1.69 (1.46, 1.95)	894,168	256	27	0.812	1.02 (0.85, 1.23)	
	17.5-18.9	1,127,545	926	78	<0.001	1.36 (1.24, 1.48)	2,875,513	816	26	0.952	1.00 (0.86, 1.17)	
	19.0-19.9	1,686,746	1,193	97	<0.001	1.17 (1.08, 1.27)	2,712,511	799	34	0.696	1.03 (0.88, 1.21)	
	20.0-20.9	2,437,836	1,638	81	0.008	1.11 (1.03, 1.2)	2,616,930	738	48	0.786	0.98 (0.84, 1.15)	
	21.0-21.9	2,897,173	1,832	84	0.267	1.04 (0.97, 1.13)	2,019,981	607	40	0.684	1.03 (0.88, 1.21)	
	22.0-22.9	3,135,760	1,949	72	0.587	1.02 (0.95, 1.1)	1,441,754	417	33	0.882	0.99 (0.83, 1.17)	
	23.0-23.9	3,113,842	1,801	78	0.121	0.94 (0.87, 1.02)	951,453	272	34	0.737	0.97 (0.81, 1.16)	
	24.0-24.9	2,789,606	1,608	63	0.062	0.93 (0.86, 1)	659,770	196	53		1.00 (Reference)	
	25.0-25.9	2,354,421	1,410	66	0.266	0.96 (0.88, 1.03)	385,813	128	29	0.342	1.11 (0.89, 1.39)	
	26.0-26.9	1,695,958	1,070	71		1.00 (Reference)	258,983	116	76	0.001	1.50 (1.19, 1.88)	
	27.0-27.9	1,192,952	772	69	0.663	1.02 (0.93, 1.12)	176,510	70	87	0.045	1.32 (1.01, 1.74)	
	28.0-28.9	795,258	545	77	0.152	1.08 (0.97, 1.2)	115,935	45	105	0.128	1.29 (0.93, 1.78)	
	29.0-29.9	542,540	376	88	0.157	1.09 (0.97, 1.22)	76,896	33	33	0.060	1.42 (0.98, 2.06)	
	30.0-31.4	445,968	377	77	<0.001	1.33 (1.18, 1.5)	74,825	28	187	0.282	1.24 (0.84, 1.85)	
	31.5-32.9	199,545	208	120	<0.001	1.65 (1.42, 1.91)	43,609	14	28	0.826	1.06 (0.62, 1.83)	
	33.0-34.9	108,266	102	87	<0.001	1.50 (1.23, 1.84)	28,440	16	43	0.015	1.88 (1.13, 3.13)	
	35.0-50.0	66,411	87	383	<0.001	2.13 (1.71, 2.65)	22,443	16	80	0.001	2.36 (1.42, 3.92)	
	35-44 years	<16	11,209	94	1,232	<0.001	5.26 (4.28, 6.46)	12,725	51	282	<0.001	4.87 (3.68, 6.45)
		16.0-17.4	99,101	396	663	<0.001	2.60 (2.34, 2.89)	124,109	150	285	<0.001	1.56 (1.32, 1.85)
17.5-18.9		545,156	1,560	364	<0.001	1.91 (1.8, 2.03)	660,934	544	106	0.193	1.07 (0.97, 1.19)	
19.0-19.9		920,922	2,120	262	<0.001	1.55 (1.47, 1.64)	1,040,495	758	75	0.138	0.93 (0.85, 1.02)	
20.0-20.9		1,502,605	3,192	262	<0.001	1.45 (1.38, 1.52)	1,611,176	1,176	104	0.055	0.92 (0.85, 1)	
21.0-21.9		2,118,955	3,973	215	<0.001	1.28 (1.22, 1.34)	1,873,393	1,414	101	0.115	0.94 (0.87, 1.02)	
22.0-22.9		2,668,004	4,420	197	<0.001	1.14 (1.08, 1.19)	1,891,364	1,460	88	0.146	0.94 (0.87, 1.02)	
23.0-23.9		3,056,063	4,594	184	0.173	1.03 (0.99, 1.08)	1,624,179	1,234	82	0.041	0.92 (0.85, 1)	
24.0-24.9		3,101,345	4,503	173	0.853	1.00 (0.95, 1.04)	1,354,077	1,137	111		1.00 (Reference)	
25.0-25.9		2,740,819	3,875	159	0.227	0.97 (0.93, 1.02)	886,066	769	101	0.634	1.02 (0.93, 1.12)	
26.0-26.9		2,058,583	3,004	161		1.00 (Reference)	640,655	599	112	0.080	1.09 (0.99, 1.21)	
27.0-27.9		1,404,135	2,205	204	0.012	1.07 (1.02, 1.13)	432,787	421	128	0.033	1.13 (1.01, 1.26)	
28.0-28.9		850,515	1,329	219	0.035	1.07 (1.01, 1.14)	280,901	289	158	0.012	1.18 (1.04, 1.34)	
29.0-29.9		530,710	984	231	<0.001	1.28 (1.19, 1.37)	174,651	197	136	0.002	1.28 (1.1, 1.48)	
30.0-31.4		386,250	735	176	<0.001	1.31 (1.21, 1.42)	144,963	179	87	<0.001	1.40 (1.19, 1.64)	
31.5-32.9		139,966	282	225	<0.001	1.39 (1.23, 1.57)	79,253	97	88	0.004	1.36 (1.1, 1.67)	
33.0-34.9		62,250	145	188	<0.001	1.61 (1.36, 1.9)	40,989	53	176	0.012	1.42 (1.08, 1.88)	
35.0-50.0		28,268	83	245	<0.001	2.02 (1.63, 2.52)	25,380	39	97	0.002	1.66 (1.21, 2.28)	
45-54 years		<16	8,709	204	1,832	<0.001	5.63 (4.9, 6.48)	8,349	65	629	<0.001	4.85 (3.79, 6.2)
		16.0-17.4	62,422	834	1,565	<0.001	3.36 (3.12, 3.61)	58,145	192	376	<0.001	2.20 (1.9, 2.54)
	17.5-18.9	311,100	2,873	1,079	<0.001	2.39 (2.28, 2.5)	301,786	671	328	<0.001	1.55 (1.42, 1.68)	
	19.0-19.9	530,168	3,848	869	<0.001	1.92 (1.85, 2.01)	533,958	895	194	<0.001	1.18 (1.1, 1.28)	
	20.0-20.9	900,615	5,613	785	<0.001	1.68 (1.62, 1.74)	999,159	1,611	220	<0.001	1.14 (1.07, 1.21)	
	21.0-21.9	1,354,006	7,056	633	<0.001	1.42 (1.37, 1.48)	1,468,359	2,154	189	0.392	1.02 (0.97, 1.08)	
	22.0-22.9	1,795,474	8,006	573	<0.001	1.24 (1.2, 1.28)	1,841,059	2,612	181	0.350	0.97 (0.92, 1.03)	
	23.0-23.9	2,173,485	8,655	517	<0.001	1.12 (1.08, 1.16)	1,903,245	2,812	216	0.901	1.00 (0.95, 1.05)	
	24.0-24.9	2,306,735	8,606	480	0.002	1.05 (1.02, 1.09)	1,879,993	2,837	190		1.00 (Reference)	
	25.0-25.9	2,030,896	7,234	478	0.436	1.01 (0.98, 1.05)	1,393,876	2,170	201	0.662	1.01 (0.96, 1.07)	
	26.0-26.9	1,527,239	5,358	503		1.00 (Reference)	1,083,768	1,697	196	0.869	1.01 (0.95, 1.07)	
	27.0-27.9	1,032,349	3,839	458	0.010	1.06 (1.01, 1.1)	759,137	1,294	208	0.026	1.08 (1.01, 1.15)	
	28.0-28.9	594,043	2,283	468	<0.001	1.09 (1.04, 1.15)	504,377	915	176	0.001	1.13 (1.05, 1.22)	
	29.0-29.9	352,384	1,459	564	<0.001	1.17 (1.11, 1.24)	309,925	613	235	<0.001	1.22 (1.12, 1.33)	
	30.0-31.4	237,836	1,071	588	<0.001	1.27 (1.18, 1.35)	256,386	528	207	<0.001	1.26 (1.15, 1.38)	

Table S2		Men (n=7,300,575)					Women (n=5,532,062)					
Age group <sup>c</sup>	BMI <sup>d</sup> at baseline	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	
55-64 years	31.5-32.9	79,446	383	658	<0.001	1.34 (1.21, 1.48)	134,351	305	259	<0.001	1.37 (1.22, 1.54)	
	33.0-34.9	30,475	163	459	<0.001	1.48 (1.26, 1.73)	63,380	152	291	<0.001	1.43 (1.22, 1.69)	
	35.0-50.0	12,379	73	494	<0.001	1.60 (1.27, 2.02)	38,662	113	227	<0.001	1.73 (1.43, 2.09)	
	<16	11,312	653	7,425	<0.001	4.97 (4.59, 5.38)	10,665	197	2,246	<0.001	3.89 (3.38, 4.49)	
	16.0-17.4	65,634	2,338	3,682	<0.001	3.15 (3, 3.29)	52,912	565	1,248	<0.001	2.33 (2.14, 2.54)	
	17.5-18.9	273,525	6,641	3,154	<0.001	2.21 (2.14, 2.28)	199,801	1,602	1,078	<0.001	1.81 (1.71, 1.91)	
	19.0-19.9	412,578	7,927	2,660	<0.001	1.81 (1.76, 1.87)	300,241	1,861	986	<0.001	1.44 (1.37, 1.52)	
	20.0-20.9	647,697	10,824	2,114	<0.001	1.61 (1.56, 1.66)	525,391	2,803	801	<0.001	1.26 (1.2, 1.32)	
	21.0-21.9	915,628	12,923	2,072	<0.001	1.39 (1.36, 1.43)	796,671	3,876	761	<0.001	1.16 (1.11, 1.2)	
	22.0-22.9	1,167,101	14,467	1,718	<0.001	1.25 (1.22, 1.29)	1,102,036	4,962	699	<0.001	1.07 (1.03, 1.11)	
	23.0-23.9	1,351,550	14,831	1,664	<0.001	1.13 (1.1, 1.16)	1,242,260	5,306	663	0.585	1.01 (0.97, 1.05)	
	24.0-24.9	1,385,296	13,937	1,471	0.001	1.05 (1.02, 1.08)	1,403,060	5,971	647		1.00 (Reference)	
	25.0-25.9	1,167,303	11,265	1,544	0.219	1.02 (0.99, 1.05)	1,138,743	4,867	645	0.507	0.99 (0.95, 1.03)	
	26.0-26.9	864,333	8,162	1,294		1.00 (Reference)	965,343	4,245	659	0.910	1.00 (0.96, 1.04)	
	27.0-27.9	581,879	5,455	1,454	0.840	1.00 (0.96, 1.03)	706,326	3,161	712	0.842	1.00 (0.96, 1.05)	
	28.0-28.9	323,685	3,130	1,318	0.202	1.03 (0.99, 1.07)	491,230	2,392	828	0.002	1.08 (1.03, 1.13)	
	29.0-29.9	184,532	1,878	1,622	0.002	1.08 (1.03, 1.14)	300,496	1,468	715	0.021	1.07 (1.01, 1.13)	
	30.0-31.4	123,913	1,311	1,887	<0.001	1.11 (1.05, 1.18)	242,188	1,342	889	<0.001	1.20 (1.13, 1.28)	
	31.5-32.9	41,330	482	1,913	<0.001	1.22 (1.11, 1.33)	123,444	785	808	<0.001	1.37 (1.27, 1.47)	
	33.0-34.9	15,165	190	3,340	<0.001	1.31 (1.13, 1.51)	53,682	333	1,087	<0.001	1.33 (1.19, 1.48)	
35.0-50.0	6,859	98	1,288	<0.001	1.47 (1.21, 1.8)	30,947	252	1,174	<0.001	1.72 (1.52, 1.95)		
65-74 years	<16	14,175	1,500	13,614	<0.001	3.52 (3.33, 3.72)	17,107	749	5,363	<0.001	2.53 (2.35, 2.72)	
	16.0-17.4	69,133	5,120	10,000	<0.001	2.47 (2.39, 2.56)	61,790	1,923	4,515	<0.001	1.87 (1.78, 1.96)	
	17.5-18.9	221,974	12,231	8,570	<0.001	1.87 (1.82, 1.92)	187,835	4,745	4,442	<0.001	1.58 (1.53, 1.64)	
	19.0-19.9	276,050	12,782	7,225	<0.001	1.60 (1.56, 1.65)	236,796	5,153	3,427	<0.001	1.39 (1.34, 1.44)	
	20.0-20.9	383,908	15,462	6,100	<0.001	1.41 (1.37, 1.45)	351,421	6,787	3,100	<0.001	1.25 (1.21, 1.29)	
	21.0-21.9	480,993	17,621	5,384	<0.001	1.31 (1.27, 1.34)	480,779	8,544	2,722	<0.001	1.17 (1.14, 1.21)	
	22.0-22.9	549,603	18,255	5,388	<0.001	1.20 (1.17, 1.24)	607,483	9,669	2,683	<0.001	1.06 (1.03, 1.09)	
	23.0-23.9	572,327	17,312	4,633	<0.001	1.11 (1.08, 1.14)	628,008	9,762	2,845	0.004	1.04 (1.01, 1.07)	
	24.0-24.9	548,903	15,370	4,692	0.012	1.04 (1.01, 1.06)	690,923	10,254	2,609		1.00 (Reference)	
	25.0-25.9	418,833	11,081	4,659	0.570	0.99 (0.96, 1.02)	566,757	8,280	2,748	0.346	0.99 (0.96, 1.02)	
	26.0-26.9	298,652	7,900	4,699		1.00 (Reference)	488,779	7,119	2,632	0.258	0.98 (0.95, 1.01)	
	27.0-27.9	190,393	4,832	5,516	0.037	0.96 (0.93, 1)	363,661	5,351	2,954	0.686	0.99 (0.96, 1.03)	
	28.0-28.9	102,882	2,708	4,613	0.930	1.00 (0.96, 1.04)	256,856	3,876	2,995	0.513	1.01 (0.98, 1.05)	
	29.0-29.9	56,581	1,571	5,239	0.018	1.07 (1.01, 1.13)	160,586	2,549	2,783	0.004	1.07 (1.02, 1.11)	
	30.0-31.4	37,637	1,038	4,007	0.055	1.07 (1, 1.14)	126,956	2,038	2,622	0.002	1.08 (1.03, 1.13)	
	31.5-32.9	11,882	363	3,163	0.004	1.17 (1.05, 1.3)	62,116	1,049	3,452	<0.001	1.14 (1.07, 1.21)	
	33.0-34.9	4,798	170	16,884	0.001	1.31 (1.12, 1.52)	26,823	480	3,584	<0.001	1.19 (1.09, 1.3)	
	35.0-50.0	2,089	75	4,235	0.007	1.37 (1.09, 1.71)	14,343	289	1,776	<0.001	1.35 (1.2, 1.52)	
	75-99 years	<16	6,859	1,312	19,382	<0.001	2.71 (2.54, 2.9)	11,157	1,171	9,758	<0.001	1.92 (1.8, 2.04)
		16.0-17.4	26,655	3,864	14,438	<0.001	1.98 (1.89, 2.08)	31,779	2,946	8,530	<0.001	1.70 (1.63, 1.78)
17.5-18.9		65,596	7,884	11,927	<0.001	1.62 (1.55, 1.69)	79,507	6,240	7,200	<0.001	1.46 (1.41, 1.51)	
19.0-19.9		71,648	7,591	10,550	<0.001	1.44 (1.38, 1.5)	83,983	5,979	6,620	<0.001	1.35 (1.31, 1.4)	
20.0-20.9		88,792	8,827	9,827	<0.001	1.34 (1.29, 1.4)	107,818	6,915	5,962	<0.001	1.23 (1.19, 1.27)	
21.0-21.9		102,168	9,288	8,992	<0.001	1.23 (1.18, 1.29)	130,968	7,919	5,715	<0.001	1.17 (1.13, 1.21)	
22.0-22.9		102,168	8,700	8,411	<0.001	1.15 (1.11, 1.2)	145,342	8,191	5,377	<0.001	1.10 (1.07, 1.14)	
23.0-23.9		98,527	7,965	8,018	<0.001	1.10 (1.05, 1.15)	130,836	7,116	5,232	<0.001	1.07 (1.04, 1.11)	
24.0-24.9		84,422	6,437	7,530	0.135	1.03 (0.99, 1.08)	127,572	6,370	4,877		1.00 (Reference)	
25.0-25.9		60,559	4,478	7,288	0.917	1.00 (0.96, 1.05)	102,574	5,097	4,840	0.734	0.99 (0.96, 1.03)	
26.0-26.9		40,678	2,977	7,223		1.00 (Reference)	81,209	3,986	4,817	0.820	1.00 (0.96, 1.04)	
27.0-27.9		24,549	1,753	7,131	0.432	0.98 (0.92, 1.04)	57,644	2,839	4,853	0.977	1.00 (0.96, 1.04)	
28.0-28.9		13,513	967	7,048	0.341	0.97 (0.9, 1.04)	40,164	2,016	4,939	0.391	1.02 (0.97, 1.07)	
29.0-29.9	7,303	490	6,486	0.019	0.89 (0.81, 0.98)	25,767	1,244	4,777	0.654	0.99 (0.93, 1.05)		

Table S2		Men (n=7,300,575)					Women (n=5,532,062)				
Age group <sup>c</sup>	BMI <sup>d</sup> at baseline	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)
45-49 years	30.0-31.4	4,564	333	7,135	0.776	0.98 (0.88, 1.1)	18,765	994	5,267	0.072	1.06 (0.99, 1.14)
	31.5-32.9	1,882	139	7,432	0.957	1.00 (0.84, 1.18)	9,316	466	5,017	0.470	1.04 (0.94, 1.14)
	33.0-34.9	463	38	8,323	0.590	1.09 (0.79, 1.5)	3,728	205	5,307	0.115	1.12 (0.97, 1.29)
	35.0-50.0	331	32	9,505	0.107	1.33 (0.94, 1.89)	2,317	111	4,657	0.420	0.93 (0.77, 1.12)
	<16						3,922	26	467	<0.001	5.37 (3.64, 7.92)
	16.0-17.4						31,227	72	386	<0.001	1.93 (1.52, 2.45)
	17.5-18.9						174,746	272	118	<0.001	1.34 (1.17, 1.53)
	19.0-19.9						312,532	385	95	0.250	1.07 (0.95, 1.2)
	20.0-20.9						575,640	671	128	0.727	1.02 (0.92, 1.12)
	21.0-21.9						810,451	934	125	0.931	1.00 (0.92, 1.1)
	22.0-22.9						963,293	1,113	153	0.909	1.00 (0.92, 1.09)
	23.0-23.9						945,524	1,098	123	0.893	1.01 (0.92, 1.09)
	24.0-24.9						890,253	1,036	151		1.00 (Reference)
	25.0-25.9						631,111	774	167	0.366	1.04 (0.95, 1.15)
50-64 years	26.0-26.9						478,256	635	173	0.022	1.12 (1.02, 1.24)
	27.0-27.9						327,245	454	197	0.007	1.16 (1.04, 1.3)
	28.0-28.9						215,863	294	183	0.069	1.13 (0.99, 1.28)
	29.0-29.9						132,363	217	170	<0.001	1.35 (1.16, 1.56)
	30.0-31.4						110,659	195	134	<0.001	1.43 (1.23, 1.67)
	31.5-32.9						58,599	99	132	0.005	1.35 (1.09, 1.65)
	33.0-34.9						29,010	50	124	0.041	1.34 (1.01, 1.79)
	35.0-50.0						17,649	38	158	0.002	1.65 (1.19, 2.28)
	<16						15,092	236	1,939	<0.001	3.99 (3.51, 4.54)
	16.0-17.4						79,830	685	1,074	<0.001	2.34 (2.16, 2.53)
	17.5-18.9						326,842	2,001	912	<0.001	1.79 (1.71, 1.89)
	19.0-19.9						521,667	2,371	831	<0.001	1.41 (1.34, 1.47)
	20.0-20.9						948,911	3,743	687	<0.001	1.26 (1.21, 1.31)
	21.0-21.9						1,454,580	5,096	645	<0.001	1.13 (1.09, 1.17)
22.0-22.9						1,979,803	6,461	597	0.015	1.04 (1.01, 1.08)	
23.0-23.9						2,199,980	7,020	567	0.688	1.01 (0.97, 1.04)	
24.0-24.9						2,392,800	7,772	558		1.00 (Reference)	
25.0-25.9						1,901,508	6,263	553	0.512	0.99 (0.96, 1.02)	
26.0-26.9						1,570,855	5,307	566	0.563	0.99 (0.96, 1.02)	
27.0-27.9						1,138,218	4,001	610	0.599	1.01 (0.97, 1.05)	
28.0-28.9						779,744	3,013	713	<0.001	1.09 (1.04, 1.14)	
29.0-29.9						478,058	1,864	624	0.001	1.09 (1.03, 1.14)	
30.0-31.4						387,916	1,675	755	<0.001	1.20 (1.14, 1.26)	
31.5-32.9						199,197	991	695	<0.001	1.37 (1.28, 1.46)	
33.0-34.9						88,051	435	931	<0.001	1.36 (1.24, 1.5)	
35.0-50.0						51,959	327	1,019	<0.001	1.74 (1.55, 1.94)	

BMI, body mass index; CI, confidence interval; HR, hazard ratio.

<sup>a</sup> Uniformly age-standardized death rate per 100,000 person-years (namely, the simple mean of calculable age-specific rates in the 14 age-specific rates at ages 18-24 years, 25-29 years, and up to 85 years or older, increasing by 5 years per group, based on **age attained** during follow-up) was calculated for each BMI category. Several age-specific rates were calculated at each age group. The age-specific rate in the oldest ages at each age group can be very high due to small number of follow-up years.

Therefore, death rate at a BMI category can be very high compared to other categories.

<sup>b</sup> Hazard ratios were calculated using Cox proportional hazards models after adjustment for age at enrollment (continuous variable), smoking status (current smoker, former smoker, never-smoker, and those with missing smoking status), and known pre-existing illness either cured or not (yes, and no including those with missing information).

<sup>c</sup> Age groups at 18-34 years, 35-44 years, 45-54 years, 55-64 years, 45-64 years, 65-74 years, and 75-99 years as well as **45-49 years and 50-64 years (only in women)**.

<sup>d</sup> 18 categories.

**Table S3. Apparent optimal<sup>a</sup> and acceptable<sup>a</sup> ranges of body mass index<sup>b</sup> for longevity in never-smokers.**

Age (years)	Men		Age (years)	Women	
	Optimal range	Normal range		Optimal range	Normal range
18-34	22.0-25.9	20.0-27.9	18-34	15.5-24.9 <sup>c</sup>	15.5-24.9 <sup>c</sup>
35-44	23.0-25.9	22.0-27.9	35-44	19.0-23.9	17.5-25.9
45-54	24.0-26.9	23.0-27.9	45-49	20.0-25.9	19.0-26.9
			50-54	22.0-27.9	21.0-28.9
55-64	24.0-27.9	23.0-31.4	55-64	23.0-27.9	22.0-29.9
65-74	25.0-28.9	23.0-31.4	65-74	24.0-28.9	22.0-31.4
75-99	25.0-34.9	24.0-34.9	75-99	24.0-29.9	22.0-36.4 <sup>d</sup>

<sup>a</sup> Generally, the ranges with an excess risk below 5%, relative to the lowest potential risk (the lowest unweighted geometric mean of hazard ratios at three consecutive body-mass index categories), were considered the optimal ranges, while the ranges with an excess risk below 15%, relative to the potential lowest risk, were deemed the acceptable ranges for each sex-age group. For example, in lifetime non-smoking men aged 18-34 years, the potential lowest risk were 0.91 (the geometric mean of hazard ratios at BMI of 23-23.9 [hazard ratio=0.95], 24-24.9 [0.92], and 25-25.9 [0.86]; Figure S5). The relative hazard at 26-26.9 kg/m<sup>2</sup> (hazard ratio=1.0) was 1.10 (1.0/0.91), and the excess risk was 10%. Thus, in lifetime non-smoking men aged 18-34 years, BMI of 26-26.9 kg/m<sup>2</sup> was considered the acceptable range.

<sup>b</sup> Body mass index (weight in kilograms divided by the square of the height in meters; kg/m<sup>2</sup>). Weight and height were measured while examinees wore light clothing without shoes.

<sup>c</sup> The lower end (15.5) of the range is the median of body mass index in the lowest body mass index category (<16) among all participants.

<sup>d</sup> The higher end (36.4) of the range is the median of body mass index in the highest body mass index category (35.0-50.0) among all participants.

**Table S4. Death rate<sup>a</sup> and hazard ratio<sup>b</sup> of death associated with 11 categories<sup>c</sup> of body mass index according to smoking status and age<sup>d</sup> in men among all participants (n=7,300,575).**

Men		Never-smokers (n=2,523,287)					Current smokers (n=3,483,108)					Former smokers (n=1,017,048)				
Age group <sup>d</sup>	BMI <sup>c</sup> at baseline	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)
18-44 years	<17.5	97,014	180	216	<0.001	2.86 (2.45, 3.33)	214,468	453	518	<0.001	2.32 (2.1, 2.55)	24,838	61	217	<0.001	3.57 (2.76, 4.63)
	17.5-18.9	447,519	470	172	<0.001	1.61 (1.46, 1.79)	1,006,885	1,708	283	<0.001	1.86 (1.76, 1.96)	135,687	187	218	<0.001	2.00 (1.71, 2.35)
	19.0-20.4	1,226,626	1,119	115	<0.001	1.34 (1.25, 1.45)	2,538,245	3,772	241	<0.001	1.55 (1.48, 1.62)	418,985	422	102	<0.001	1.40 (1.25, 1.57)
	20.5-21.9	2,116,478	1,788	103	<0.001	1.16 (1.09, 1.24)	3,933,733	5,448	199	<0.001	1.35 (1.3, 1.41)	792,050	666	100	0.062	1.10 (1, 1.22)
	22.0-23.4	2,667,382	2,248	106	0.024	1.07 (1.01, 1.14)	4,557,707	5,775	176	<0.001	1.16 (1.11, 1.2)	1,095,632	908	99	0.734	1.02 (0.93, 1.11)
	23.5-24.9	2,813,209	2,338	91	0.772	0.99 (0.93, 1.05)	4,678,477	5,596	160	0.062	1.04 (1, 1.08)	1,251,368	1,040	81	0.458	0.97 (0.88, 1.06)
	25.0-26.4	2,151,137	1,870	89		1.00 (Reference)	3,685,427	4,341	145		1.00 (Reference)	1,010,654	894	71		1.00 (Reference)
	26.5-27.9	1,254,198	1,186	95	0.047	1.08 (1, 1.16)	2,243,601	2,902	158	<0.001	1.09 (1.04, 1.15)	595,584	497	114	0.233	0.94 (0.84, 1.04)
	28.0-29.4	675,915	719	148	<0.001	1.24 (1.14, 1.35)	1,284,181	1,682	168	<0.001	1.15 (1.09, 1.21)	316,892	291	156	0.477	1.05 (0.92, 1.2)
	29.5-30.9	267,674	286	120	<0.001	1.28 (1.13, 1.45)	542,187	810	141	<0.001	1.37 (1.27, 1.48)	122,942	134	108	0.006	1.29 (1.07, 1.54)
31.0-50.0	214,729	272	124	<0.001	1.68 (1.48, 1.9)	459,395	709	194	<0.001	1.55 (1.43, 1.68)	90,573	110	210	<0.001	1.52 (1.25, 1.86)	
45-64 years	<17.5	45,494	1,082	2,665	<0.001	3.82 (3.59, 4.07)	83,619	2,431	3,179	<0.001	3.21 (3.07, 3.35)	14,290	386	2,965	<0.001	4.42 (3.98, 4.91)
	17.5-18.9	178,066	2,257	1,890	<0.001	2.20 (2.1, 2.31)	324,833	5,989	2,757	<0.001	2.20 (2.13, 2.27)	61,664	885	1,914	<0.001	2.61 (2.42, 2.8)
	19.0-20.4	528,777	5,002	1,532	<0.001	1.73 (1.67, 1.79)	847,367	11,762	2,203	<0.001	1.77 (1.72, 1.81)	192,001	1,797	1,312	<0.001	1.82 (1.72, 1.92)
	20.5-21.9	1,116,792	8,363	1,300	<0.001	1.40 (1.36, 1.44)	1,486,040	16,207	1,876	<0.001	1.45 (1.42, 1.49)	429,692	3,137	1,281	<0.001	1.49 (1.43, 1.57)
	22.0-23.4	1,777,077	11,039	1,005	<0.001	1.18 (1.15, 1.21)	1,955,274	17,219	1,639	<0.001	1.20 (1.18, 1.23)	719,936	4,156	1,148	<0.001	1.22 (1.16, 1.27)
	23.5-24.9	2,265,343	12,338	977	0.001	1.05 (1.02, 1.07)	2,156,171	15,996	1,446	<0.001	1.05 (1.02, 1.07)	958,455	4,889	930	<0.001	1.11 (1.06, 1.16)
	25.0-26.4	1,890,554	9,760	955		1.00 (Reference)	1,647,209	11,349	1,473		1.00 (Reference)	822,013	3,718	1,005		1.00 (Reference)
	26.5-27.9	1,147,102	6,040	946	0.379	1.01 (0.98, 1.05)	956,809	6,493	1,311	0.808	1.00 (0.97, 1.03)	493,459	2,261	714	0.766	1.01 (0.96, 1.06)
	28.0-29.4	554,684	3,173	839	<0.001	1.11 (1.07, 1.15)	457,612	3,037	1,438	0.687	0.99 (0.95, 1.03)	235,112	1,171	931	0.001	1.11 (1.04, 1.19)
	29.5-30.9	194,076	1,170	1,303	<0.001	1.16 (1.09, 1.23)	160,904	1,214	1,518	<0.001	1.12 (1.06, 1.19)	80,416	420	903	0.005	1.16 (1.04, 1.28)
31.0-50.0	111,835	833	1,954	<0.001	1.43 (1.33, 1.53)	93,237	734	2,159	<0.001	1.19 (1.1, 1.28)	45,151	250	1,220	0.004	1.21 (1.06, 1.37)	
65-99 years	<17.5	45,495	4,679	11,310	<0.001	2.69 (2.6, 2.78)	52,801	5,172	11,927	<0.001	2.13 (2.05, 2.21)	14,590	1,533	11,266	<0.001	2.61 (2.46, 2.77)
	17.5-18.9	115,934	7,899	8,185	<0.001	1.89 (1.83, 1.94)	123,273	8,776	9,149	<0.001	1.63 (1.57, 1.68)	39,026	2,765	8,456	<0.001	1.91 (1.82, 2.01)
	19.0-20.4	243,663	12,968	6,650	<0.001	1.54 (1.5, 1.58)	222,406	13,257	8,229	<0.001	1.41 (1.37, 1.46)	80,255	4,606	7,212	<0.001	1.61 (1.55, 1.69)
	20.5-21.9	395,061	17,465	5,918	<0.001	1.34 (1.31, 1.37)	286,769	14,794	7,387	<0.001	1.24 (1.21, 1.28)	127,388	5,833	6,220	<0.001	1.35 (1.29, 1.4)
	22.0-23.4	502,411	18,721	5,332	<0.001	1.18 (1.15, 1.2)	286,616	13,205	6,859	<0.001	1.14 (1.11, 1.18)	161,037	6,293	5,466	<0.001	1.18 (1.13, 1.23)
	23.5-24.9	524,799	17,152	4,947	<0.001	1.06 (1.04, 1.09)	243,138	10,188	6,526	0.001	1.06 (1.02, 1.09)	166,545	5,604	5,067	0.036	1.05 (1, 1.09)
	25.0-26.4	375,446	11,266	4,648		1.00 (Reference)	148,584	5,756	6,200		1.00 (Reference)	116,283	3,663	4,918		1.00 (Reference)
	26.5-27.9	216,765	6,157	4,463	0.008	0.96 (0.93, 0.99)	75,291	2,848	6,620	0.748	0.99 (0.95, 1.04)	62,481	1,952	5,067	0.650	1.01 (0.96, 1.07)
	28.0-29.4	94,192	2,792	4,599	0.781	1.01 (0.97, 1.05)	31,490	1,229	6,093	0.892	1.00 (0.94, 1.07)	27,111	809	4,722	0.577	0.98 (0.91, 1.06)
	29.5-30.9	33,590	979	4,584	0.976	1.00 (0.94, 1.07)	10,799	455	6,493	0.035	1.11 (1.01, 1.22)	8,722	291	4,876	0.194	1.08 (0.96, 1.22)
31.0-50.0	17,660	579	4,873	0.033	1.10 (1.01, 1.19)	5,866	269	7,371	0.002	1.21 (1.07, 1.37)	4,787	181	6,720	0.011	1.21 (1.05, 1.41)	



BMI, body mass index; CI, confidence interval; HR, hazard ratio.

<sup>a</sup> Uniformly age-standardized death rate per 100,000 person-years (namely, the simple mean of calculable age-specific rates in the 14 age-specific rates at ages 18-24 years, 25-29 years, and up to 85 years or older, increasing by 5 years per group, based on age attained during follow-up) was calculated for each BMI category. Several age-specific rates were calculated at each age group. The age-specific rate in the oldest ages at each age group can be very high due to small number of follow-up years. Therefore, death rate at a BMI category can be very high compared to other categories.

<sup>b</sup> Hazard ratios were calculated using Cox proportional hazards models after adjustment for age at enrollment (continuous variable), smoking status (current smoker, former smoker, never-smoker, and those with missing smoking status), and known pre-existing illness either cured or not (yes, and no including those with missing information).

<sup>c</sup> Due to relatively small numbers in some subgroups, analysis of 11 categories produced more stable results than analysis of 18 categories.

<sup>d</sup> Age groups at 18-44 years, 45-64 years, and 65-99 years.

<sup>e</sup> 11 categories.

**Table S5. Death rate<sup>a</sup> and hazard ratio<sup>b</sup> of death associated with seven categories<sup>c</sup> of body mass index according to smoking status and age<sup>d</sup> in women among all participants (n=5,532,062).**

Women		Never-smokers (n=4,913,461)					Current smokers (n=174,358)					Former smokers (n=83,602)				
Age group <sup>d</sup>	BMI <sup>e</sup> at baseline	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	Death rate <sup>a</sup>	p- value	HR (95% CI)
18-44 years	<18.5	2,690,817	1,027	91	<0.001	1.15 (1.06, 1.24)	105,778	84	126	0.049	1.32 (1, 1.75)	68,675	35	713	0.776	0.94 (0.62, 1.43)
	18.5-21.0	8,250,742	3,373	61	0.424	0.98 (0.93, 1.03)	286,289	244	125	0.283	1.12 (0.91, 1.39)	194,253	96	67	0.066	0.75 (0.55, 1.02)
	21.0-23.0	6,374,466	3,326	62	0.763	0.99 (0.94, 1.05)	204,162	230	208	0.080	1.21 (0.98, 1.49)	133,939	76	58	0.023	0.69 (0.5, 0.95)
	23.0-25.0	4,068,072	2,428	64		1.00 (Reference)	128,910	136	117		1.00 (Reference)	77,831	74	152		1.00 (Reference)
	25.0-27.5	2,222,608	1,617	79	<0.001	1.15 (1.08, 1.22)	76,815	95	97	0.405	1.12 (0.86, 1.45)	44,430	33	64	0.143	0.74 (0.49, 1.11)
	27.5-30.0	801,828	669	100	<0.001	1.30 (1.19, 1.41)	35,622	60	317	0.005	1.55 (1.14, 2.1)	17,056	10	54	0.122	0.59 (0.31, 1.15)
	30.0-50.0	394,609	380	77	<0.001	1.56 (1.4, 1.74)	23,590	27	104	0.408	1.19 (0.79, 1.8)	11,304	10	80	0.987	0.99 (0.51, 1.93)
45-64 years	<18.5	339,861	1,874	725	<0.001	2.13 (2.03, 2.23)	19,698	242	2,230	<0.001	1.97 (1.71, 2.28)	4,283	26	759	0.011	1.70 (1.13, 2.55)
	18.5-21.0	2,321,703	6,923	649	<0.001	1.30 (1.26, 1.34)	87,329	563	944	<0.001	1.26 (1.13, 1.4)	27,440	115	1,021	0.003	1.41 (1.12, 1.77)
	21.0-23.0	4,682,239	11,776	536	<0.001	1.07 (1.04, 1.1)	134,964	732	730	0.383	1.05 (0.95, 1.16)	52,527	145	327	0.316	0.90 (0.73, 1.11)
	23.0-25.0	5,795,365	14,720	471		1.00 (Reference)	144,364	789	933		1.00 (Reference)	62,240	212	801		1.00 (Reference)
	25.0-27.5	4,872,732	13,531	487	0.907	1.00 (0.98, 1.03)	119,289	625	1,370	0.024	0.89 (0.8, 0.98)	50,966	199	785	0.653	1.05 (0.86, 1.27)
	27.5-30.0	2,019,738	6,521	561	<0.001	1.10 (1.07, 1.13)	55,420	298	1,120	0.075	0.89 (0.78, 1.01)	22,359	79	379	0.240	0.86 (0.66, 1.11)
	30.0-50.0	842,428	3,311	635	<0.001	1.32 (1.27, 1.37)	27,968	191	1,046	0.128	1.13 (0.97, 1.32)	9,741	47	522	0.230	1.21 (0.88, 1.67)
65-99 years	<18.5	217,824	10,069	5,227	<0.001	1.70 (1.66, 1.74)	34,707	2,253	6,618	<0.001	1.48 (1.39, 1.56)	4,969	336	6,442	<0.001	1.66 (1.45, 1.89)
	18.5-21.0	759,084	23,332	3,983	<0.001	1.28 (1.26, 1.31)	70,609	3,456	5,323	<0.001	1.18 (1.12, 1.24)	14,347	695	5,275	<0.001	1.37 (1.24, 1.53)
	21.0-23.0	1,189,940	28,674	3,456	<0.001	1.10 (1.08, 1.12)	73,820	2,985	4,785	0.235	1.03 (0.98, 1.09)	19,366	672	4,080	0.649	1.03 (0.92, 1.14)
	23.0-25.0	1,395,544	28,368	3,174		1.00 (Reference)	64,598	2,402	4,648		1.00 (Reference)	20,750	669	3,877		1.00 (Reference)
	25.0-27.5	1,319,927	24,969	3,060	<0.001	0.96 (0.94, 0.98)	50,198	1,697	4,405	0.035	0.94 (0.88, 1)	18,548	538	4,082	0.886	0.99 (0.89, 1.11)
	27.5-30.0	596,681	11,537	3,174	0.673	1.00 (0.97, 1.02)	19,141	667	4,606	0.660	0.98 (0.9, 1.07)	8,035	226	3,701	0.726	0.97 (0.84, 1.13)
	30.0-50.0	236,826	4,888	3,350	<0.001	1.07 (1.04, 1.11)	7,574	231	4,397	0.072	0.88 (0.77, 1.01)	3,297	114	4,425	0.105	1.18 (0.97, 1.44)

BMI, body mass index; CI, confidence interval; HR, hazard ratio.

<sup>a</sup> Uniformly age-standardized death rate per 100,000 person-years (namely, the simple mean of calculable age-specific rates in the 14 age-specific rates at ages 18-24 years, 25-29 years, and up to 85 years or older, increasing by 5 years per group, based on age attained during follow-up) was calculated for each BMI category. Several age-specific rates were calculated at each age group. The age-specific rate in the oldest ages at each age group can be very high due to small number of follow-up years. Therefore, death rate at a BMI category can be very high compared to other categories.

<sup>b</sup> Hazard ratios were calculated using Cox proportional hazards models after adjustment for age at enrollment (continuous variable), and known pre-existing illness either cured or not (yes, and no including those with missing information).

<sup>c</sup> Due to relatively small numbers in some subgroups, analysis of 7 categories produced more stable results than analysis of 18 categories.

<sup>d</sup> Age groups at 18-44 years, 45-64 years, and 65-99 years

<sup>e</sup> 7 categories.

**Table S6. Hazard ratio<sup>a</sup> of death associated with standard five categories<sup>b</sup> of body mass index according to sex and age<sup>c</sup> (6 groups) among all participants and never-smokers.**

Table S6		All participants (n=12,832,637)					Never-smokers (n=7,436,748)				
Sex-age group	BMI <sup>b</sup> at baseline	Follow-up person-years	No. of deaths	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	p- value	HR (95% CI)		
Men and women at all ages	<18.5	5,788,716	52,213	<0.001	1.72 (1.71, 1.74)	3,832,331	25,174	<0.001	1.78 (1.76, 1.81)		
	18.5-24.9	88,305,674	455,072		1.00 (Reference)	51,360,467	237,824		1.00 (Reference)		
	25.0-29.9	37,264,890	172,236	<0.001	0.83 (0.83, 0.84)	20,371,306	102,699	<0.001	0.85 (0.85, 0.86)		
	30.0-34.9	3,464,851	16,594	0.616	1.00 (0.98, 1.01)	1,984,022	10,921	0.393	1.01 (0.99, 1.03)		
	35.0-50.0	250,428	1,268	<0.001	1.28 (1.21, 1.36)	151,605	885	<0.001	1.28 (1.2, 1.37)		
Men and women at 18-34 years	<18.5	3,523,593	1,508	<0.001	1.17 (1.11, 1.24)	2,496,701	807	0.002	1.13 (1.04, 1.22)		
	18.5-24.9	28,179,853	13,819		1.00 (Reference)	14,772,487	5,064		1.00 (Reference)		
	25.0-29.9	7,595,266	4,565	0.692	0.99 (0.96, 1.03)	2,671,948	1,214	0.060	1.06 (1, 1.14)		
	30.0-34.9	900,654	745	<0.001	1.39 (1.29, 1.49)	309,859	188	<0.001	1.48 (1.28, 1.72)		
	35.0-50.0	88,854	103	<0.001	2.11 (1.74, 2.56)	34,761	29	<0.001	2.26 (1.57, 3.25)		
Men and women at 35-44 years	<18.5	865,651	1,825	<0.001	1.75 (1.67, 1.83)	528,464	663	<0.001	1.56 (1.44, 1.69)		
	18.5-24.9	23,350,159	30,951		1.00 (Reference)	12,954,675	11,763		1.00 (Reference)		
	25.0-29.9	9,999,822	13,672	<0.001	0.92 (0.9, 0.93)	4,528,005	4,933	0.012	1.04 (1.01, 1.08)		
	30.0-34.9	853,671	1,491	<0.001	1.21 (1.15, 1.28)	407,852	583	<0.001	1.42 (1.3, 1.54)		
	35.0-50.0	53,648	122	<0.001	1.72 (1.44, 2.05)	30,271	52	<0.001	1.81 (1.38, 2.38)		
Men and women at 45-54 years	<18.5	453,202	3,296	<0.001	2.16 (2.09, 2.24)	259,423	1,082	<0.001	2.11 (1.99, 2.25)		
	18.5-24.9	17,983,565	56,248		1.00 (Reference)	11,089,068	22,521		1.00 (Reference)		
	25.0-29.9	9,587,994	26,862	<0.001	0.85 (0.84, 0.86)	5,754,509	12,390	<0.001	0.95 (0.93, 0.97)		
	30.0-34.9	801,874	2,602	<0.001	1.09 (1.04, 1.13)	536,332	1,402	<0.001	1.23 (1.17, 1.3)		
	35.0-50.0	51,041	186	<0.001	1.45 (1.25, 1.67)	38,896	125	<0.001	1.68 (1.41, 2)		
Men and women at 55-64 years	<18.5	394,936	8,517	<0.001	2.06 (2.02, 2.11)	220,063	3,187	<0.001	2.16 (2.08, 2.24)		
	18.5-24.9	11,468,424	103,167		1.00 (Reference)	7,482,162	48,584		1.00 (Reference)		
	25.0-29.9	6,723,869	46,023	<0.001	0.83 (0.82, 0.83)	4,800,877	27,061	<0.001	0.87 (0.86, 0.88)		
	30.0-34.9	599,722	4,443	0.492	1.01 (0.98, 1.04)	471,257	3,090	<0.001	1.09 (1.05, 1.13)		
	35.0-50.0	37,806	350	<0.001	1.40 (1.26, 1.56)	31,277	271	<0.001	1.51 (1.34, 1.70)		
Men and women at 65-74 years	<18.5	390,510	19,253	<0.001	1.73 (1.7, 1.75)	226,036	8,928	<0.001	1.82 (1.78, 1.86)		
	18.5-24.9	5,988,698	153,986		1.00 (Reference)	4,106,810	85,997		1.00 (Reference)		
	25.0-29.9	2,903,981	55,267	<0.001	0.84 (0.83, 0.85)	2,254,002	37,778	<0.001	0.85 (0.84, 0.86)		
	30.0-34.9	270,212	5,138	<0.001	0.95 (0.92, 0.98)	226,321	3,914	0.007	0.96 (0.93, 0.99)		
	35.0-50.0	16,432	364	0.003	1.17 (1.06, 1.3)	14,207	299	0.003	1.19 (1.06, 1.33)		
Men and women at 75-99 years	<18.5	160,823	17,814	<0.001	1.48 (1.46, 1.51)	101,645	10,507	<0.001	1.53 (1.5, 1.56)		
	18.5-24.9	1,334,975	96,901		1.00 (Reference)	955,265	63,895		1.00 (Reference)		
	25.0-29.9	453,959	25,847	<0.001	0.84 (0.83, 0.85)	361,964	19,323	<0.001	0.84 (0.82, 0.85)		
	30.0-34.9	38,718	2,175	<0.001	0.89 (0.86, 0.93)	32,402	1,744	<0.001	0.90 (0.85, 0.94)		
	35.0-50.0	2,647	143	0.066	0.86 (0.73, 1.01)	2,193	109	0.061	0.84 (0.69, 1.01)		
Men at all ages at 18-34 years	<18.5	1,981,652	35,265	<0.001	1.77 (1.75, 1.79)	583,830	12,204	<0.001	1.92 (1.88, 1.95)		
	18.5-24.9	48,910,732	308,542		1.00 (Reference)	16,523,311	114,904		1.00 (Reference)		
	25.0-29.9	24,038,475	104,390	<0.001	0.80 (0.79, 0.8)	8,537,792	43,855	<0.001	0.81 (0.8, 0.82)		
	30.0-34.9	1,931,635	7,530	0.002	0.96 (0.94, 0.99)	626,697	3,061	0.117	0.97 (0.94, 1.01)		
	35.0-50.0	116,337	448	<0.001	1.35 (1.23, 1.48)	35,067	166	0.003	1.25 (1.08, 1.46)		
Men at 18-34 years	<18.5	849,092	734	<0.001	1.38 (1.28, 1.48)	227,459	181	<0.001	1.69 (1.45, 1.96)		
	18.5-24.9	16,582,994	10,464		1.00 (Reference)	4,860,946	2,336		1.00 (Reference)		

Table S6		All participants (n=12,832,637)				Never-smokers (n=7,436,748)				
Sex-age group	BMI <sup>1</sup> at baseline	Follow-up person-years	No. of deaths	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	p- value	HR (95% CI)	
Men	25.0-29.9	6,581,129	4,173	0.153	0.97 (0.94, 1.01)	1,819,319	890	0.852	0.99 (0.92, 1.07)	
	30.0-34.9	753,779	687	<0.001	1.39 (1.29, 1.5)	190,866	140	<0.001	1.49 (1.26, 1.77)	
	35.0-50.0	66,411	87	<0.001	2.06 (1.67, 2.54)	17,162	17	0.003	2.08 (1.29, 3.35)	
	<18.5	394,202	1,338	<0.001	1.90 (1.8, 2.01)	106,888	262	<0.001	1.91 (1.69, 2.16)	
	at 35-44 years	18.5-24.9	13,629,157	23,514		1.00 (Reference)	4,172,935	5,364		1.00 (Reference)
	25.0-29.9	7,584,762	11,397	<0.001	0.87 (0.85, 0.89)	2,356,199	2,971	0.114	0.96 (0.92, 1.01)	
	30.0-34.9	588,465	1,162	<0.001	1.15 (1.09, 1.22)	171,976	295	<0.001	1.32 (1.17, 1.48)	
	35.0-50.0	28,268	83	<0.001	1.71 (1.38, 2.12)	8,129	20	0.004	1.92 (1.24, 2.98)	
	<18.5	235,162	2,672	<0.001	2.23 (2.14, 2.32)	67,387	554	<0.001	2.33 (2.14, 2.54)	
	at 45-54 years	18.5-24.9	9,207,552	43,023		1.00 (Reference)	3,211,654	11,139		1.00 (Reference)
	25.0-29.9	5,536,910	20,173	<0.001	0.80 (0.79, 0.82)	2,117,938	6,553	<0.001	0.88 (0.85, 0.91)	
	30.0-34.9	347,756	1,617	0.791	1.01 (0.96, 1.06)	133,515	553	0.001	1.16 (1.06, 1.26)	
	35.0-50.0	12,379	73	0.066	1.24 (0.99, 1.56)	4,789	27	0.021	1.56 (1.07, 2.28)	
	<18.5	224,799	6,836	<0.001	2.08 (2.03, 2.13)	72,238	1,841	<0.001	2.32 (2.21, 2.43)	
	at 55-64 years	18.5-24.9	6,005,522	77,705		1.00 (Reference)	2,560,270	26,547		1.00 (Reference)
25.0-29.9	3,121,733	29,890	<0.001	0.78 (0.77, 0.79)	1,544,978	12,846	<0.001	0.81 (0.79, 0.83)		
30.0-34.9	180,408	1,983	<0.001	0.89 (0.85, 0.93)	93,571	947	0.391	0.97 (0.91, 1.04)		
35.0-50.0	6,859	98	0.197	1.14 (0.93, 1.39)	3,460	50	0.051	1.32 (1.00, 1.74)		
<18.5	206,928	13,774	<0.001	1.77 (1.74, 1.8)	77,049	4,835	<0.001	2.00 (1.94, 2.06)		
at 65-74 years	18.5-24.9	2,910,138	101,879		1.00 (Reference)	1,402,681	42,515		1.00 (Reference)	
25.0-29.9	1,067,340	28,092	<0.001	0.79 (0.78, 0.8)	607,168	14,246	<0.001	0.79 (0.78, 0.81)		
30.0-34.9	54,317	1,571	<0.001	0.89 (0.84, 0.93)	32,400	819	<0.001	0.87 (0.81, 0.93)		
35.0-50.0	2,089	75	0.438	1.09 (0.87, 1.37)	1,319	35	0.435	0.88 (0.63, 1.22)		
<18.5	71,468	9,911	<0.001	1.53 (1.5, 1.57)	32,807	4,531	<0.001	1.63 (1.58, 1.69)		
at 75-99 years	18.5-24.9	575,369	51,957		1.00 (Reference)	314,825	27,003		1.00 (Reference)	
25.0-29.9	146,602	10,665	<0.001	0.81 (0.79, 0.83)	92,189	6,349	<0.001	0.80 (0.77, 0.82)		
30.0-34.9	6,909	510	<0.001	0.82 (0.75, 0.89)	4,369	307	<0.001	0.79 (0.71, 0.89)		
35.0-50.0	331	32	0.611	1.09 (0.77, 1.55)	208	17	0.779	0.93 (0.58, 1.5)		
Women at all ages	<18.5	3,807,064	16,948	<0.001	1.63 (1.6, 1.65)	3,248,502	12,970	<0.001	1.68 (1.65, 1.71)	
18.5-24.9	39,394,942	146,530		1.00 (Reference)	34,837,155	122,920		1.00 (Reference)		
25.0-29.9	13,226,415	67,846	<0.001	0.88 (0.87, 0.89)	11,833,514	58,844	<0.001	0.88 (0.87, 0.89)		
30.0-34.9	1,533,216	9,064	0.120	1.02 (1, 1.04)	1,357,326	7,860	0.135	1.02 (0.99, 1.04)		
35.0-50.0	134,091	820	<0.001	1.26 (1.17, 1.35)	116,538	719	<0.001	1.29 (1.2, 1.38)		
<18.5	2,674,501	774	0.460	1.03 (0.95, 1.11)	2,269,241	626	0.433	1.04 (0.95, 1.13)		
at 18-34 years	18.5-24.9	11,596,860	3,355		1.00 (Reference)	9,911,540	2,728		1.00 (Reference)	
25.0-29.9	1,014,137	392	<0.001	1.29 (1.16, 1.43)	852,629	324	<0.001	1.35 (1.2, 1.51)		
30.0-34.9	146,874	58	0.041	1.31 (1.01, 1.7)	118,993	48	0.010	1.46 (1.1, 1.94)		
35.0-50.0	22,443	16	0.001	2.36 (1.44, 3.85)	17,599	12	0.001	2.51 (1.43, 4.43)		
<18.5	471,449	487	<0.001	1.42 (1.3, 1.56)	421,575	401	<0.001	1.39 (1.26, 1.54)		
at 35-44 years	18.5-24.9	9,721,002	7,437		1.00 (Reference)	8,781,740	6,399		1.00 (Reference)	
25.0-29.9	2,415,060	2,275	<0.001	1.16 (1.11, 1.22)	2,171,806	1,962	<0.001	1.17 (1.11, 1.23)		
30.0-34.9	265,206	329	<0.001	1.47 (1.32, 1.64)	235,876	288	<0.001	1.53 (1.36, 1.73)		
35.0-50.0	25,380	39	<0.001	1.76 (1.28, 2.4)	22,142	32	0.001	1.77 (1.25, 2.51)		
<18.5	218,040	624	<0.001	1.89 (1.75, 2.05)	192,036	528	<0.001	1.93 (1.76, 2.1)		

Table S6		All participants (n=12,832,637)				Never-smokers (n=7,436,748)			
Sex-age group	BMI <sup>b</sup> at baseline	Follow-up person-years	No. of deaths	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	p- value	HR (95% CI)
at 45-54 years	18.5-24.9	8,776,013	13,225		1.00 (Reference)	7,877,415	11,382		1.00 (Reference)
	25.0-29.9	4,051,084	6,689	0.133	1.02 (0.99, 1.05)	3,636,571	5,837	0.035	1.03 (1, 1.07)
	30.0-34.9	454,118	985	<0.001	1.28 (1.2, 1.36)	402,817	849	<0.001	1.30 (1.21, 1.4)
	35.0-50.0	38,662	113	<0.001	1.68 (1.39, 2.02)	34,107	98	<0.001	1.74 (1.43, 2.12)
	Women	<18.5	170,137	1,681	<0.001	1.98 (1.88, 2.08)	147,825	1,346	<0.001
at 55-64 years	18.5-24.9	5,462,901	25,462		1.00 (Reference)	4,921,892	22,037		1.00 (Reference)
	25.0-29.9	3,602,137	16,133	<0.001	0.92 (0.9, 0.94)	3,255,899	14,215	<0.001	0.93 (0.91, 0.95)
	30.0-34.9	419,314	2,460	<0.001	1.15 (1.11, 1.2)	377,686	2,143	<0.001	1.16 (1.11, 1.21)
	35.0-50.0	30,947	252	<0.001	1.57 (1.38, 1.78)	27,818	221	<0.001	1.58 (1.39, 1.81)
	Women	<18.5	183,582	5,479	<0.001	1.62 (1.58, 1.67)	148,986	4,093	<0.001
at 65-74 years	18.5-24.9	3,078,560	52,107		1.00 (Reference)	2,704,128	43,482		1.00 (Reference)
	25.0-29.9	1,836,641	27,175	<0.001	0.89 (0.88, 0.9)	1,646,834	23,532	<0.001	0.89 (0.88, 0.9)
	30.0-34.9	215,895	3,567	0.647	0.99 (0.96, 1.03)	193,921	3,095	0.535	0.99 (0.95, 1.03)
	35.0-50.0	14,343	289	0.001	1.21 (1.08, 1.36)	12,888	264	<0.001	1.26 (1.12, 1.42)
	Women	<18.5	89,355	7,903	<0.001	1.41 (1.38, 1.45)	68,838	5,976	<0.001
at 75-99 years	18.5-24.9	759,606	44,944		1.00 (Reference)	640,440	36,892		1.00 (Reference)
	25.0-29.9	307,357	15,182	<0.001	0.87 (0.85, 0.89)	269,775	12,974	<0.001	0.86 (0.85, 0.88)
	30.0-34.9	31,808	1,665	0.002	0.93 (0.88, 0.97)	28,033	1,437	0.004	0.93 (0.88, 0.98)
	35.0-50.0	2,317	111	0.024	0.81 (0.67, 0.97)	1,984	92	0.062	0.82 (0.67, 1.01)

BMI, body mass index; CI, confidence interval; HR, hazard ratio.

<sup>a</sup> Hazard ratios were calculated using Cox proportional hazards models after adjustment for age at enrollment (continuous variable), sex (men, and women; only in the analysis for both sexes combined) smoking status (current smoker, former smoker, never-smoker, and those with missing smoking status; only in the analysis for all participants), and known pre-existing illness either cured or not (yes, and no including those with missing information).

<sup>b</sup> 5 categories. Analysis was done for comparison with other research using current standard cut-off points.

<sup>c</sup> Age groups at all ages, 18-34 years, 35-44 years, 45-54 years, 55-64 years, 45-64 years, 65-74 years, and 75-99 years.

**Table S7. Hazard ratio<sup>a</sup> of death associated with standard four categories<sup>b</sup> of body mass index according to sex and age<sup>c</sup> (6 groups) among all participants and never-smokers.**

Table S7		All participants (n=12,832,637)					Never-smokers (n=7,436,748)				
Sex-age group	BMI <sup>b</sup> at baseline	Follow-up person-years	No. of deaths	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	p- value	HR (95% CI)		
Men and women at all ages	<18.5	5,788,716	52,213	<0.001	1.72 (1.71, 1.74)	3,832,331	25,174	<0.001	1.78 (1.76, 1.81)		
	18.5-24.9	88,305,674	455,072		1.00 (Reference)	51,360,467	237,824		1.00 (Reference)		
	25.0-29.9	37,264,890	172,236	<0.001	0.83 (0.83, 0.84)	20,371,306	102,699	<0.001	0.85 (0.85, 0.86)		
	30.0-50.0	3,715,278	17,862	0.119	1.01 (1, 1.03)	2,135,628	11,806	0.010	1.02 (1.01, 1.04)		
Men and women at 18-34 years	<18.5	3,523,593	1,508	<0.001	1.17 (1.11, 1.24)	2,496,701	807	0.002	1.13 (1.04, 1.22)		
	18.5-24.9	28,179,853	13,819		1.00 (Reference)	14,772,487	5,064		1.00 (Reference)		
	25.0-29.9	7,595,266	4,565	0.701	0.99 (0.96, 1.03)	2,671,948	1,214	0.059	1.06 (1, 1.14)		
	30.0-50.0	989,507	848	<0.001	1.45 (1.35, 1.55)	344,620	217	<0.001	1.55 (1.35, 1.78)		
Men and women at 35-44 years	<18.5	865,651	1,825	<0.001	1.75 (1.67, 1.83)	528,464	663	<0.001	1.56 (1.44, 1.69)		
	18.5-24.9	23,350,159	30,951		1.00 (Reference)	12,954,675	11,763		1.00 (Reference)		
	25.0-29.9	9,999,822	13,672	<0.001	0.92 (0.9, 0.93)	4,528,005	4,933	0.012	1.04 (1.01, 1.08)		
	30.0-50.0	907,319	1,613	<0.001	1.24 (1.18, 1.30)	438,123	635	<0.001	1.44 (1.33, 1.56)		
Men and women at 45-54 years	<18.5	453,202	3,296	<0.001	2.16 (2.09, 2.24)	259,423	1,082	<0.001	2.11 (1.99, 2.25)		
	18.5-24.9	17,983,565	56,248		1.00 (Reference)	11,089,068	22,521		1.00 (Reference)		
	25.0-29.9	9,587,994	26,862	<0.001	0.85 (0.84, 0.86)	5,754,509	12,390	<0.001	0.95 (0.93, 0.97)		
	30.0-50.0	852,915	2,788	<0.001	1.11 (1.06, 1.15)	575,229	1,527	<0.001	1.26 (1.2, 1.33)		
Men and women at 55-64 years	<18.5	394,936	8,517	<0.001	2.06 (2.02, 2.11)	220,063	3,187	<0.001	2.16 (2.08, 2.24)		
	18.5-24.9	11,468,424	103,167		1.00 (Reference)	7,482,162	48,584		1.00 (Reference)		
	25.0-29.9	6,723,869	46,023	<0.001	0.83 (0.82, 0.83)	4,800,877	27,061	<0.001	0.87 (0.86, 0.88)		
	30.0-50.0	637,528	4,793	0.037	1.03 (1, 1.06)	502,534	3,361	<0.001	1.11 (1.07, 1.15)		
Men and women at 65-74 years	<18.5	390,510	19,253	<0.001	1.73 (1.7, 1.75)	226,036	8,928	<0.001	1.82 (1.78, 1.86)		
	18.5-24.9	5,988,698	153,986		1.00 (Reference)	4,106,810	85,997		1.00 (Reference)		
	25.0-29.9	2,903,981	55,267	<0.001	0.84 (0.83, 0.85)	2,254,002	37,778	<0.001	0.85 (0.84, 0.86)		
	30.0-50.0	286,644	5,502	0.004	0.96 (0.94, 0.99)	240,527	4,213	0.057	0.97 (0.94, 1)		
Men and women at 75-99 years	<18.5	160,823	17,814	<0.001	1.48 (1.46, 1.51)	101,645	10,507	<0.001	1.53 (1.5, 1.56)		
	18.5-24.9	1,334,975	96,901		1.00 (Reference)	955,265	63,895		1.00 (Reference)		
	25.0-29.9	453,959	25,847	<0.001	0.84 (0.83, 0.85)	361,964	19,323	<0.001	0.84 (0.82, 0.85)		
	30.0-50.0	41,365	2,318	<0.001	0.89 (0.86, 0.93)	34,595	1,853	<0.001	0.89 (0.85, 0.93)		
Men at all ages	<18.5	1,981,652	35,265	<0.001	1.77 (1.75, 1.79)	583,830	12,204	<0.001	1.92 (1.88, 1.95)		
	18.5-24.9	48,910,732	308,542		1.00 (Reference)	16,523,311	114,904		1.00 (Reference)		
	25.0-29.9	24,038,475	104,390	<0.001	0.80 (0.79, 0.8)	8,537,792	43,855	<0.001	0.81 (0.8, 0.82)		
	30.0-50.0	2,047,972	7,978	0.078	0.98 (0.96, 1)	661,764	3,227	0.340	0.98 (0.95, 1.02)		
Men at 18-34 years	<18.5	849,092	734	<0.001	1.38 (1.28, 1.48)	227,459	181	<0.001	1.69 (1.45, 1.96)		
	18.5-24.9	16,582,994	10,464		1.00 (Reference)	4,860,946	2,336		1.00 (Reference)		
	25.0-29.9	6,581,129	4,173	0.155	0.97 (0.94, 1.01)	1,819,319	890	0.855	0.99 (0.92, 1.07)		
	30.0-50.0	820,190	774	<0.001	1.45 (1.34, 1.55)	208,029	157	<0.001	1.54 (1.31, 1.81)		
Men at 35-44 years	<18.5	394,202	1,338	<0.001	1.90 (1.8, 2.01)	106,888	262	<0.001	1.91 (1.69, 2.16)		
	18.5-24.9	13,629,157	23,514		1.00 (Reference)	4,172,935	5,364		1.00 (Reference)		
	25.0-29.9	7,584,762	11,397	<0.001	0.87 (0.85, 0.89)	2,356,199	2,971	0.114	0.96 (0.92, 1.01)		
	30.0-50.0	616,734	1,245	<0.001	1.18 (1.11, 1.25)	180,105	315	<0.001	1.34 (1.20, 1.50)		
Men at 45-54 years	<18.5	235,162	2,672	<0.001	2.23 (2.14, 2.32)	67,387	554	<0.001	2.33 (2.14, 2.54)		
	18.5-24.9	9,207,552	43,023		1.00 (Reference)	3,211,654	11,139		1.00 (Reference)		
	25.0-29.9	5,536,910	20,173	<0.001	0.80 (0.79, 0.82)	2,117,938	6,553	<0.001	0.88 (0.85, 0.91)		
	30.0-50.0	360,135	1,690	0.548	1.02 (0.97, 1.07)	138,304	580	<0.001	1.17 (1.08, 1.27)		
Men at 55-64 years	<18.5	224,799	6,836	<0.001	2.08 (2.03, 2.13)	72,238	1,841	<0.001	2.32 (2.21, 2.43)		
	18.5-24.9	6,005,522	77,705		1.00 (Reference)	2,560,270	26,547		1.00 (Reference)		
	25.0-29.9	3,121,733	29,890	<0.001	0.78 (0.77, 0.79)	1,544,978	12,846	<0.001	0.81 (0.79, 0.83)		
	30.0-50.0	187,267	2,081	<0.001	0.90 (0.86, 0.94)	97,030	997	0.639	0.98 (0.92, 1.05)		
Men at 65-74 years	<18.5	206,928	13,774	<0.001	1.77 (1.74, 1.8)	77,049	4,835	<0.001	2.00 (1.94, 2.06)		
	18.5-24.9	2,910,138	101,879		1.00 (Reference)	1,402,681	42,515		1.00 (Reference)		
	25.0-29.9	1,067,340	28,092	<0.001	0.79 (0.78, 0.8)	607,168	14,246	<0.001	0.79 (0.78, 0.81)		

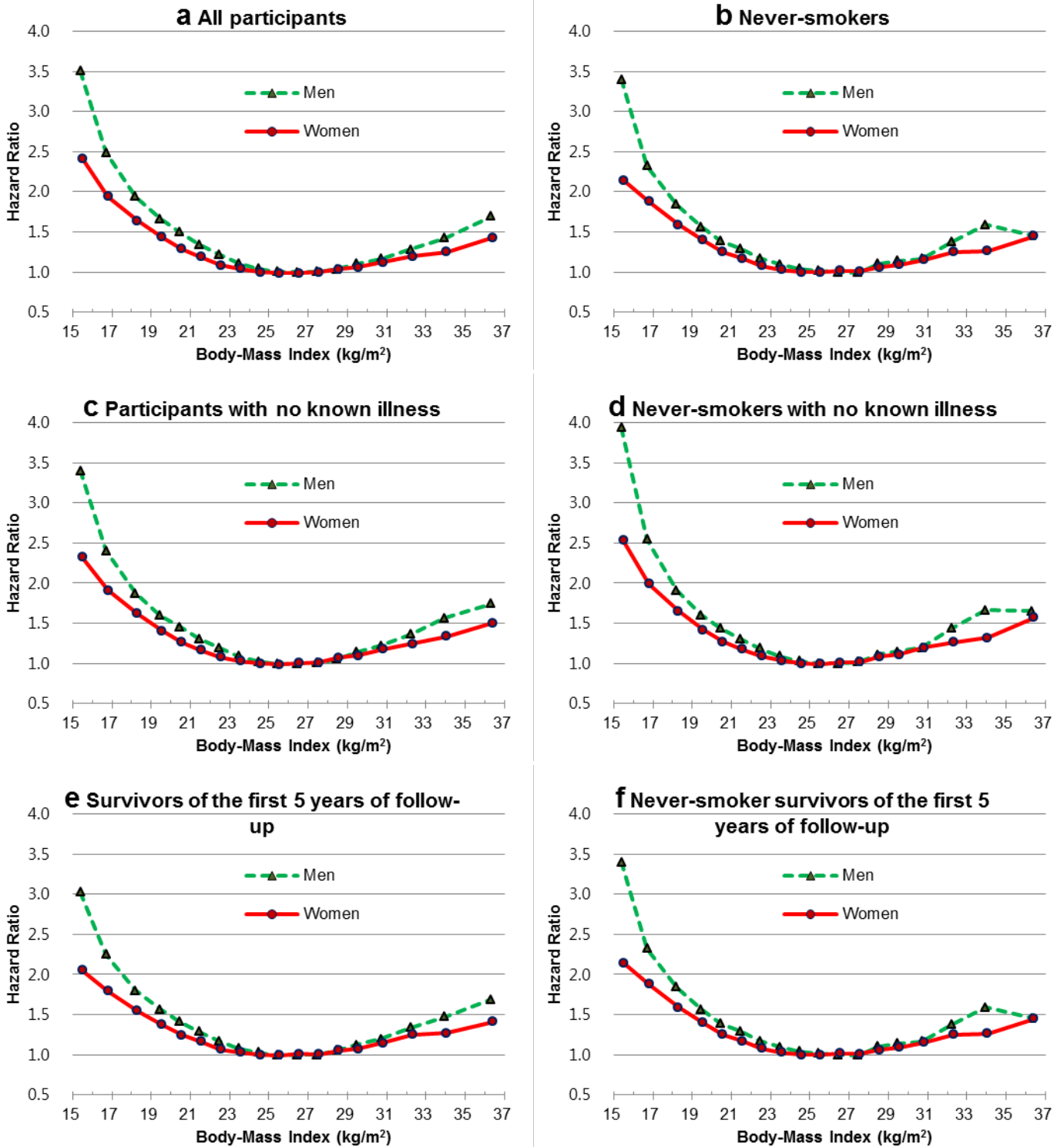
Table S7		All participants (n=12,832,637)				Never-smokers (n=7,436,748)			
Sex-age group	BMI <sup>b</sup> at baseline	Follow-up person-years	No. of deaths	p- value	HR (95% CI)	Follow-up person-years	No. of deaths	p- value	HR (95% CI)
Men at 75-99 years	30.0-50.0	56,406	1,646	<0.001	0.90 (0.85, 0.94)	33,718	854	<0.001	0.87 (0.81, 0.93)
	<18.5	71,468	9,911	<0.001	1.53 (1.5, 1.57)	32,807	4,531	<0.001	1.63 (1.58, 1.69)
	18.5-24.9	575,369	51,957		1.00 (Reference)	314,825	27,003		1.00 (Reference)
	25.0-29.9	146,602	10,665	<0.001	0.81 (0.79, 0.83)	92,189	6,349	<0.001	0.80 (0.77, 0.82)
Women at all ages	30.0-50.0	7,240	542	<0.001	0.83 (0.76, 0.9)	4,577	324	<0.001	0.80 (0.72, 0.89)
	<18.5	3,807,064	16,948	<0.001	1.63 (1.6, 1.65)	3,248,502	12,970	<0.001	1.68 (1.65, 1.71)
	18.5-24.9	39,394,942	146,530		1.00 (Reference)	34,837,155	122,920		1.00 (Reference)
	25.0-29.9	13,226,415	67,846	<0.001	0.88 (0.87, 0.89)	11,833,514	58,844	<0.001	0.88 (0.87, 0.89)
Women at 18-34 years	30.0-50.0	1,667,306	9,884	0.002	1.03 (1.01, 1.05)	1,473,864	8,579	0.002	1.04 (1.01, 1.06)
	<18.5	2,674,501	774	0.461	1.03 (0.95, 1.11)	2,269,241	626	0.433	1.04 (0.95, 1.13)
	18.5-24.9	11,596,860	3,355		1.00 (Reference)	9,911,540	2,728		1.00 (Reference)
	25.0-29.9	1,014,137	392	<0.001	1.29 (1.16, 1.43)	852,629	324	<0.001	1.35 (1.2, 1.51)
Women at 35-44 years	30.0-50.0	169,317	74	0.002	1.45 (1.15, 1.83)	136,592	60	<0.001	1.59 (1.23, 2.05)
	<18.5	471,449	487	<0.001	1.42 (1.3, 1.56)	421,575	401	<0.001	1.39 (1.26, 1.54)
	18.5-24.9	9,721,002	7,437		1.00 (Reference)	8,781,740	6,399		1.00 (Reference)
	25.0-29.9	2,415,060	2,275	<0.001	1.16 (1.11, 1.22)	2,171,806	1,962	<0.001	1.17 (1.11, 1.23)
Women at 45-54 years	30.0-50.0	290,586	368	<0.001	1.50 (1.35, 1.66)	258,018	320	<0.001	1.55 (1.39, 1.74)
	<18.5	218,040	624	<0.001	1.89 (1.75, 2.05)	192,036	528	<0.001	1.93 (1.76, 2.1)
	18.5-24.9	8,776,013	13,225		1.00 (Reference)	7,877,415	11,382		1.00 (Reference)
	25.0-29.9	4,051,084	6,689	0.133	1.02 (0.99, 1.05)	3,636,571	5,837	0.035	1.03 (1, 1.07)
Women at 55-64 years	30.0-50.0	492,779	1,098	<0.001	1.31 (1.23, 1.39)	436,925	947	<0.001	1.34 (1.25, 1.43)
	<18.5	170,137	1,681	<0.001	1.98 (1.88, 2.08)	147,825	1,346	<0.001	1.97 (1.87, 2.08)
	18.5-24.9	5,462,901	25,462		1.00 (Reference)	4,921,892	22,037		1.00 (Reference)
	25.0-29.9	3,602,137	16,133	<0.001	0.92 (0.9, 0.94)	3,255,899	14,215	<0.001	0.93 (0.91, 0.95)
Women at 65-74 years	30.0-50.0	450,261	2,712	<0.001	1.18 (1.14, 1.23)	405,503	2,364	<0.001	1.19 (1.14, 1.24)
	<18.5	183,582	5,479	<0.001	1.62 (1.58, 1.67)	148,986	4,093	<0.001	1.65 (1.6, 1.71)
	18.5-24.9	3,078,560	52,107		1.00 (Reference)	2,704,128	43,482		1.00 (Reference)
	25.0-29.9	1,836,641	27,175	<0.001	0.89 (0.88, 0.9)	1,646,834	23,532	<0.001	0.89 (0.88, 0.9)
Women at 75-99 years	30.0-50.0	230,238	3,856	0.731	1.01 (0.97, 1.04)	206,809	3,359	0.761	1.01 (0.97, 1.04)
	<18.5	89,355	7,903	<0.001	1.41 (1.38, 1.45)	68,838	5,976	<0.001	1.45 (1.41, 1.49)
	18.5-24.9	759,606	44,944		1.00 (Reference)	640,440	36,892		1.00 (Reference)
	25.0-29.9	307,357	15,182	<0.001	0.87 (0.85, 0.89)	269,775	12,974	<0.001	0.86 (0.85, 0.88)
	30.0-50.0	34,125	1,776	<0.001	0.92 (0.87, 0.96)	30,017	1,529	0.001	0.92 (0.87, 0.97)

BMI, body mass index; CI, confidence interval; HR, hazard ratio.

<sup>a</sup> Hazard ratios were calculated using Cox proportional hazards models after adjustment for age at enrollment (continuous variable), sex (men, and women; only in the analysis for both sexes combined) smoking status (current smoker, former smoker, never-smoker, and those with missing smoking status; only in the analysis for all participants), and known pre-existing illness either cured or not (yes, and no including those with missing information).

<sup>b</sup> 4 categories. Analysis was done for comparison with other research using current standard cut-off points.

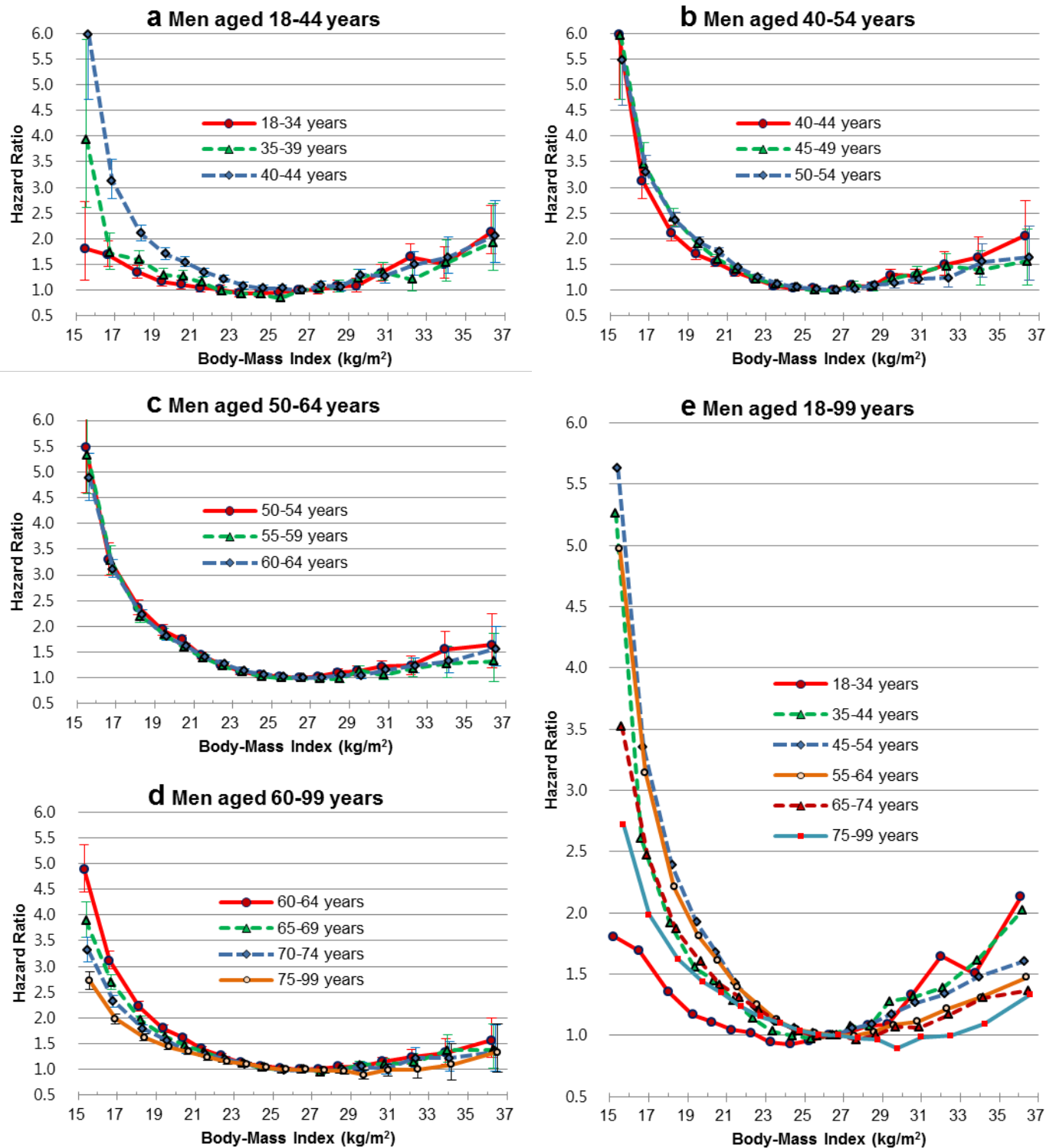
<sup>c</sup> Age groups at all ages, 18-34 years, 35-44 years, 45-54 years, 55-64 years, 65-74 years, and 75-99 years.



**Figure S1. Hazard ratios of risk of death associated with body-mass index according to subgroup in all participants and never-smokers.**

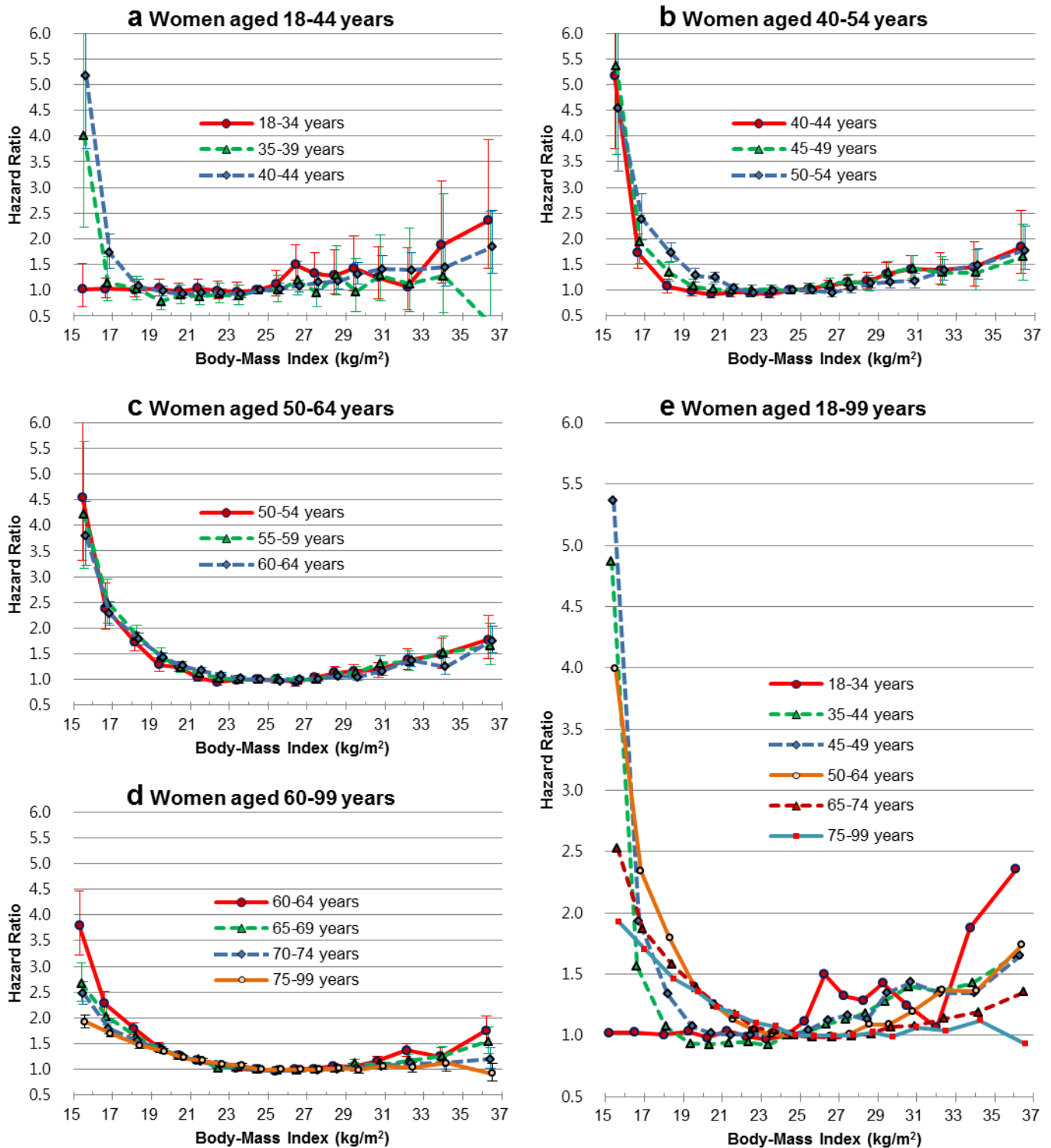
Hazard ratios were calculated using Cox proportional hazard models. 18 categories of body-mass index (reference: 26.0-26.9 for men and 24.0-24.9 for women) were used. The midpoint was used as a representative value for each body-mass index category, except for both ends (15.5 and 36.4), for which the median of all participants was used. The analyses were adjusted for age, smoking status (except non-smokers), and known pre-existing illness (except people with no known previous illness).





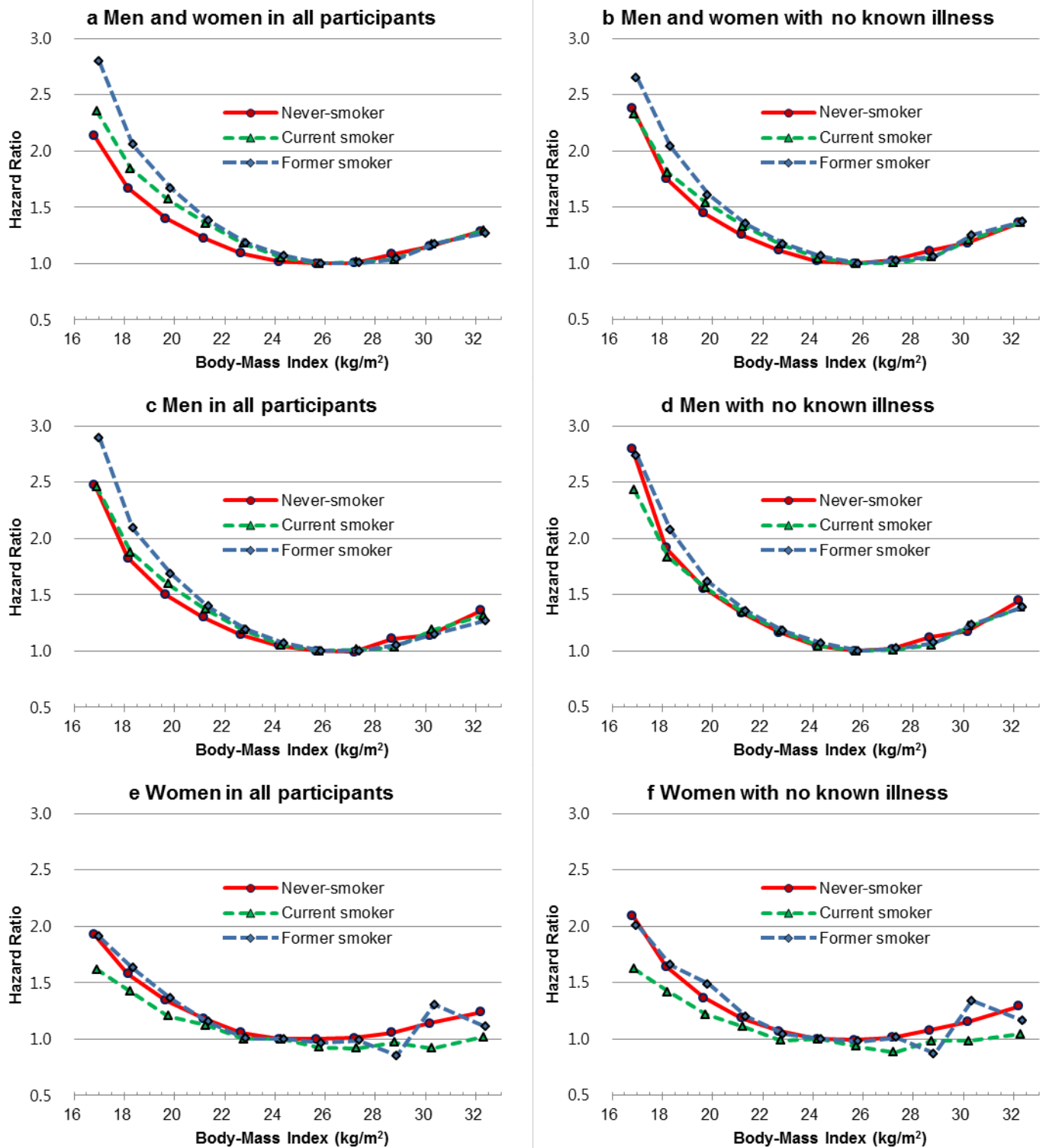
**Figure S2. Age-specific hazard ratios of risk of death associated with body-mass index in men.**

Hazard ratios and 95% confidence intervals were calculated using Cox proportional hazard models. 18 categories of body-mass index (reference: 26.0-26.9) were used. The midpoint was used as a representative value of each body-mass index category, except for both ends (15.5 and 36.4), for which the median of all participants was used. The analyses were adjusted for age, smoking status, and known pre-existing illness.



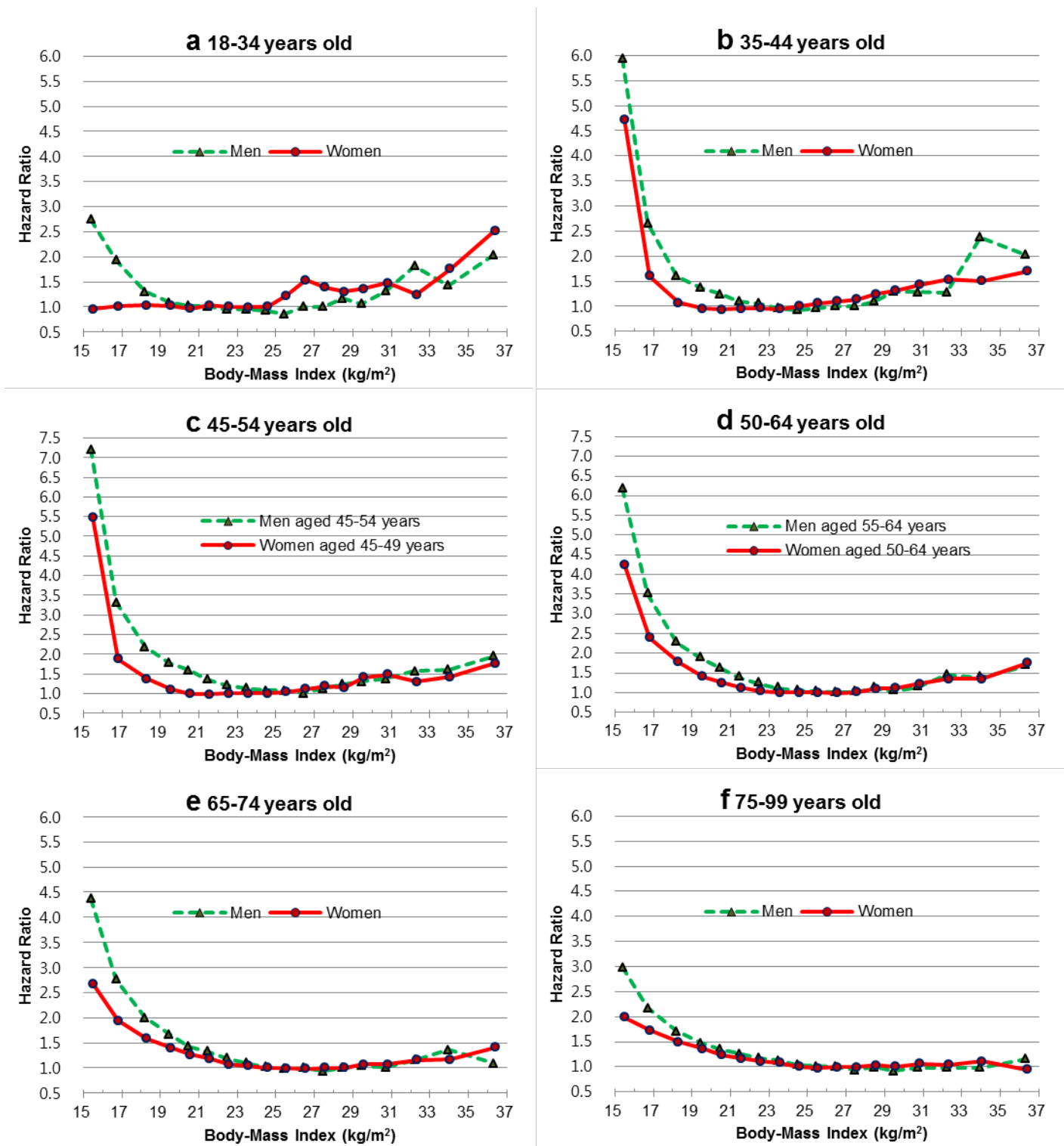
**Figure S3. Age-specific hazard ratios of risk of death associated with body-mass index in women.**

Hazard ratios and 95% confidence intervals were calculated using Cox proportional hazard models. 18 categories of body-mass index (reference: 24.0-24.9) were used. The midpoint was used as a representative value of each body-mass index category, except for both ends (15.5 and 36.4), for which the median of all participants was used. The analyses were adjusted for age, smoking status, and known pre-existing illness.



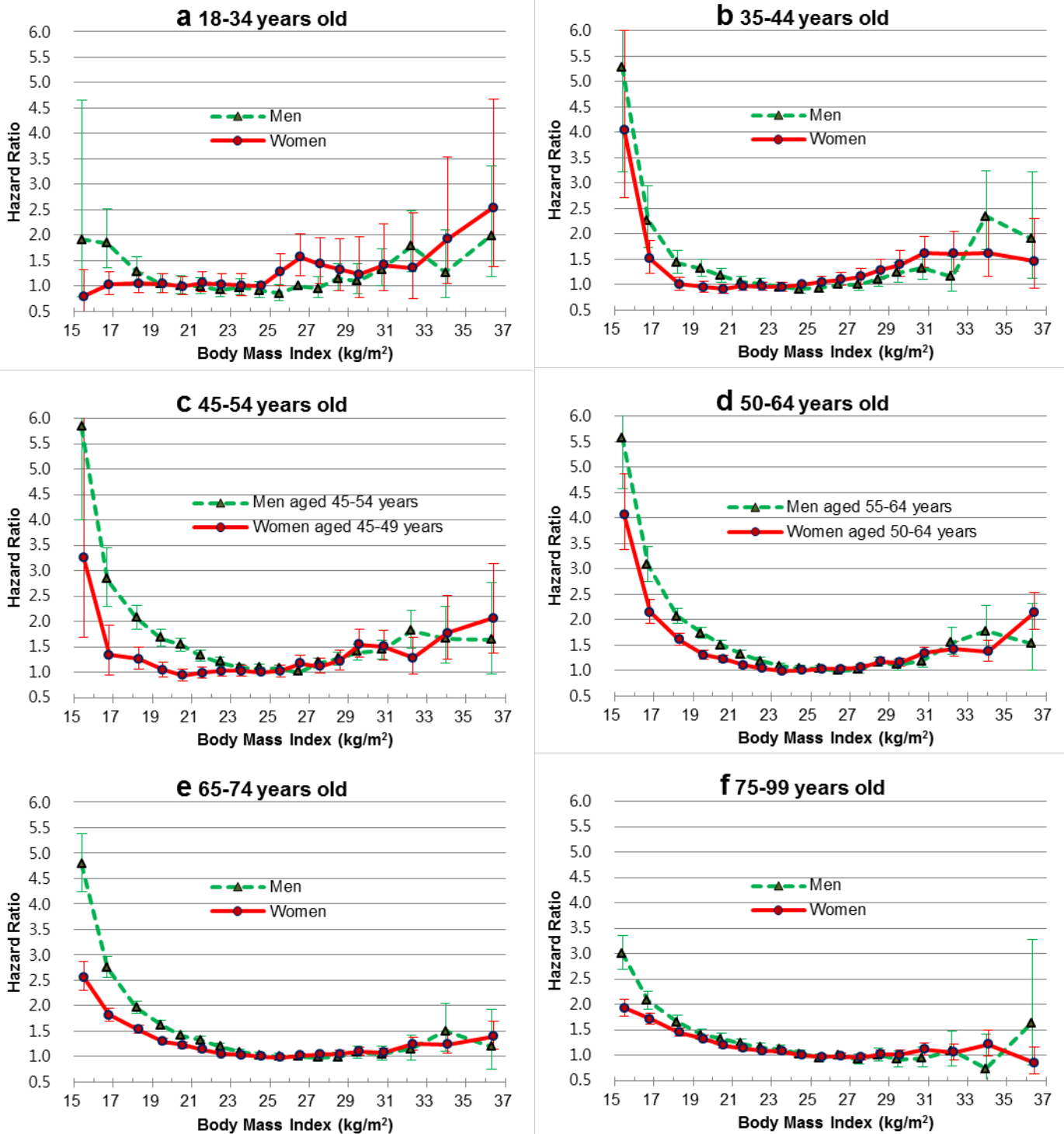
**Figure S4. Hazard ratios of risk of death associated with body-mass index according to smoking status and sex in all participants and those with no known illness.**

Hazard ratios were calculated using Cox proportional hazard models. 11 categories of body-mass index were used (reference: 25.0-26.5 for men and two sexes combined and 23.5-25.0 for women). The midpoint was used as a representative value of each body-mass index category, except for both ends (16.9 and 32.3), for which the median of all participants was used. The analyses were adjusted for age, sex (men, and women; only in the analysis for both sexes combined), and known pre-existing illness (only for all participants).



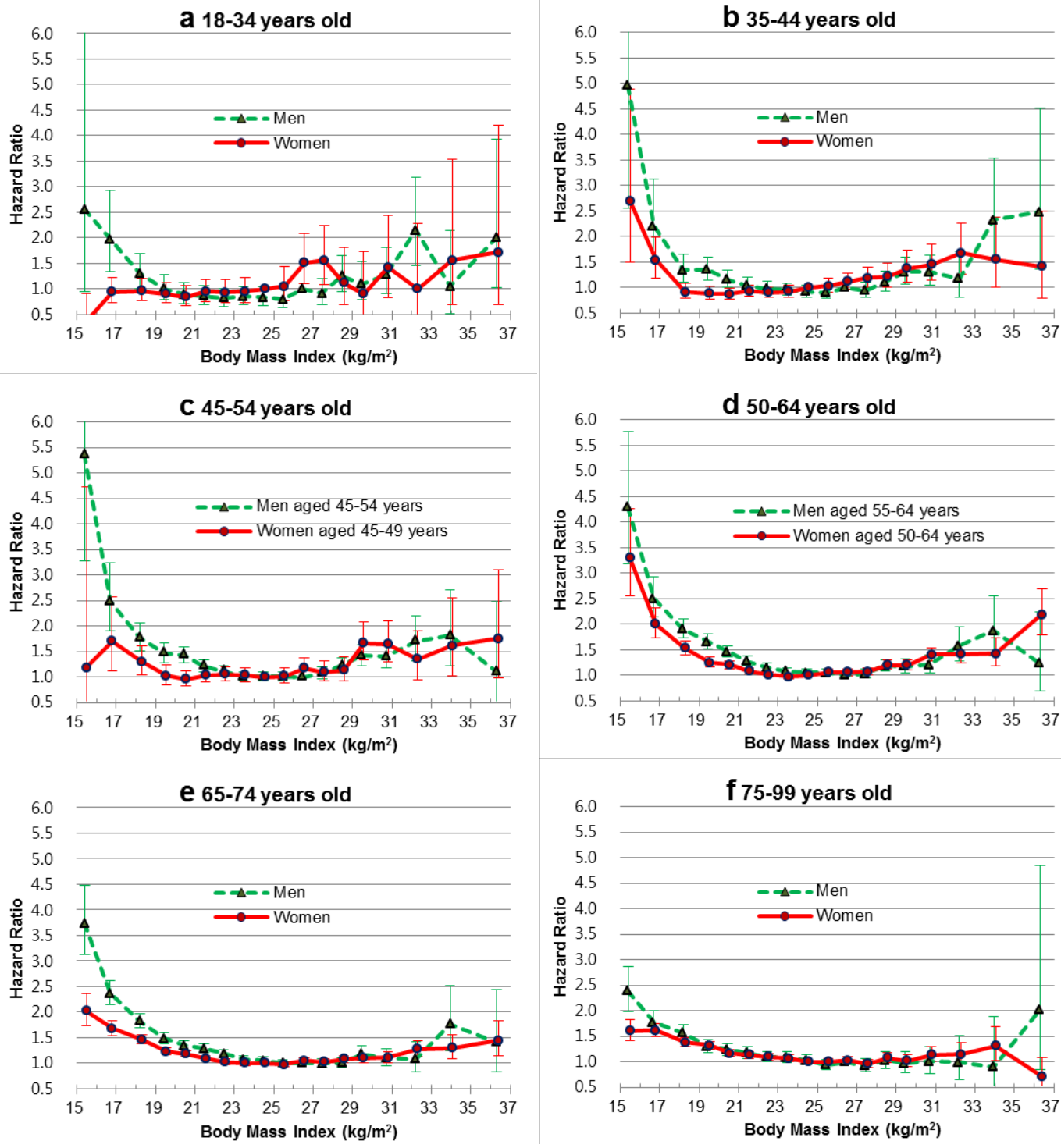
**Figure S5. Sex-age-specific hazard ratios of risk of death associated with body-mass index in never-smokers.**

Hazard ratios were calculated using Cox proportional hazard models. 18 categories of body-mass index (reference: 26.0-26.9 for men and 24.0-24.9 for women) were used. The midpoint was used as a representative value of each body-mass index category, except for both ends (15.5 and 36.4), for which the median of all participants was used. The analyses were adjusted for age and known pre-existing illness.



**Figure S6. Sex-age-specific hazard ratios of risk of death associated with body-mass index in never-smokers with no known illness.**

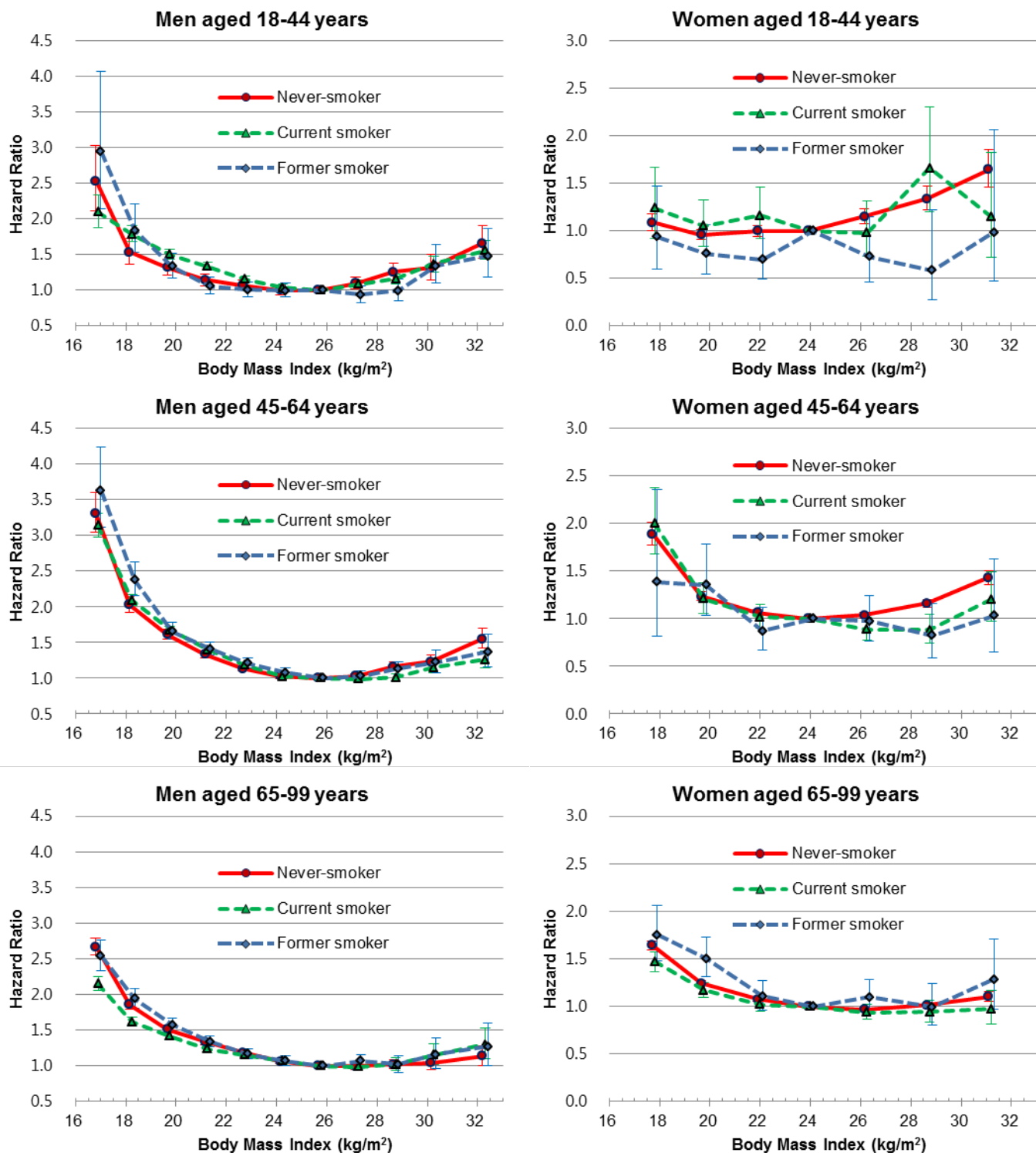
Hazard ratios were calculated using Cox proportional hazard models. 18 categories of body-mass index (reference: 26.0-26.9 for men and 24.0-24.9 for women) were used. The midpoint was used as a representative value of each body-mass index category, except for both ends (15.5 and 36.4), for which the median of all participants was used. The analyses were adjusted for age.



**Figure S7. Sex-age-specific hazard ratios of risk of death associated with body-mass index in never-smokers with no known illness who survived 5 years after enrollment.**

Hazard ratios were calculated using Cox proportional hazard models. 18 categories of body-mass index (reference: 26.0-26.9 for men and 24.0-24.9 for women) were used. The midpoint was used as a representative value of each body-mass index category, except for both ends (15.5 and 36.4), for which the median of all participants was used. The analyses were adjusted for age.





**Figure S8. Age-specific hazard ratios of risk of death associated with body-mass index in participants with no known illness according to sex and smoking status.**

Hazard ratios were calculated using Cox proportional hazard models. 11 categories of body-mass index for men (reference: 25.0-26.4) and 7 categories for women (reference: 23.0-24.9) were used. The midpoint was used as a representative value of each body-mass index category, except for both ends (16.9 and 32.3 for men [due to 11 groups]; 17.8 and 31.2 for women [7 groups]), for which the median of all participants was used. The analyses were adjusted for age.