

# Blood pressure, diabetes, body-mass index, and cardiovascular mortality in Cuba: prospective study of 146 556 adults

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**ESTUDIO CUBANO SOBRE TABACO Y SALUD**

Provincia No.  1-9 Municipio No.   0-99 Area de  0-9 Salud No.

**17524 A**

Carnet de  -   
 Identidad No. Fecha de nacimiento (a.m.d) + 5 números  
 (11 números: excluir si no tiene C.I. de 6 + 5 números)

Nombre de la persona y dirección:   
 Calle No. Teléfono

Nombre del familiar y dirección:   
 Calle No. Municipio Provincia Teléfono

**LETRA DE MOLDE,  
 POR FAVOR**

Sexo (1 = masc, 2 = fem.)  1-2  
 Color de piel (1 = blanco, 2 = negro, 3 = mestizo, 4 = otra)  1-4  
 Estado social (1 = soltero/viudo, 2 = casado)  1-2  
 Educación completada (0 = ninguno\*, 1 = primaria, 2 = secundaria, 3 = técnico medio, 4 = obrero calificado, 5 = pre-universitario, 6 = universitario)  0-6  
 Categoría ocupacional (0 = ninguno\*, 1 = dirigente, 2 = profesional, 3 = técnico, 4 = de servicio, 5 = agrícola, 6 = industria, 7 = militar)  0-7  
 \* Si es cero (Ej. ama de casa, jubilado o desempleado), diga si ha trabajado alguna vez.  0-7

Quisiera medir su presión arterial mientras esta sentado, hacerle unas pocas preguntas sobre tabaco y alcohol, y medir su PA de nuevo.  
 Presión arterial (una sola toma, sentado):  /  PAS / PAD

Ahora, TABACO: ¿Ha fumado alguna vez regularmente (Ej. en la mayoría de los días)?  S=Sí, N=No  
 SI NO, vaya directamente a las preguntas sobre ALCOHOL.

¿A QUE EDAD APROXIMADAMENTE COMENZO USTED A FUMAR REGULARMENTE?  años de edad  
 ¿Desde entonces ha dejado de fumar alguna vez por un año o más?  S=Sí, N=No  
 ¿Aproximadamente cuántos cigarrillos por día se fumó usted el último mes? (0 = ninguno)  diariamente  
 ¿Aproximadamente cuántos tabacos por día se fumó usted el último mes? (0 = ninguno)  diariamente  
 ¿Si no fumó el último mes, a que edad dejó usted de fumar? (en blanco si no es aplicable)  años de edad

Ahora me gustaría hacerle algunas preguntas sobre ALCOHOL:

¿Aproximadamente cuántos días a la semana toma usted ron u otra bebida fuerte?  0-7  
 (0 = cero días o usualmente menos de una vez por semana)  
 ¿El día que usted toma ron (u otra bebida fuerte) cuántas líneas se toma?  líneas  
 ¿Aproximadamente cuántos días a la semana toma usted cerveza?  0-7  
 (0 = cero días o usualmente menos de una vez por semana)  
 ¿El día que usted toma cerveza, cuántas botellas se toma (aprox.)  botellas

Finalmente, algunos aspectos médicos: Quisiera preguntarle sobre algunas enfermedades. Lo que quiero conocer es si usted alguna vez ha sido tratado por alguna de estas enfermedades. Si no lo ha sido, conteste No (N).

Asma	<input type="checkbox"/> S/N	A.V.E. (definitivo/probable)	<input type="checkbox"/> S/N	Cirrosis	<input type="checkbox"/> S/N
Enfisema (E.P.O.C.)	<input type="checkbox"/> S/N	Infarto miocardio	<input type="checkbox"/> S/N	Enf. renal crónica	<input type="checkbox"/> S/N
Diabetes	<input type="checkbox"/> S/N	Angina pectoris	<input type="checkbox"/> S/N	Cáncer de piel	<input type="checkbox"/> S/N
Úlcera péptica	<input type="checkbox"/> S/N	Hipertensión arterial	<input type="checkbox"/> S/N	Otro cáncer*	<input type="checkbox"/> S/N

\*Si Otro Cáncer = Sí, dónde le comenzó el cáncer?  0-9

(1 = boca o faringe, 2 = laringe, 3 = pulmón, 4 = esófago, 5 = estómago, 6 = páncreas, 7 = cuello útero, 8 = vejiga, 9 = mama, 0 = otro, más de un sitio, o no conocido)

¿Esta usted tomando alguna medicina regularmente desde hace más de un mes? Si es Sí: ¿Qué medicinas esta tomando? (Marque con X)

Digoxina	<input type="checkbox"/>	Nitratos	<input type="checkbox"/>	Hipoglic. oral	<input type="checkbox"/>	Anticoncept.	<input type="checkbox"/>	Ca. Antag.	<input type="checkbox"/>
Beta B.	<input type="checkbox"/>	Inh. ACE	<input type="checkbox"/>	Insulina	<input type="checkbox"/>	Antidepres.	<input type="checkbox"/>	Broncodilat.	<input type="checkbox"/>
Diurético	<input type="checkbox"/>	ASA	<input type="checkbox"/>	Esteroides	<input type="checkbox"/>	Ansiolítico	<input type="checkbox"/>	Antiácido/H2	<input type="checkbox"/>

MUCHAS GRACIAS POR SUS RESPUESTAS: Ahora necesito tomarle de nuevo su presión arterial. Repita la toma de PA (una sola toma sentado):  /  PAS/PAD

¿Cuál es la última cifra PA que tiene en su historia clínica antes de hoy?  /  PAS/PAD  
 Fecha de la última PA (a.m.d)  &  /  PAS/PAD

**Por favor chequee TODA la encuesta  
 ¡MUCHAS GRACIAS!**

¿Cuál es su TALLA aproximada? (medirlo o preguntarlo)  cm  
 ¿Cuál es su PESO aproximado? (pesarlo o preguntarlo)  kg

Fecha de la entrevista  (a.m.d)

Calidad de la cooperación (1 = pobre, 2 = regular, 3 = buena)  1-3

Nombre y apellidos del entrevistador:

¿Algún comentario? .....



**Table S1. Mortality endpoints and ICD codes**

<b>Endpoint name</b>	<b>ICD-9 codes</b>	<b>ICD-10 codes</b>
Ischaemic heart disease	410-414	I20-I25
Stroke	430-431, 433-434, 436	I60-I61, I63-I64
Other vascular	390-409, 415-429, 432, 435, 437-459, 798	I00-I19, I26-I59, I62, I65-I99, R96
Rheumatic heart disease	390-398	I00-I09
Hypertensive disease	401-405	I10-I15
Pulmonary embolism	415, 450	I26
Inflammatory heart disease	420-424	I30-I33, I38-I43
Cardiac arrhythmia	426-427	I44-I45, I47-I49
Heart failure	428	I50
Other cerebrovascular (not stroke)	432, 435, 437-438	I62, I65-I69
Atherosclerosis	440, 442-448	I70, I72-I79
Aortic aneurysm	441	I71
Other	399-400, 406-409, 416-419, 425, 429, 439, 449, 451-459, 798	I16-I19, I27-I29, I34-I37, I46, I51-I59, I80-I99, R96
All vascular causes	390-459, 798	I00-I99, R96

**Table S2. Number of participants excluded from mortality analyses, by sex**

	Men	Women	All
<b>Number of participants recruited</b>	64 743	81 813	146 556
<b>Reason for exclusion:</b>			
<b>Prior vascular disease*</b>	4331	5722	10 053
<b>Systolic blood pressure</b>			
Missing	122	170	292
<80 mm Hg	12	49	61
≥250 mmHg	2	4	6
<b>Diastolic blood pressure</b>			
Missing	167	227	394
<40 mm Hg	3	8	11
≥150 mmHg	3	7	10
<b>BMI</b>			
Missing	619	2178	2797
<15 kg/m <sup>2</sup>	217	431	648
≥40 kg/m <sup>2</sup>	275	624	899
<b>Diabetic status</b>			
Missing	0	0	0
<b>Missing values in covariates</b>			
Age at baseline	0	0	0
Sex	0	0	0
Province	0	0	0
Level of education	61	103	164
Smoking status	0	0	0
Alcohol status	0	0	0
<b>No follow-up at ages 35-79 years</b>			
Age 80 years or over at baseline	3333	4156	7489
Lost to follow-up at baseline†	116	116	232
<b>Total participants excluded</b>	8346	12 271	20 617
<b>Total participants in main analyses</b>	<b>56 397</b>	<b>69 542</b>	<b>125 939</b>

\*At baseline screening, history of any of myocardial infarction, angina, stroke, chronic obstructive pulmonary disease, cirrhosis of the liver, chronic kidney disease, any cancer (including skin), peptic ulcer.

†Uncertainty with identification number given at baseline, which was required to identify death.

**Table S3. Blood pressure, diabetes, and BMI at baseline, by age and sex**

<b>Age at baseline, years</b>	<b>Mean age, years</b>	<b>Mean SBP, mmHg</b>	<b>Mean DBP, mmHg</b>	<b>Diabetes prevalence, %</b>	<b>Mean BMI, kg/m<sup>2</sup></b>
<b>Men</b>					
35-39	37	122	79	1.6	23.9
40-44	43	123	80	1.9	23.9
45-49	47	124	81	2.5	24.1
50-54	52	125	81	3.4	24.2
55-59	57	126	82	4.2	24.2
60-64	62	127	82	5.3	24.1
65-69	67	128	81	6.5	23.9
70-74	72	128	81	6.7	23.8
75-79	77	128	81	7.3	23.6
<b>Women</b>					
35-39	37	117	76	2.1	23.9
40-44	43	119	77	3.0	24.1
45-49	47	122	79	4.0	24.3
50-54	52	124	80	6.0	24.6
55-59	57	127	81	8.1	24.7
60-64	62	128	82	10.6	24.7
65-69	67	130	82	13.0	24.5
70-74	72	130	81	13.1	24.2
75-79	77	130	81	13.6	23.9

SBP=systolic blood pressure; DBP=diastolic blood pressure. Exclusions as in Table 1.

**Table S4. Baseline characteristics, by BMI (7 categories)**

	Baseline BMI, kg/m <sup>2</sup>							Overall
	15-<20	20-<22.5	22.5-<25	25-<27.5	27.5-<30	30-<35	35-<40	
Number of participants	11 846	29 537	40 959	24 123	11 375	6747	1352	125 939
Female	61%	54%	51%	54%	59%	67%	74%	55%
Age, years	53 (13)	52 (12)	52 (12)	52 (12)	53 (12)	54 (12)	54 (11)	53 (12)
BMI, kg/m <sup>2</sup>	18.6 (1.2)	21.4 (0.7)	23.7 (0.7)	26.1 (0.7)	28.5 (0.7)	31.8 (1.3)	36.9 (1.4)	24.2 (3.6)
Height, cm	166 (9)	165 (9)	164 (9)	164 (9)	163 (10)	160 (10)	154 (12)	164 (9)
SBP, mmHg	121 (15)	122 (14)	124 (14)	126 (15)	128 (17)	129 (18)	131 (18)	124 (15)
Diabetes	4%	4%	5%	6%	7%	8%	10%	5%
No formal education beyond primary school	36%	34%	31%	31%	32%	34%	32%	33%
Current smoker (in men)	55%	50%	46%	42%	38%	34%	31%	46%
Current smoker (in women)	37%	30%	26%	24%	22%	22%	22%	27%
Alcohol intake at least weekly	16%	16%	16%	16%	15%	15%	13%	16%
Taking anti-hypertensives	11%	12%	15%	19%	22%	26%	29%	16%

Data are n (%) or mean (SD). Results are standardised to the age and sex of the 125 939 participants. Participants with no follow-up at ages 35-79 years, those with pre-existing vascular disease at baseline, and those with incomplete information on SBP, diabetes, BMI or covariates were excluded.

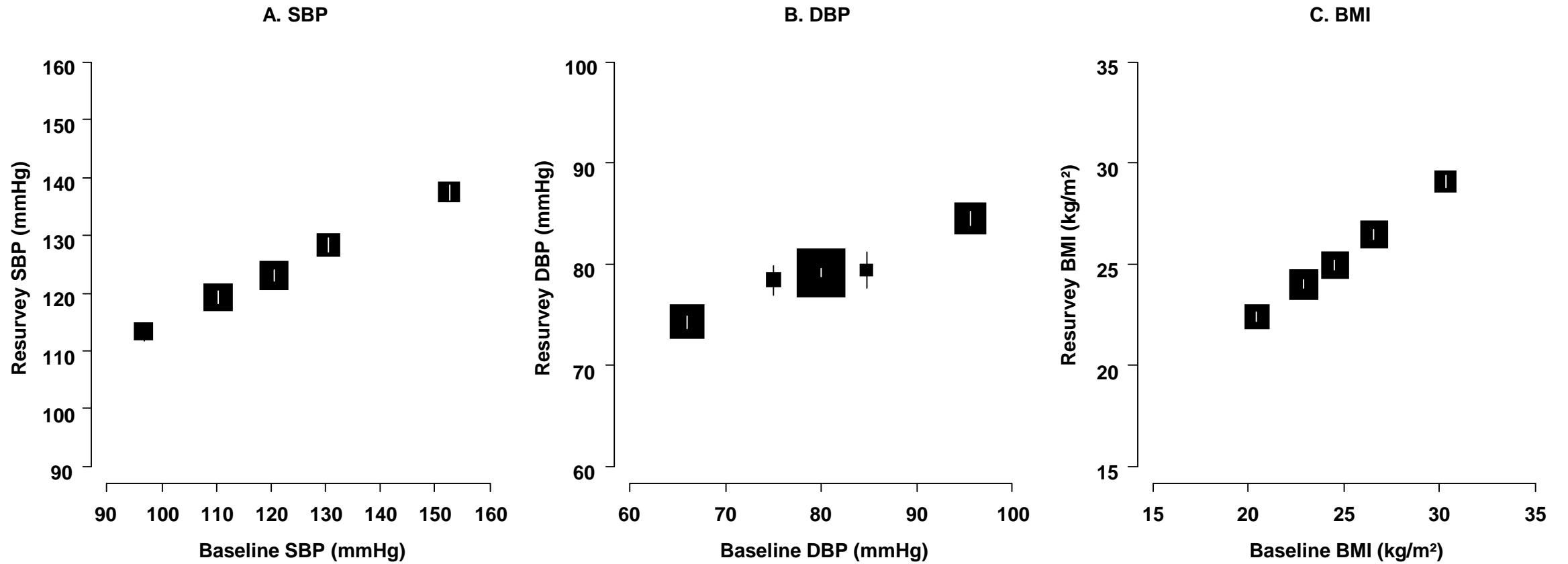
**Table S5. Blood pressure, diabetes and BMI of resurveyed participants, by age at baseline and at resurvey**

A. Baseline blood pressure, diabetes, and BMI, by age at baseline							B. Resurvey blood pressure, diabetes, and BMI, by age at resurvey						
Age at baseline, years	Participants	Mean age, years	Mean SBP, mmHg	Mean DBP, mmHg	Diabetes prevalence, %	Mean BMI, kg/m <sup>2</sup>	Age at resurvey, years	Participants	Mean age, years	Mean SBP, mmHg	Mean DBP, mmHg	Diabetes prevalence, %	Mean BMI, kg/m <sup>2</sup>
40-44	524	42	119	78	2.5	24.7	40-44	477	43	117	77	2.9	25.5
45-49	564	48	122	80	2.3	24.9	45-49	556	47	120	78	3.6	25.5
50-54	573	52	127	82	4.5	25.2	50-54	544	53	124	80	7.9	25.5
55-59	454	58	129	83	6.4	25.2	55-59	569	57	127	81	8.4	25.5
60-64	362	62	130	82	7.2	25.0	60-64	493	62	127	80	14.8	25.8
65-69	228	67	133	84	8.8	25.3	65-69	390	67	131	81	11.8	25.3
70-74	158	72	135	83	8.9	24.8	70-74	264	72	130	80	16.7	25.2
75-79	136	77	135	83	8.8	24.4	75-79	191	77	132	79	13.6	25.0
All	2999	55	126	81	5.1	25.0	All*	3484	55	124	79	8.0	25.5

SBP=systolic blood pressure; DBP=diastolic blood pressure. Analyses at baseline and at resurvey were restricted to participants ages 40-79 as there were few participants aged less than 40 at resurvey. Exclusions as in Table 1. \*Standardised to the baseline age distribution of resurvey participants



**Figure S1. Baseline versus resurvey values of systolic blood pressure (SBP), diastolic blood pressure (DBP), and BMI, in groups defined by baseline quintiles of each measure, among resurveyed participants**



Exclusions as in Table 1.

**Table S6. Estimated long-term average ('usual') values of systolic blood pressure (SBP), diastolic blood pressure (DBP) and BMI**

**A. SBP**

<b>Baseline SBP categories, mmHg</b>	<b>Mean SBP at baseline, mmHg</b>	<b>Estimated usual SBP, mmHg</b>
80-<125	114.9	119.7
125-<145	132.9	128.3
145-<165	153.0	138.0
165-<250	178.3	150.1
All	124.1	124.1

**B. DBP**

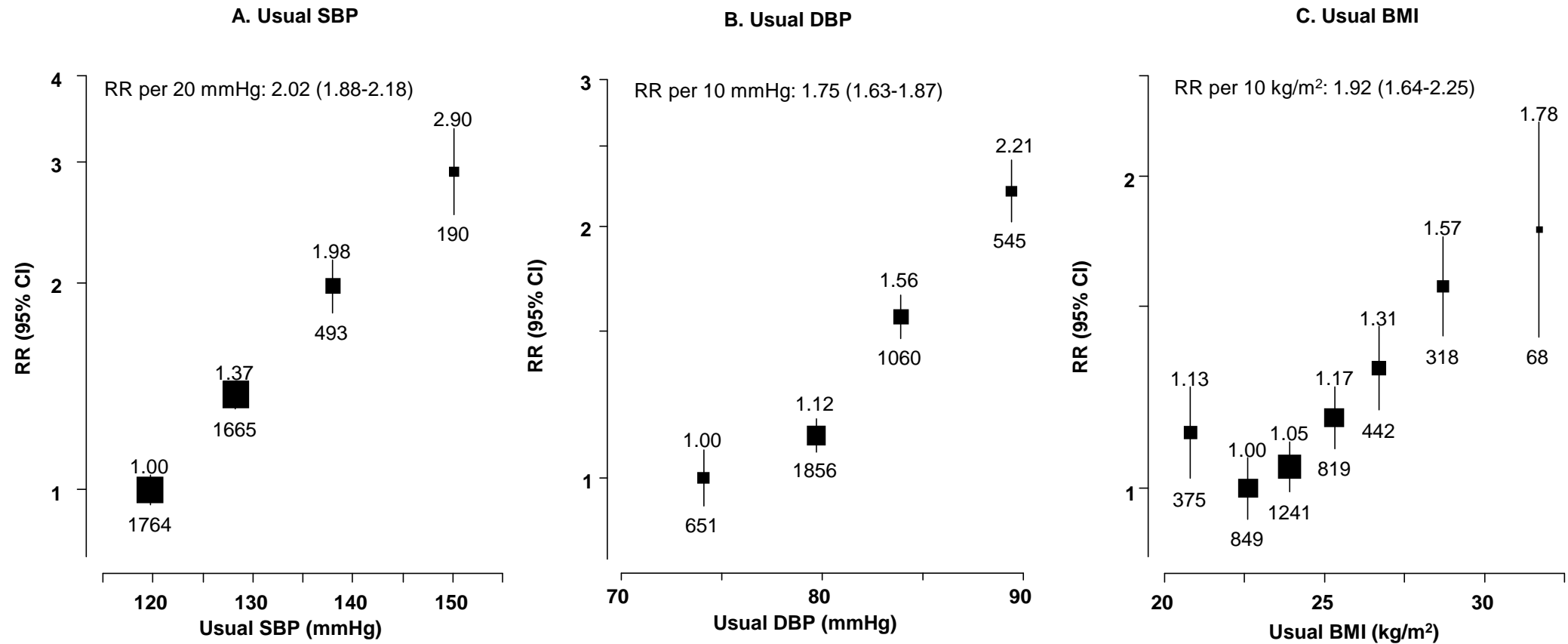
<b>Baseline DBP categories, mmHg</b>	<b>Mean DBP at baseline, mmHg</b>	<b>Estimated usual DBP, mmHg</b>
40-<75	66.9	74.1
75-<85	79.6	79.7
85-<95	88.9	83.9
95-<150	101.5	89.4
All	79.8	79.8

**C. BMI**

<b>Baseline BMI categories, kg/m<sup>2</sup></b>	<b>Mean BMI at baseline, kg/m<sup>2</sup></b>	<b>Estimated usual BMI, kg/m<sup>2</sup></b>
15-<20	18.6	20.8
20-<22.5	21.4	22.6
22.5-<25	23.7	23.9
25-<27.5	26.1	25.3
27.5-<30	28.5	26.7
30-<35	31.8	28.7
35-<40	36.8	31.7
All	24.2	24.2

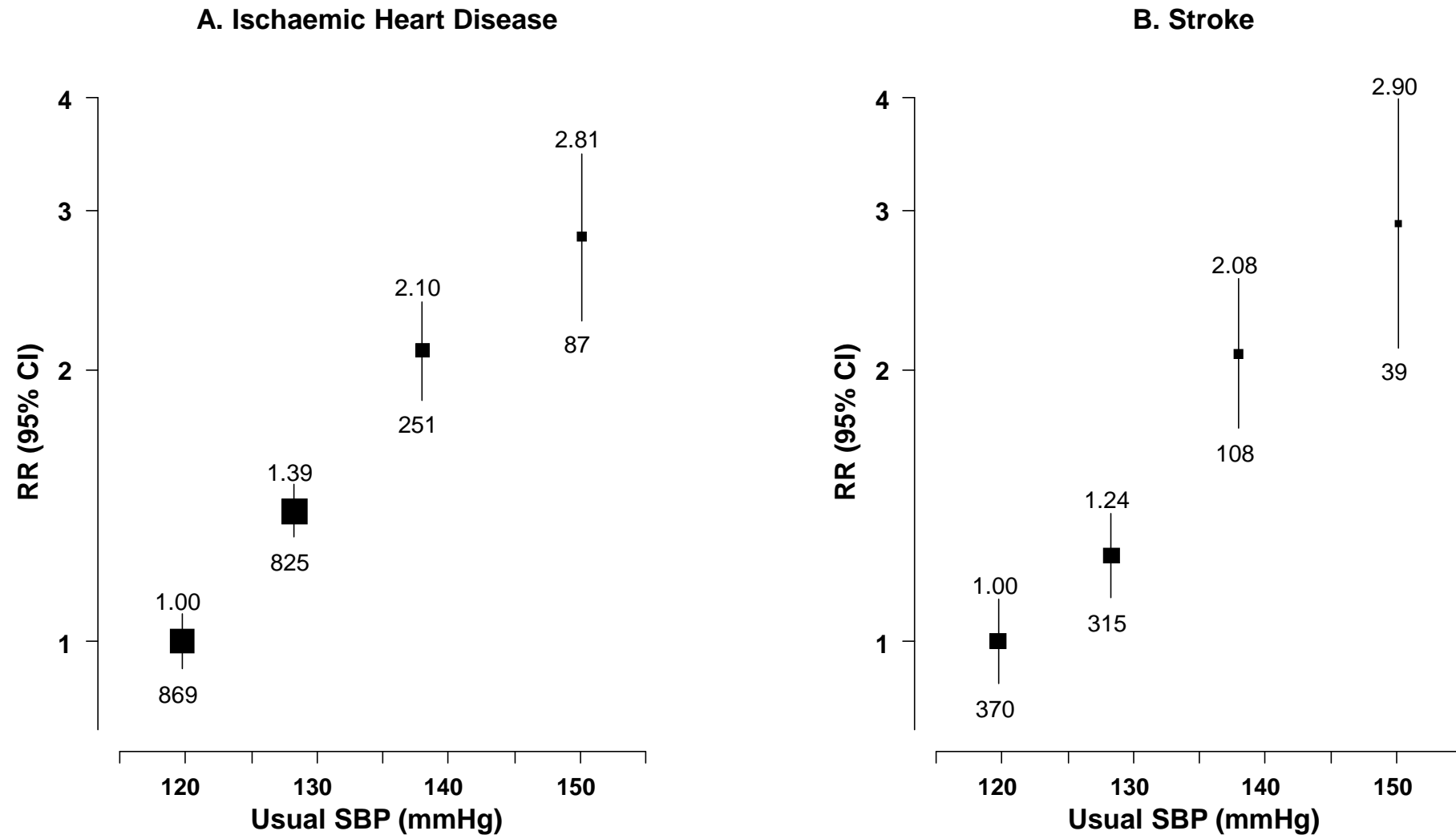
Exclusions as in Table 1. Usual SBP, usual DBP and usual BMI were estimated by correcting mean SBP, mean DBP and mean BMI at baseline using regression dilution ratios of 0.48, 0.44 and 0.59 respectively.

**Figure S2. Vascular mortality vs usual systolic blood pressure (SBP), usual diastolic blood pressure (DBP), and usual BMI at ages 35-79 years in Cuba**



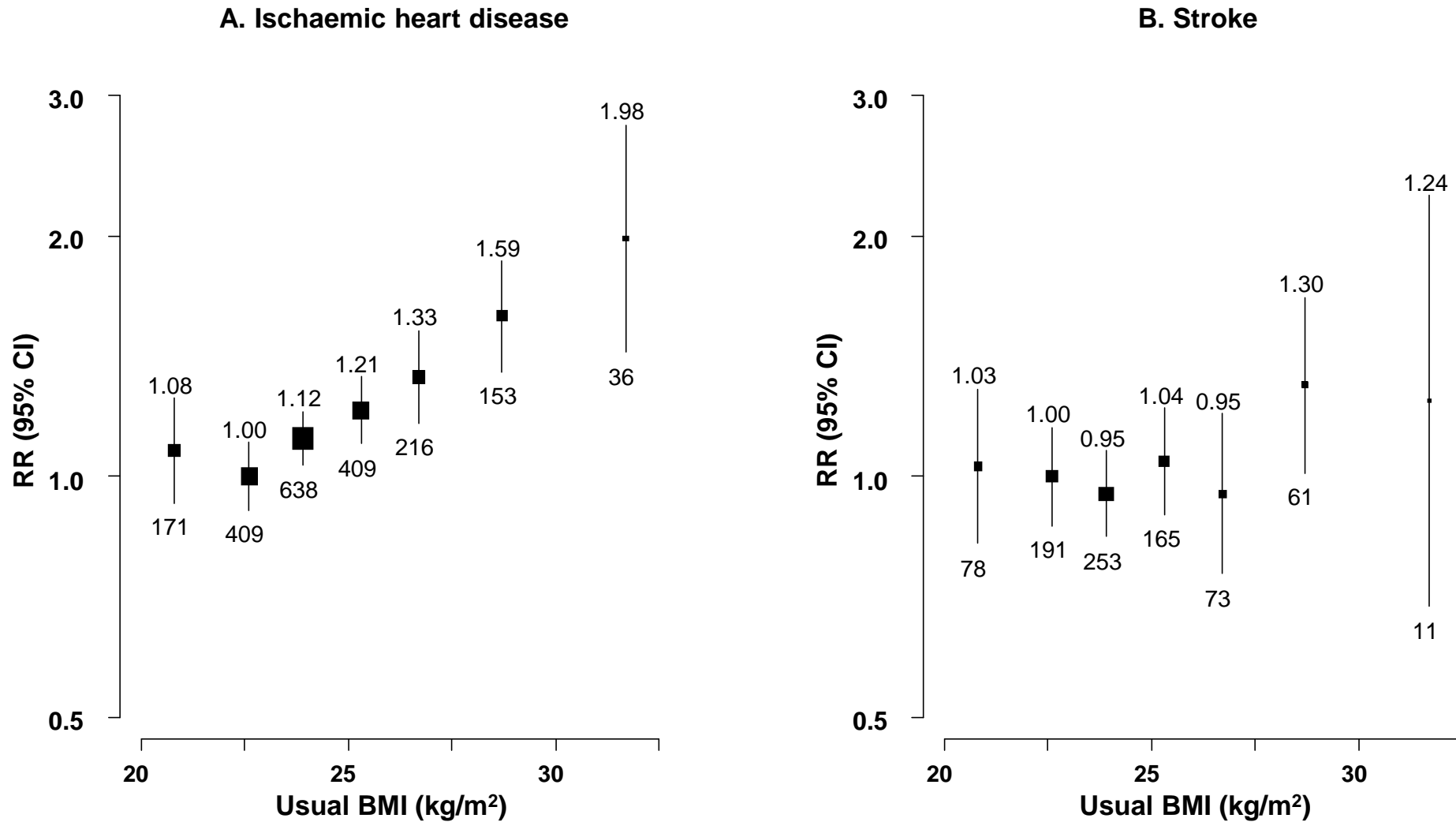
Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI (when appropriate), and omit the first 5 years of follow up. Exclusions as in Table 1. For each category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI).

Figure S3. Ischaemic heart disease and stroke mortality vs usual systolic blood pressure (SBP) at ages 35-79 years in Cuba



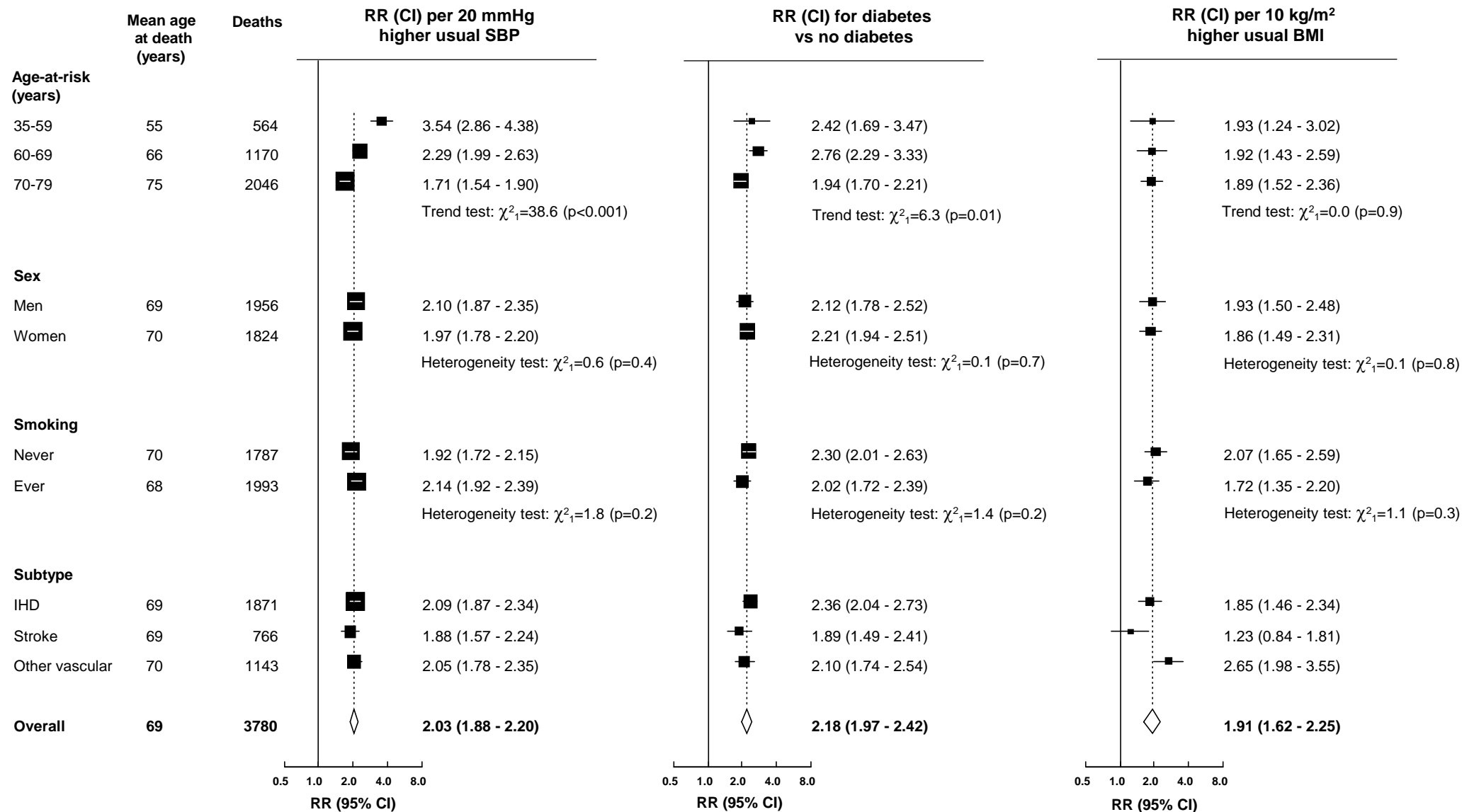
Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI, and omit the first 5 years of follow up. Exclusions as in Table 1. For each SBP category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI).

Figure S4. Ischaemic heart disease and stroke mortality vs usual BMI at ages 35-79 years in Cuba



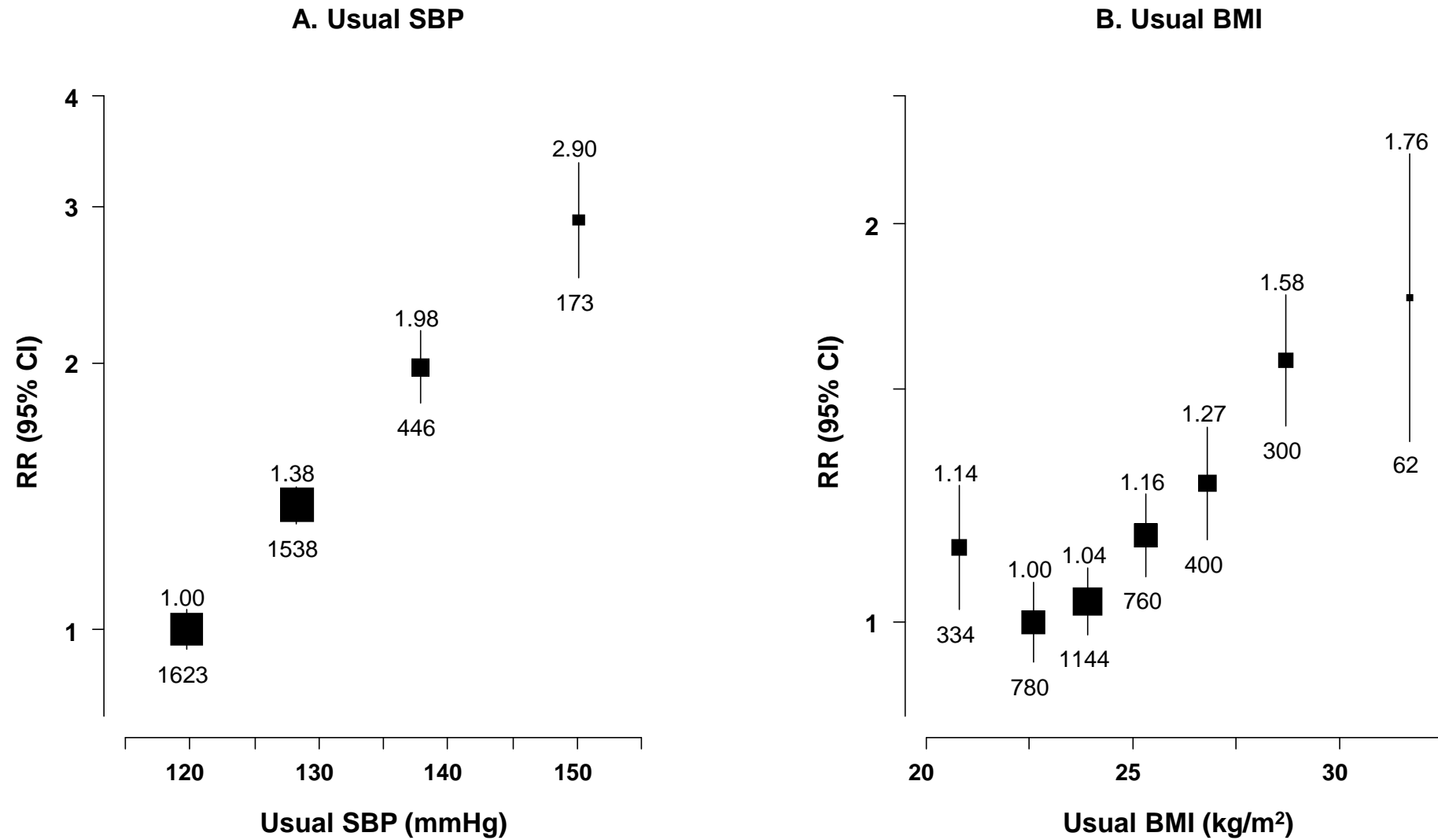
Rate ratios (RR) adjusted for age, sex, education, province, smoking, and alcohol, and omit the first 5 years of follow up. Exclusions as in Table 1. For each BMI category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI).

**Figure S5. Death rate ratios (RR) for vascular mortality vs usual systolic blood pressure (SBP), diabetes, and usual BMI, at ages 35-79 years in Cuba, with further exclusion of those with non-vascular chronic disease at baseline**



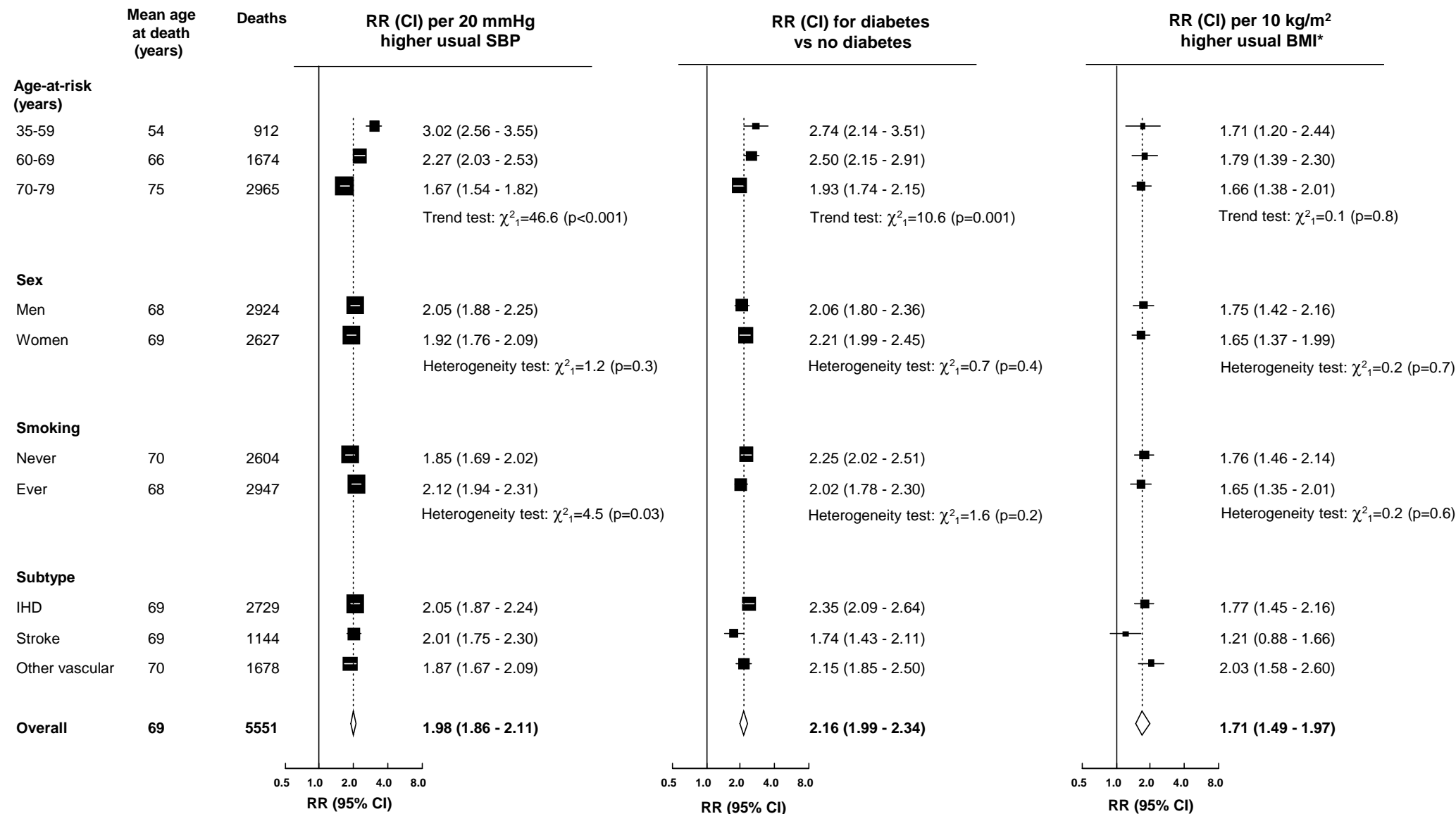
Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI (when appropriate), and omit the first 5 years of follow up. Exclusions as in Table 1 plus prior history of any chronic disease i.e. \*vascular disease, emphysema/COPD, liver cirrhosis, chronic kidney disease, cancer or peptic ulcer. For each category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI). \*Excludes lowest category of BMI.

**Figure S6. Vascular mortality vs usual systolic blood pressure (SBP) and usual BMI, at ages 35-79 years in Cuba, with further exclusion of those with non-vascular chronic disease at baseline**



Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI (when appropriate), and omit the first 5 years of follow up. Exclusions as in Table 1 plus prior history of any chronic disease i.e. \*vascular disease, emphysema/COPD, liver cirrhosis, chronic kidney disease, cancer or peptic ulcer. For each category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI).

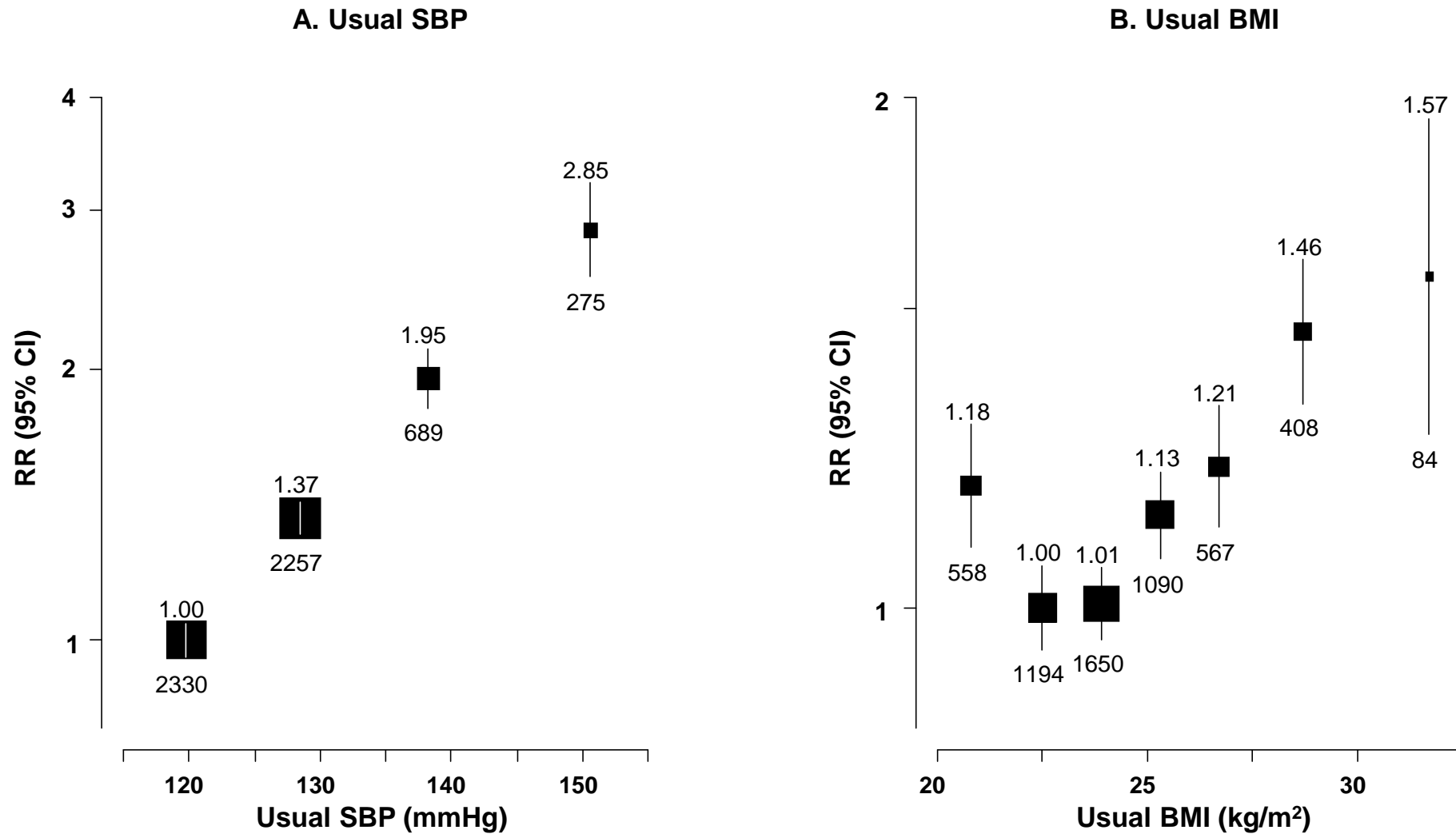
**Figure S7. Death rate ratios (RR) for vascular mortality vs usual systolic blood pressure (SBP), diabetes, and usual BMI, at ages 35-79 years in Cuba, not excluding any follow-up**



Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI (when appropriate), and did not omit the first 5 years of follow up. Exclusions as in Table 1. For each category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI). \*Excludes lowest category of BMI.

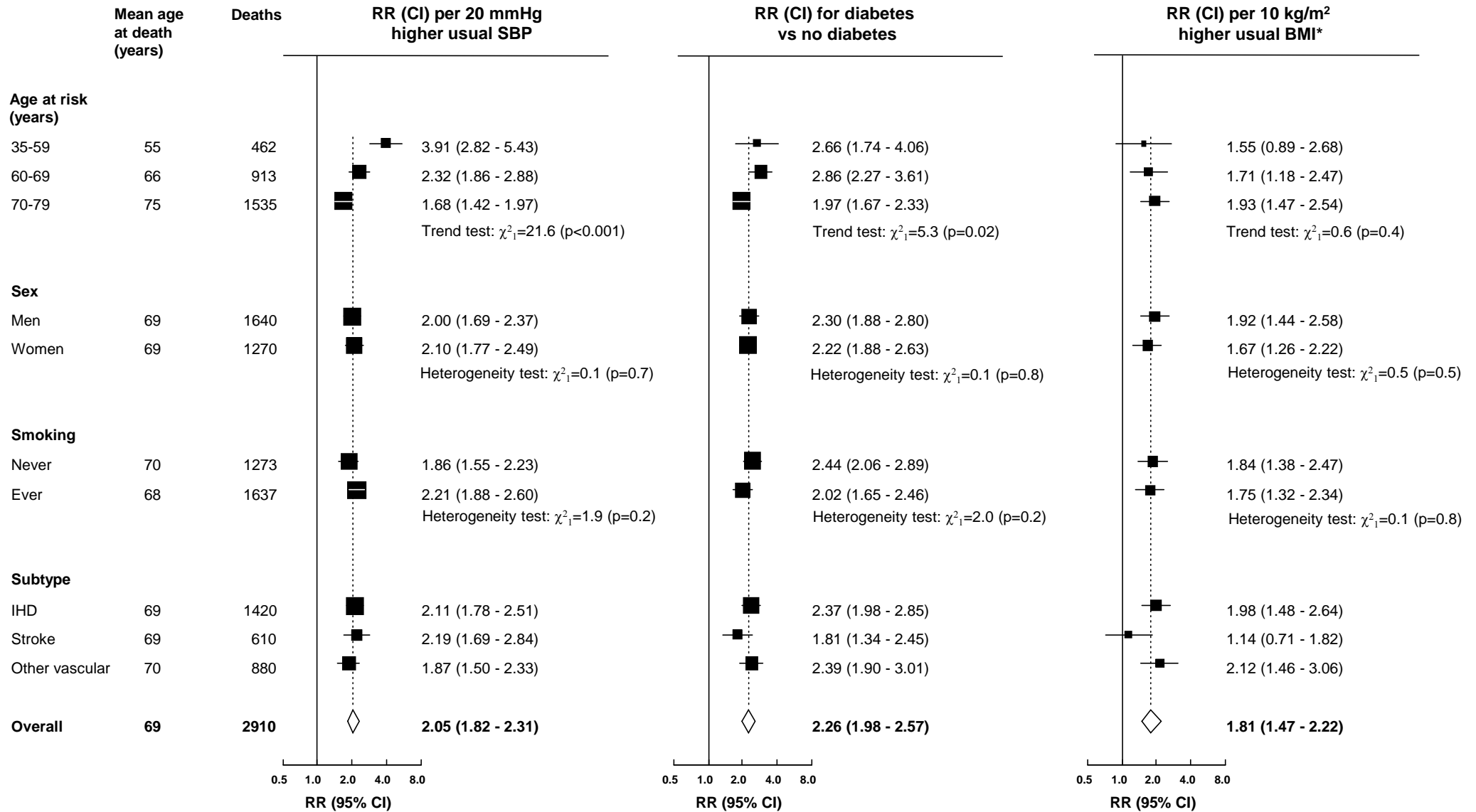


**Figure S8. Vascular mortality vs usual systolic blood pressure (SBP) and usual BMI, at ages 35-79 years in Cuba, not excluding any follow-up**



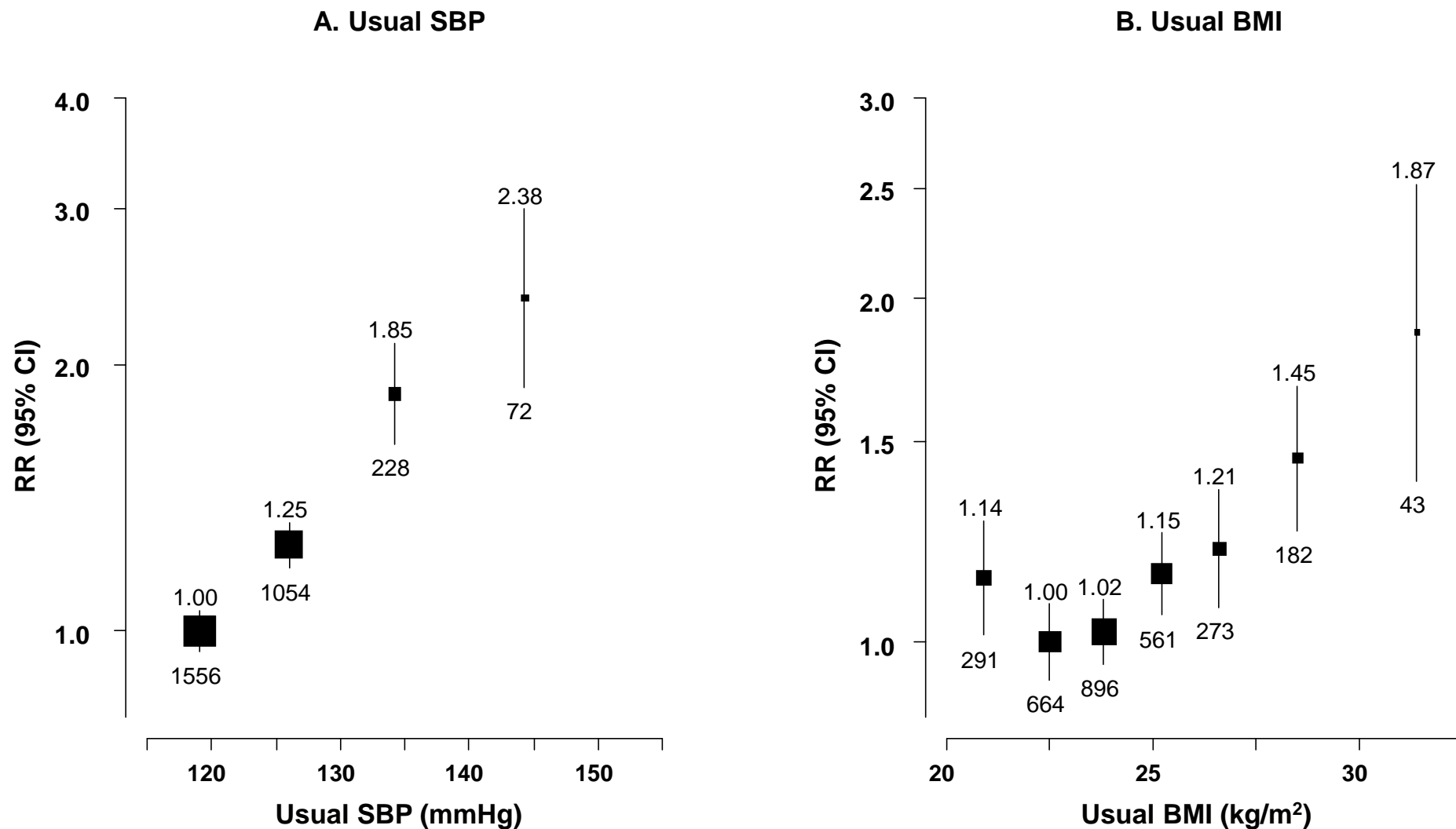
Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI (when appropriate), and did not omit the first 5 years of follow up. Exclusions as in Table 1. For each category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI).

**Figure S9. Death rate ratios (RR) for vascular mortality vs usual systolic blood pressure (SBP), diabetes, and usual BMI at ages 35-79 years in Cuba, excluding those taking blood pressure-lowering medication at baseline**



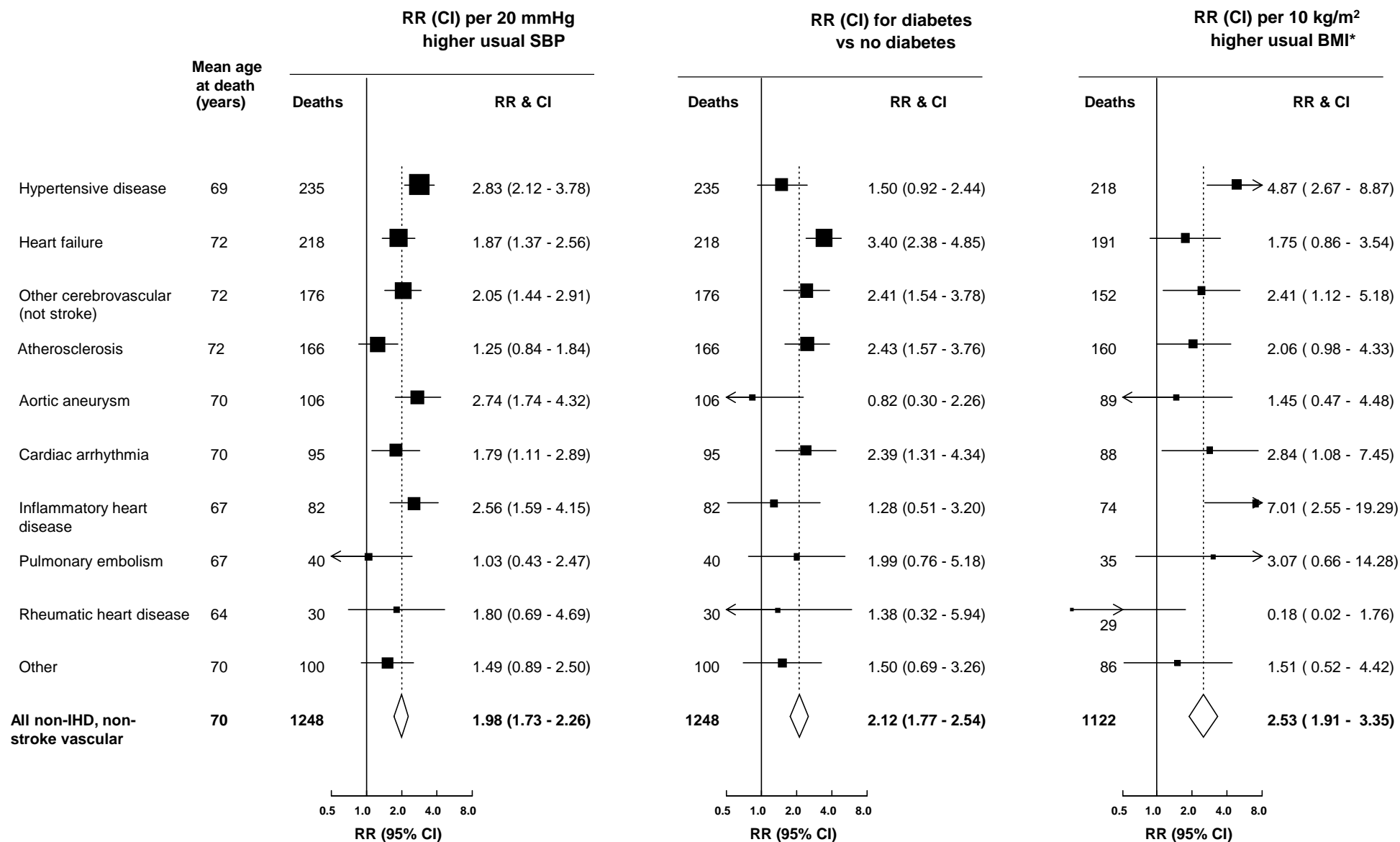
Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI (when appropriate), and omit the first 5 years of follow up. Exclusions as in Table 1, with further exclusion of those on blood pressure-lowering medication. For each category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI). \*Excludes lowest category of BMI.

**Figure S10. Vascular mortality vs usual systolic blood pressure (SBP) and usual BMI, at ages 35-79 years in Cuba, excluding those taking blood pressure-lowering medication at baseline**



Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI (when appropriate), and omit the first 5 years of follow up. Exclusions as in Table 1, with further exclusion of those on blood pressure-lowering medication at baseline. For each BMI category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI).

**Figure S11. Death rate ratios (RR) for vascular mortality (excluding ischaemic heart disease and stroke) vs usual systolic blood pressure (SBP), diabetes, and usual BMI at ages 35-79 years in Cuba**



Rate ratios (RR) adjusted for age, sex, education, province, smoking, alcohol, and BMI (when appropriate). Analyses omitted the first 5 years of follow up. Exclusions as in Table 1. For each category, area of the square is inversely proportional to the variance of the category-specific log risk, which also determines the confidence interval (CI). \*Excludes lowest category of BMI.