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ORIGINAL RESEARCH

Office Blood Pressure Range and Cardiovascular Events in Patients With Hypertension: A Nationwide Cohort Study in South Korea

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BACKGROUND: It is unclear what office blood pressure (BP) is the optimal treatment target range in patients with hypertension.

METHODS AND RESULTS: Using the Korean National Health Insurance Service database, we extracted the data on 479 359 patients with hypertension with available BP measurements and no history of cardiovascular events from 2002 to 2011. The study end point was major cardiovascular events (MACE), a composite of cardiovascular death, myocardial infarction, or stroke. This cohort study evaluated the association of BP levels (<120/<70, 120–129/70–79, 130–139/80–89, 140–149/90–99, and ≥150/≥100 mm Hg) with MACE. During a median follow-up of 9 years, 55 401 MACE were documented in our cohort. The risk of MACE was the lowest (adjusted hazard ratio [HR], 0.79; 95% CI, 0.76–0.84) at BP level of <120/<70 mm Hg, and was the highest (HR, 1.32; 95% CI, 1.29–1.36) at ≥150/≥100 mm Hg in comparison with 130 to 139/80 to 89 mm Hg. These results were consistent in all age groups and both sexes. Among patients treated with antihypertensive medication (n=237 592, 49.5%), in comparison with a BP level of 130 to 139/80 to 89 mm Hg, the risk of MACE was significantly higher in patients with elevated BP (≥140/≥90 mm Hg), but not significantly lower in patients with BP of <130/<80 mm Hg. Low BP <120/70 mm Hg was associated with increased risk of all-cause or cardiovascular death in all age groups.

CONCLUSIONS: BP level is significantly correlated with the risk of MACE in all Korean patients with hypertension. However, there were no additional benefits for MACE amongst those treated for hypertension with BP <120/70 mm Hg.

Key Words: blood pressure ■ cardiovascular events ■ hypertension

Elevated blood pressure (BP) is a modifiable risk factor for cardiovascular morbidity and mortality.[1] Previous guidelines recommended a target BP of <140/90 mm Hg to reduce cardiovascular events.[2,3] However, SPRINT (Systolic Blood Pressure Intervention Trial) has reported in 2015 that a systolic

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CLINICAL PERSPECTIVE

What Is New?

- Elevated office blood pressure (BP) (≥140/≥90 mm Hg) was significantly associated with increased major cardiovascular events in all patients with hypertension regardless of treatment with antihypertensive medication.
- In all patients with hypertension, office BP of <130/<80 mm Hg was significantly associated with lower major cardiovascular events compared with ≥130/≥80 mm Hg; this result was consistent regardless of sex or age except in men aged ≥70 years.
- There was no additional benefit of low BP <120/70 mm Hg in comparison with <140/<90 mm Hg for major cardiovascular events in patients treated with antihypertensive medication; this result was consistent in both men and women regardless of age.

What Are the Clinical Implications?

- Results of current analyses suggest "the lower, the better" for the overall BP control in all patients with hypertension.
- When we manage patients with hypertension with antihypertensive medication, BP target of <140/90 mm Hg appears to be reasonable for prevention of major cardiovascular events in clinical practice, and low BP <120/70 mm Hg might not be beneficial.

Nonstandard Abbreviations and Acronyms

MACE	major cardiovascular events
NHIS	National Health Insurance Service

BP target of <120 mm Hg instead of <140 mm Hg lowers rates of major cardiovascular events (MACE) (fatal and non-fatal) and death from any cause among patients without diabetes mellitus at high risk for cardiovascular events.[4] The 2017 American College of Cardiology/American Heart Association and the 2018 European Society of Cardiology/European Society of Hypertension guidelines recommended that the BP values should be 130/80 mm Hg or lower in most treated patients.[5,6] This recommendation was based on multiple meta-analyses that found that, in comparison with standard BP reduction, more intense BP lowering significantly reduces the risk of stroke, coronary events, MACE, and cardiovascular mortality.[4,7–11] On the other hand, other studies have reported that lowering systolic BP to <130 mm Hg in general has no further benefit in terms of major cardiovascular events except that it may reduce the risk of stroke.[12–14]

There are some debates about optimal target BP in treatment of patients with hypertension, and there is a lack of evidence about target BP in Asian populations. Therefore, in this nationwide population–based study, we evaluated the association of office BP treatment range with MACE.

METHODS

Data Sources

This study used the National Health Information Database produced by the National Health Insurance Service (NHIS). The authors declare no conflict of interest with NHIS. The NHIS provides mandatory health insurance for all South Korean citizens, covering 97% of the Korean population.[15] The NHIS claim database includes data on demographic characteristics, diagnoses, prescriptions, health screening examination data (eg, health questionnaires and laboratory tests), and deaths. The details of the database are described elsewhere.[16] All diagnoses are recorded in the NHIS database using the *International Classification of Diseases, Tenth Revision* (*ICD-10*) codes. The authors are restricted from sharing the data underlying this study because The Korean NHIS owns the data. This study was performed as a project between the Korean Society of Hypertension and the NHIS. Researchers who are not members of the collaboration can request access on the NHIS website (http://nhiss.nhis.or.kr). Details of this process and a provision guide are now available at https://nhiss.nhis.or.kr/bd/ab/bdaba032eng.do. This study was approved by the Institutional Review Board of Kangbuk Samsung Hospital (KBSMC 2020-01-043). The anonymized data set was provided to the researchers by the NHIS and the requirement for informed consent was waived.

Study Population

The cohort included 1 554 406 participants aged ≥19 years who underwent health screening twice within 4 years by 2002 and 2011. Among them, we extracted 611 320 individuals who were diagnosed with hypertension (I10–I13, I15) before the first health screening examination. Finally, we enrolled 479 359 individuals after excluding those who had experienced myocardial infarction (I21–I23) or stroke (I60–I64) (n=62 039), were diagnosed with malignancy (C00–C99) (n=55 025) between the first and second health screenings, and whose data on baseline variables were missing (n=14 897). Individuals were followed up until death from any cause or the end of the study (December 2017), or censored when cardiovascular

death, myocardial infarction, or stroke developed. Figure 1 shows a flowchart of the study population. We defined patients treated for hypertension as patients who were prescribed antihypertensive medications including angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers, beta-adrenergic blockers, calcium channel blockers, or diuretics every year between the first and second health screenings.

Blood Pressure and End Point

BP was measured using either sphygmomanometers or oscillometric devices after 3 to 5 minutes of rest. The staff who performed the measurements was recommended to choose a cuff of appropriate size, and to repeat measurements ≥2 times at 1-to-2-minute intervals. Baseline BP was defined as the mean values of 2 BP measurements during different health screenings, which we assumed to be representative of the overall BP levels. The study participants were categorized arbitrary into 5 groups according to systolic and/or diastolic BPs (<120 and <70 [extremely intensive BP reduction group], 120–129 and/or 70–79 [intensive BP reduction group], 130–139 and/or 80–89 [standard BP reduction group], 140–149 and/or 90–99 [lenient group], ≥150 and/or ≥100 mm Hg [uncontrolled group]) (Figure S1). This categorization of the participants was based on the US guideline[5] that a BP target of <130/80 mm Hg may be reasonable, and the European guideline[6] that the first objective of treatment should be to lower BP to <140/ 90 mm Hg and reducing BP to <120/70 mm Hg should be cautious.

The primary end point was MACE, which was a composite of cardiovascular death, myocardial infarction, or stroke. Vital status and the cause of death were retrieved from the mortality records of the National Statistical Office of Korea. Cardiovascular death was defined according to the *ICD-10* codes I00–I99. Myocardial infarction was defined as a hospitalization with the *ICD-10* codes I21–23 as primary or secondary diagnosis. Stroke (hemorrhagic or ischemic) was defined by discharge diagnosis (*ICD-10* codes, I60–64) among patients who had been hospitalized and undergone brain imaging studies such as computed tomography or magnetic resonance imaging.[17] We censored a primary end point using newly occurrence of the *ICD-10* codes for cardiovascular death, myocardial infarction, or stroke. The censoring date was the earliest of the following: date of death, date of primary outcome, or end date of the study period (December 31, 2017).

Statistical Analysis

Data are reported as mean (SD) or median (interquartile range) for continuous variables, and as numbers (percentages) for categorical variables. The incidence

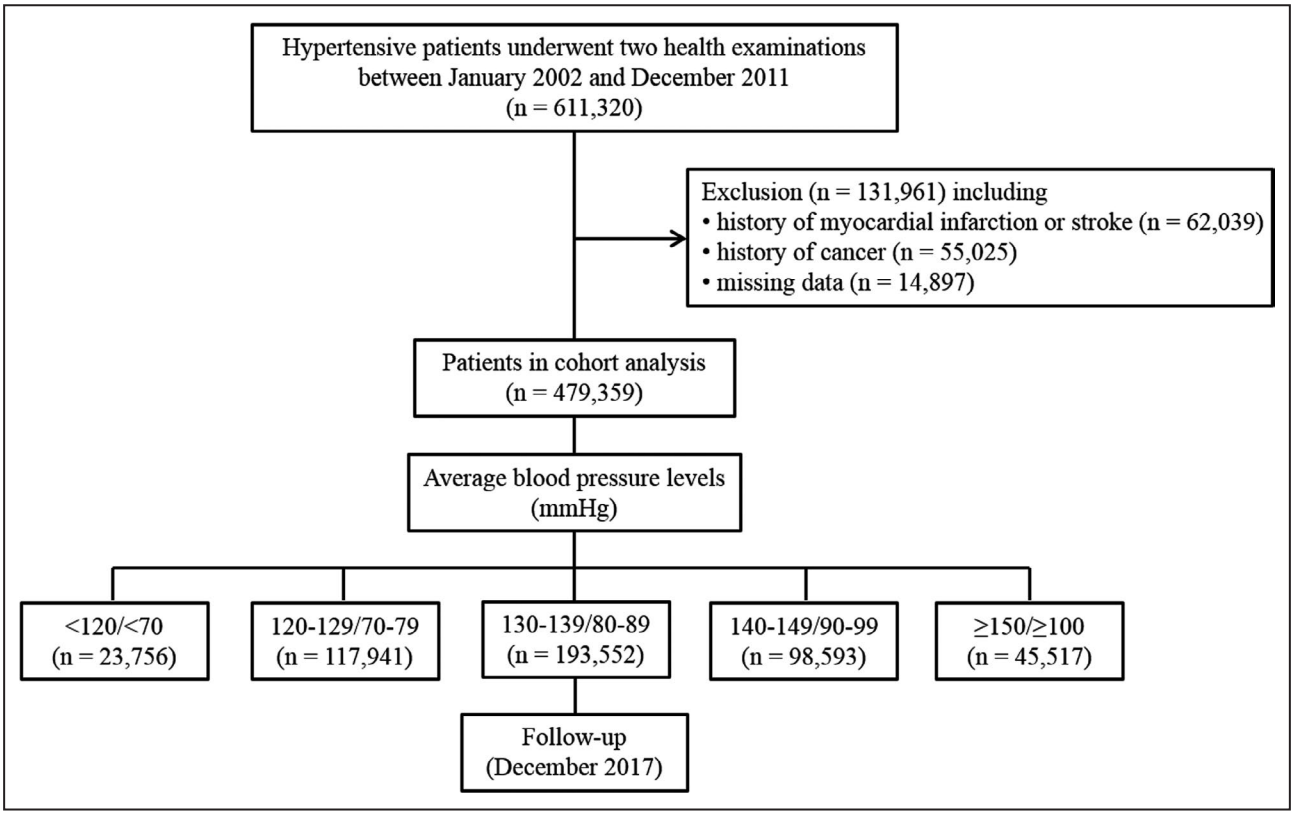

Figure 1. Flowchart of the study population.

rates were estimated using the total number of outcomes during the follow-up divided by 100 000 person-years. Cox proportional hazard models were used to evaluate the associations between baseline BP levels and the risk of cardiovascular events. Hazard ratios were adjusted for age, sex, income level, history of smoking, physical activity, alcohol consumption, body mass index, fasting glucose, total cholesterol, diabetes mellitus, and medication of aspirin or statin, and are presented with 95% CIs. We further planned a subgroup analysis of sex, antihypertensive drugs, and age groups that had different clinical outcomes in previous studies, and tested heterogeneity using the interaction term. In the group whose interaction term was statistically significant, subgroup analysis was performed. We also analyzed the association between BP levels and the risk of major cardiovascular events including heart failure in patients without baseline heart failure (*ICD-10* codes, I11.0, I13.0, I13.2, I42, and I50). Statistical analyses were performed using SAS statistical software (version 9.4, SAS Institute, Cary, NC) and R statistical software (version 3.6.1, R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Baseline Characteristics of the Study Population

A total of 479 359 subjects who were diagnosed with hypertension and who had available blood pressure measurements were identified. The mean age was 58.6±11.7 years and 43.4% were men. The mean systolic and diastolic BPs were 132.7±12.8 and 81.4±8.0 mm Hg, respectively. Mean body mass index was 24.8±3.2 kg/m^2. The proportion of treated patients, ie, those who were prescribed anti-hypertensive medication, was 49.5%. Table 1 shows baseline characteristics of the study population according to BP level. Tables S1 and S2 show baseline characteristics of the study population separately for men and women, respectively.

Relationship Between Blood Pressure Levels and MACE

During 4 294 258 person-years of follow-up (median follow-up, 9 years; interquartile range, 7–11 years), we observed 55 401 MACE (incidence rate, 1290 per 100 000 person-years): 12 087 cardiovascular deaths, 9324 myocardial infarctions, and 40 774 strokes. MACE occurred in 26 696 men (incidence rate, 1400 per 100 000 person-years) and 28 705 women (incidence rate, 1201 per 100 000 person-years). Table 2 details the incidences and adjusted hazard ratio (HR) of MACE according to BP levels. After adjusting all variables, the risk of MACE was the lowest in patients with <120/70 mm Hg and the highest in those with ≥150/≥100 mm Hg. This trend was consistent between men and women (Table S3). Among the components of MACE, the risk of stroke was significantly correlated with BP level, but the risks of cardiovascular death and myocardial infarction were not significantly lower in patients with <130/<80 mm Hg than in the reference group (130–139/80–89 mm Hg) in both men and women (Table 2 and Table S3). Figure 2 shows BP levels and adjusted HR for MACE in all patients with hypertension according to age category. Linear correlations between BP levels and adjusted HR of MACE were observed in all patient groups except men aged ≥70 years. The risk of MACE according to BP increments in all patients with hypertension is shown in Table 3. The incidences and adjusted HR of MACE including heart failure according to BP levels in patients without baseline heart failure (n=461 492) are shown in Tables S4 and S5. Even in the composite events including heart failure, the results were not different. Details of the correlations between BP levels and all-cause mortality and MACE by sex for different age groups are shown in Tables S6 through S9. Cardiovascular death is significantly increased in the lowest BP level compared with reference BP level in both men and women with ≥70 years, but risk for MACE is not increased significantly.

Relationship Between Blood Pressure Levels and MACE in Patients Treated for Hypertension

Table 4 shows the incidence of MACE according to BP levels among patients treated for hypertension. In multivariable analysis, the incidence of MACE increased significantly higher at ≥140/≥90 mm Hg than at the reference BP level (130–139/80–89 mm Hg), but it was not significantly lower at lower BP levels (<130/<80 mm Hg). This result was consistent between men and women (Table S10). Among the components of MACE, the risk of stroke was significantly decreased at BP levels lower than the reference BP level. However, low BP <130/80 mm Hg was not beneficial for the prevention of cardiovascular death or myocardial infarction. Figure 3 shows the relationship between BP levels and adjusted HR for MACE in treated hypertensive patients of different age categories. Significant risk reduction of MACE at low BP levels (<130/<80 mm Hg) was observed only in some of the age categories. Rather, patients with BP <120/<70 mm Hg had higher risk of all-cause or cardiovascular death than those with the reference BP level in all age categories (Tables S6 through S9). This trend was also consistent when analyzing the patient group excluding heart failure (Table S5). The restricted cubic spline curves for the risk of MACE according to systolic and diastolic BP levels are shown in Figure 4.

Table 1. Baseline Characteristics of the Study Population According to Blood Pressure Level

	Blood Pressure Level (mm Hg)					
	<120/<70	120–129/70–79	130–139/80–89	140–149/90–99	≥150/≥100	*P* Value
No. of patients (%)	23 756 (4.9)	117 941 (24.6)	193 552 (40.3)	98 593 (20.5)	45 517 (9.5)	<0.001
Age, y	54 (45–60)	58 (50–66)	59 (51–67)	60 (52–68)	64 (54–70)	<0.001
Sex (%)						<0.001
Men	6232 (26.2)	45 274 (38.4)	88 658 (45.8)	46 719 (47.4)	21 492 (47.2)	
Women	17 524 (73.8)	72 667 (61.6)	104 894 (54.2)	51 874 (52.6)	24 025 (52.8)	
Blood pressure, mm Hg						
Systolic blood pressure	109.1±6.4	121.2±5.6	131.9±5.0	142.7±4.2	156.8±7.9	<0.001
Diastolic blood pressure	65.5±3.3	74.7±3.3	81.9±4.1	82.3±5.6	92.6±7.9	<0.001
Household income (%)						<0.001
First (highest)	8377 (35.3)	40 920 (34.7)	66 682 (34.4)	33 060 (33.5)	14 308 (31.4)	
Second	5821 (24.5)	29 078 (24.7)	48 248 (24.9)	24 831 (25.2)	11 275 (24.8)	
Third	4593 (19.3)	22 631 (19.2)	36 783 (19.0)	19 061 (19.3)	9325 (20.5)	
Fourth (lowest)	4965 (20.9)	25 312 (21.4)	41 839 (21.6)	21 641 (22.0)	10 609 (23.3)	
Smoking (%)						<0.001
Never	18 570 (78.2)	85 362 (72.4)	134 668 (69.6)	68 669 (69.6)	32 350 (71.1)	
Past	2147 (9.0)	15 422 (13.1)	30 339 (15.7)	15 548 (15.8)	6279 (13.8)	
Current	3039 (12.8)	17 157 (14.5)	28 545 (14.7)	14 376 (14.6)	6888 (15.1)	
Physical activity, times/wk (%)						<0.001
0	12 859 (54.1)	63 908 (54.2)	102 337 (52.9)	53 963 (54.7)	26 583 (58.4)	
1–2	3841 (16.2)	17 254 (14.6)	28 409 (14.7)	14 091 (14.3)	6397 (14.1)	
3–4	2852 (12.0)	13 969 (11.8)	23 380 (12.1)	11 278 (11.4)	4557 (10.0)	
5–6	1884 (7.9)	9860 (8.4)	16 829 (8.7)	7989 (8.1)	3051 (6.7)	
7	2320 (9.8)	12 950 (11.0)	22 597 (11.6)	11 272 (11.4)	4929 (10.8)	
Alcohol consumption, times/wk (%)						<0.001
0	17 807 (74.9)	82 441 (69.9)	125 907 (65.0)	62 663 (63.6)	28 918 (63.5)	
<1	3014 (12.7)	14 773 (12.5)	24 467 (12.6)	11 465 (11.6)	4732 (10.4)	
1–2	2039 (8.6)	14 113 (12.0)	28 861 (14.9)	15 530 (15.7)	7060 (15.5)	
3–4	486 (2.0)	3583 (3.0)	7881 (4.1)	4693 (4.8)	2442 (5.3)	
≥5	410 (1.7)	3031 (2.6)	6436 (3.3)	4242 (4.3)	2365 (5.2)	
Body mass index, kg/m^2	23.1±3.0	24.4±3.1	25.0±3.2	25.3±3.3	25.3±3.5	<0.001
Glucose, mg/dL	98.3±27.1	103.0±29.1	105.4±29.3	107.7±31.3	110.5±35.4	<0.001
Total cholesterol, mg/dL	191.2±40.7	194.9±39.9	197.0±40.7	198.9±42.3	201.6±45.2	<0.001
Diabetes mellitus (%)	2892 (12.1)	14 823 (12.5)	20 804 (10.7)	10 097 (10.2)	4802 (10.5)	<0.001
Aspirin (%)	4213 (17.7)	27 713 (23.5)	50 588 (26.1)	26 127 (26.5)	11 802 (25.9)	<0.001
Statin (%)	3275 (13.7)	17 234 (14.6)	25 649 (33.4)	32 535 (33.0)	14 520 (31.9)	<0.001
Anti-hypertensive medication (%)	6555 (27.5)	51 304 (43.5)	100 112 (51.7)	54 073 (54.8)	25 548 (56.1)	<0.001

Data are expressed as mean±SD, median (interquartile range), or number (percentage).

Sensitivity Analyses in Patients Without Taking Antihypertensive Medications and in Those Without Diabetes Mellitus

We further analyzed whether the relationship between blood pressure levels and major cardiovascular events had consistent results in patients who did not take antihypertensive medications (Table S11) or who did not have diabetes mellitus (Table S12). Even in patients without diabetes mellitus, the higher the blood pressure than the reference BP (130–139/80–89 mm Hg), the higher the risk of MACE. However, patients with BP <120/70 mm Hg had higher risk of all-cause or cardiovascular death than those with the reference BP.

Table 2. Incidences of Major Cardiovascular Events According to Blood Pressure Level in All Patients With Hypertension

Blood Pressure, mm Hg	Events (n)	Person-Years	Incidence (Events/100 000 Person-Years)	Adjusted HR (95% CI)
Cardiovascular death				
<120/<70	440	203 249	216	1.18 (1.07–1.30)
120–129/70–79	2370	1 067 813	222	1.00 (0.95–1.05)
130–139/80–89	4220	1 820 120	232	1.00 (reference)
140–149/90–99	2907	921 915	315	1.19 (1.14–1.25)
≥150/≥100	2150	402 612	534	1.61 (1.52–1.69)
MI				
<120/<70	329	209 593	157	0.90 (0.81–1.01)
120–129/70–79	2124	1 095 879	194	1.00 (0.95–1.06)
130–139/80–89	3688	1 871 002	197	1.00 (reference)
140–149/90–99	2058	959 597	214	1.04 (0.99–1.1.0)
≥150/≥100	1125	432 195	260	1.18 (1.10–1.26)
Stroke				
<120/<70	1095	205 177	534	0.69 (0.65–0.73)
120–129/70–79	8156	1 059 686	770	0.88 (0.86–0.91)
130–139/80–89	15 929	1 794 934	887	1.00 (reference)
140–149/90–99	9855	909 679	1083	1.14 (1.11–1.17)
≥150/≥100	5739	402 547	1426	1.31 (1.27–1.35)
Cardiovascular death or MI or stroke				
<120/<70	1676	202 047	830	0.79 (0.76–0.84)
120–129/70–79	11 362	1 042 767	1090	0.92 (0.90–0.94)
130–139/80–89	21 460	1 765 485	1216	1.00 (reference)
140–149/90–99	13 112	892 521	1469	1.12 (1.10–1.15)
≥150/≥100	7791	391 437	1990	1.32 (1.29–1.36)

HR was adjusted for age, sex, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, and medication (aspirin or statin), and antihypertensive medication. HR indicates hazard ratio; and MI, myocardial infarction.

DISCUSSION

In this nationwide cohort study, we have revealed that (1) elevated BP is a strong predictor of future MACE including cardiovascular death, myocardial infarction, or stroke; (2) BP level is significantly correlated with the risk of MACE, especially the incidence of stroke, in all patients with hypertension; however, (3) there is no further benefit of low BP <130/80 mm Hg in comparison with <140/90 mm Hg for MACE in patients treated with antihypertensive medication; and (4) low BP <120/70 mm Hg was associated with a higher risk of all-cause or cardiovascular death in all age groups.

Although current guidelines recommend a target BP level of <130/80 mm Hg, there is no consensus on the optimal BP target in the treatment of hypertension. SPRINT trial, which was relevant to this issue, showed that intensive treatment (systolic BP target of <120 mm Hg) was associated with a 25% reduction in MACE and a 27% reduction in all-cause mortality in comparison with conventional treatment (systolic BP target of <140 mm Hg).[4] However, this trial relied on unattended automatic office BP measurements, which had not been used in any previous randomized trials.[18] Such measurements are known to result in lower BP values than conventional office BP measurements, because of the absence of the white-coat effect.[19,20] Thus, it has been suggested that the BP values (121.5 mm Hg in intensive-treatment group versus 134.6 mm Hg in standard-treatment group) reported in SPRINT may correspond to conventional office systolic BP in the 130 to 140 and 140 to 150 mm Hg ranges in the intensive versus conventional BP-lowering groups, respectively.[6]

In this nationwide cohort, all BP measurement methods could not be determined. However, most of the BP measurements must have been performed by an attending nurse or physician. Despite this, the benefit of low BP <130/80 mm Hg for MACE was found in all patients with hypertension except men aged ≥70 years, but not in patients treated for hypertension. These discordant results can be explained in several ways. First, in our study, patients with hypertension without antihypertensive medication were younger and had lower BP values, lower body mass index,

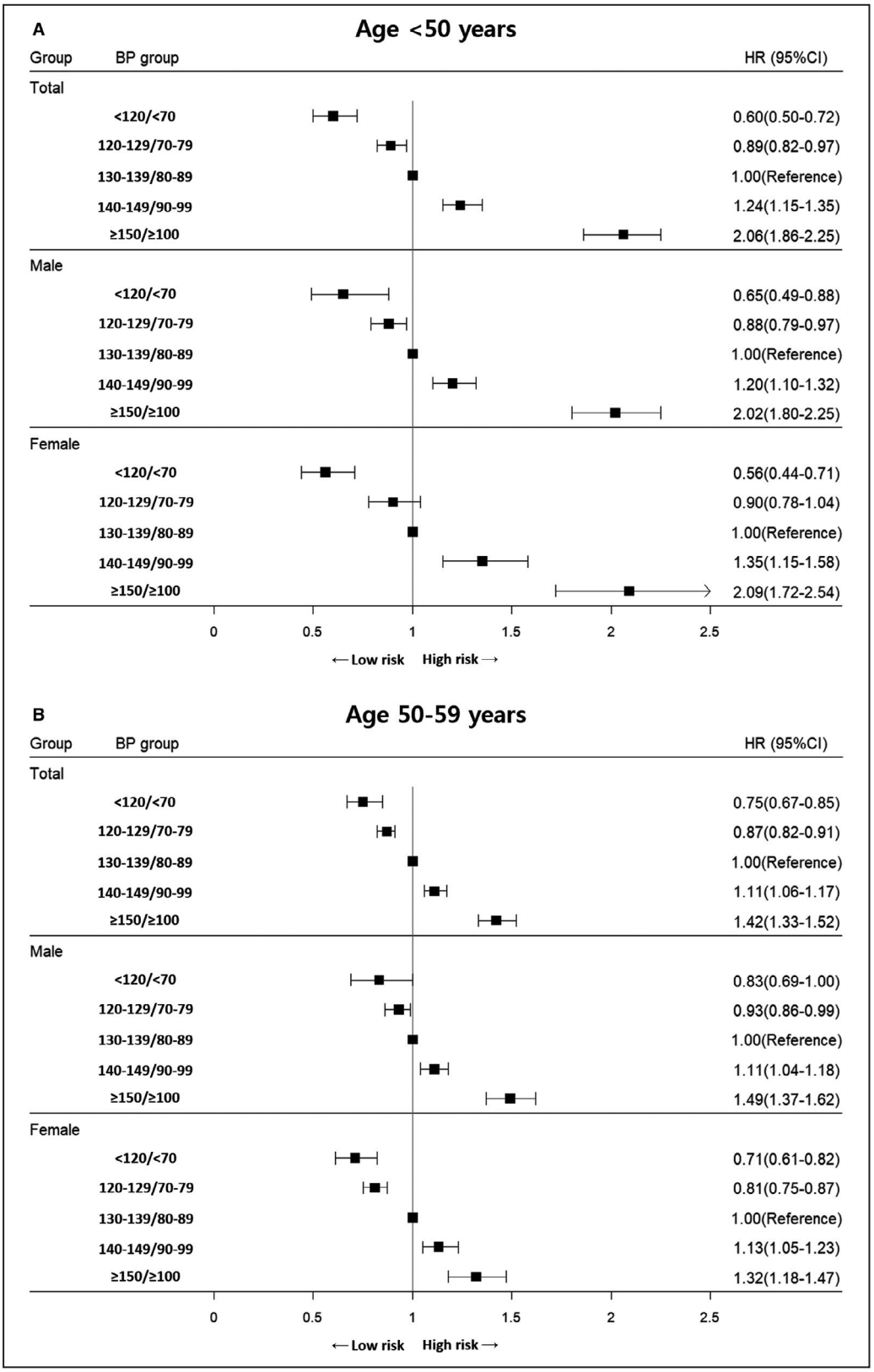

Figure 2. Baseline blood pressure levels and adjusted hazard ratios for major cardiovascular events in all patients with hypertension according to age category.
A, Aged <50 years, (**B**) aged 50 to 59 years, (**C**) aged 60 to 69 years, (**D**) aged ≥70 years. Major cardiovascular events were defined as a composite of cardiovascular death, myocardial infarction, and stroke. BP indicates blood pressure; and HR, hazard ratio.

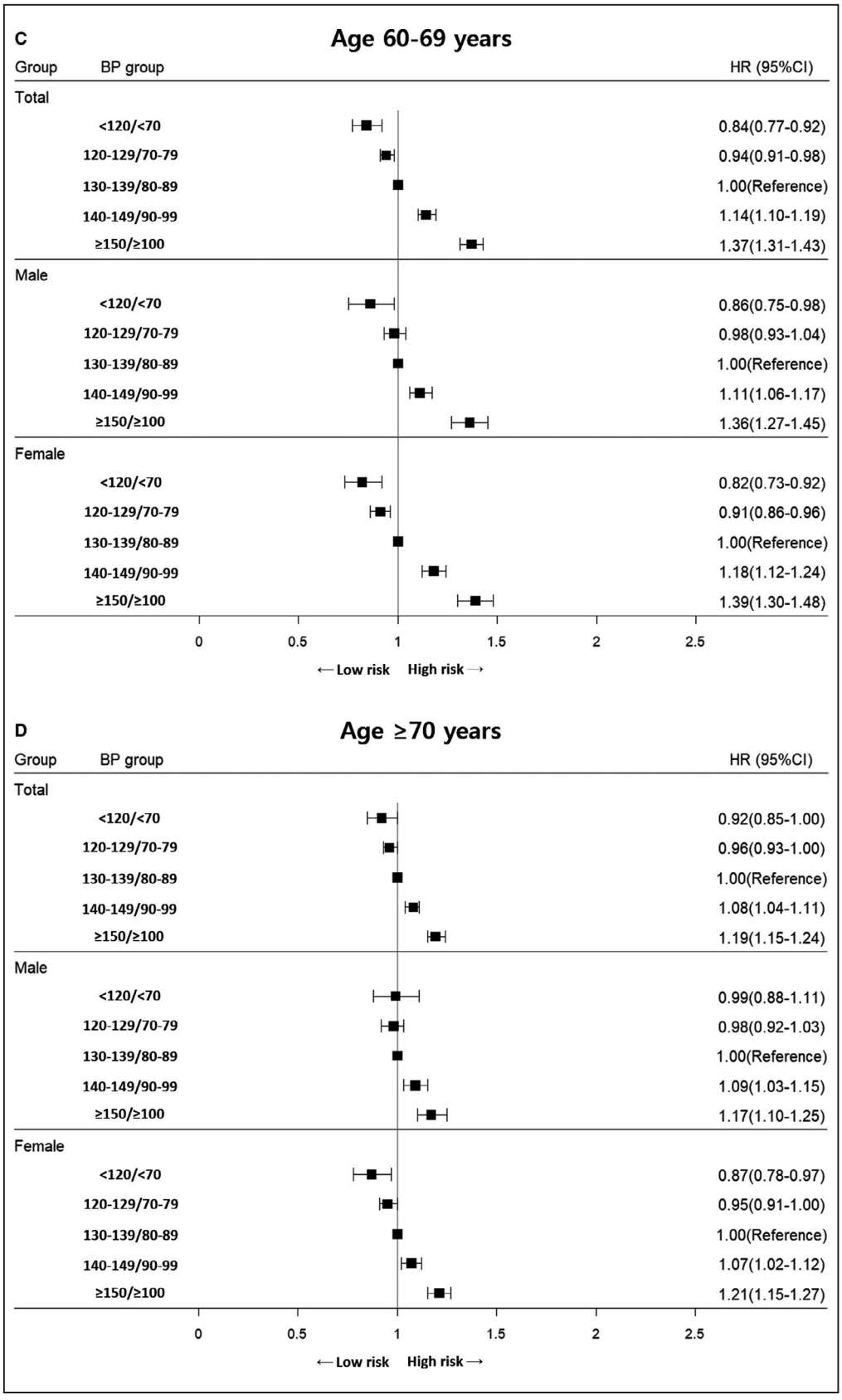

Figure 2. Continued

Table 3. Risk of Major Cardiovascular Events According to Blood Pressure Increments in All Patients With Hypertension

	Systolic Blood Pressure (mm Hg)			Diastolic Blood Pressure (mm Hg)		
	Per 20 mm Hg	Per 10 mm Hg	1-SD	Per 20 mm Hg	Per 10 mm Hg	1-SD
In total population						
Adjusted HR (95% CI)	1.23 (1.21–1.25)	1.11 (1.10–1.12)	1.14 (1.13–1.15)	1.38 (1.35–1.41)	1.18 (1.16–1.19)	1.14 (1.13–1.15)
In men						
Adjusted HR (95% CI)	1.22 (1.20–1.25)	1.11 (1.10–1.12)	1.14 (1.12–1.15)	1.30 (1.26–1.34)	1.14 (1.12–1.16)	1.11 (1.10–1.13)
In women						
Adjusted HR (95% CI)	1.21 (1.19–1.23)	1.10 (1.09–1.11)	1.13 (1.12–1.15)	1.39 (1.34–1.43)	1.18 (1.16–1.20)	1.14 (1.13–1.15)

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, medication of aspirin or statin, and antihypertensive medication. HR indicates hazard ratio.

lower fasting glucose, and lower prevalence of diabetes mellitus than treated patients. Second, because patients not medicated for hypertension constitute a large proportion of low-BP groups, these populations may implement lifestyle intervention well. On the other hand, because patients medically treated for hypertension are much more represented in higher-BP groups, these patients may have advanced vascular pathologies such as arterial stiffness and large pulse pressure values. Third, a few patients not medicated for hypertension might be misdiagnosed with hypertension because of the white-coat effect. Therefore, after patients not medicated for hypertension were excluded, the number of treated patients in low-BP groups was lower than in other groups; thus, the benefit of lowering BP for future cardiovascular events might have disappeared. In addition, our results support "the lower, the better" in BP control at

Table 4. Incidences of Major Cardiovascular Events According to Blood Pressure Level in Patients Treated for Hypertension

Blood Pressure (mm Hg)	Events (n)	Person-Years	Incidence (Events/100 000 Person-Years)	Adjusted HR (95% CI)
Cardiovascular death				
<120/<70	251	23 191	1082	1.70 (1.49–1.94)
120–129/70–79	1225	450 400	272	1.09 (1.02–1.17)
130–139/80–89	2183	910 024	240	1.00 (reference)
140–149/90–99	1545	486 613	318	1.19 (1.11–1.27)
≥150/≥100	1139	219 428	519	1.57 (1.46–1.69)
MI				
<120/<70	134	55 833	240	1.08 (0.90–1.28)
120–129/70–79	1034	463 106	223	1.08 (1.00–1.16)
130–139/80–89	1872	935 410	200	1.00 (reference)
140–149/90–99	1043	506 155	206	1.00 (0.93–1.08)
≥150/≥100	623	234 314	266	1.20 (1.09–1.31)
Stroke				
<120/<70	438	54 152	809	0.80 (0.73–0.89)
120–129/70–79	3784	447 167	846	0.90 (0.87–0.94)
130–139/80–89	8091	898 319	901	1.00 (reference)
140–149/90–99	5127	481 293	1065	1.12 (1.08–1.15)
≥150/≥100	3028	219 361	1380	1.28 (1.22–1.33)
Cardiovascular death or MI or stroke				
<120/<70	728	52 660	1382	0.99 (0.92–1.07)
120–129/70–79	5418	438 920	1234	0.96 (0.93–0.99)
130–139/80–89	10 943	883 940	1238	1.00 (reference)
140–149/90–99	6843	472 686	1448	1.10 (1.07–1.13)
≥150/≥100	4151	213 621	1943	1.30 (1.25–1.35)

Hazard ratio was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, and medication (aspirin or statin). HR indicates hazard ratio; and MI, myocardial infarction.

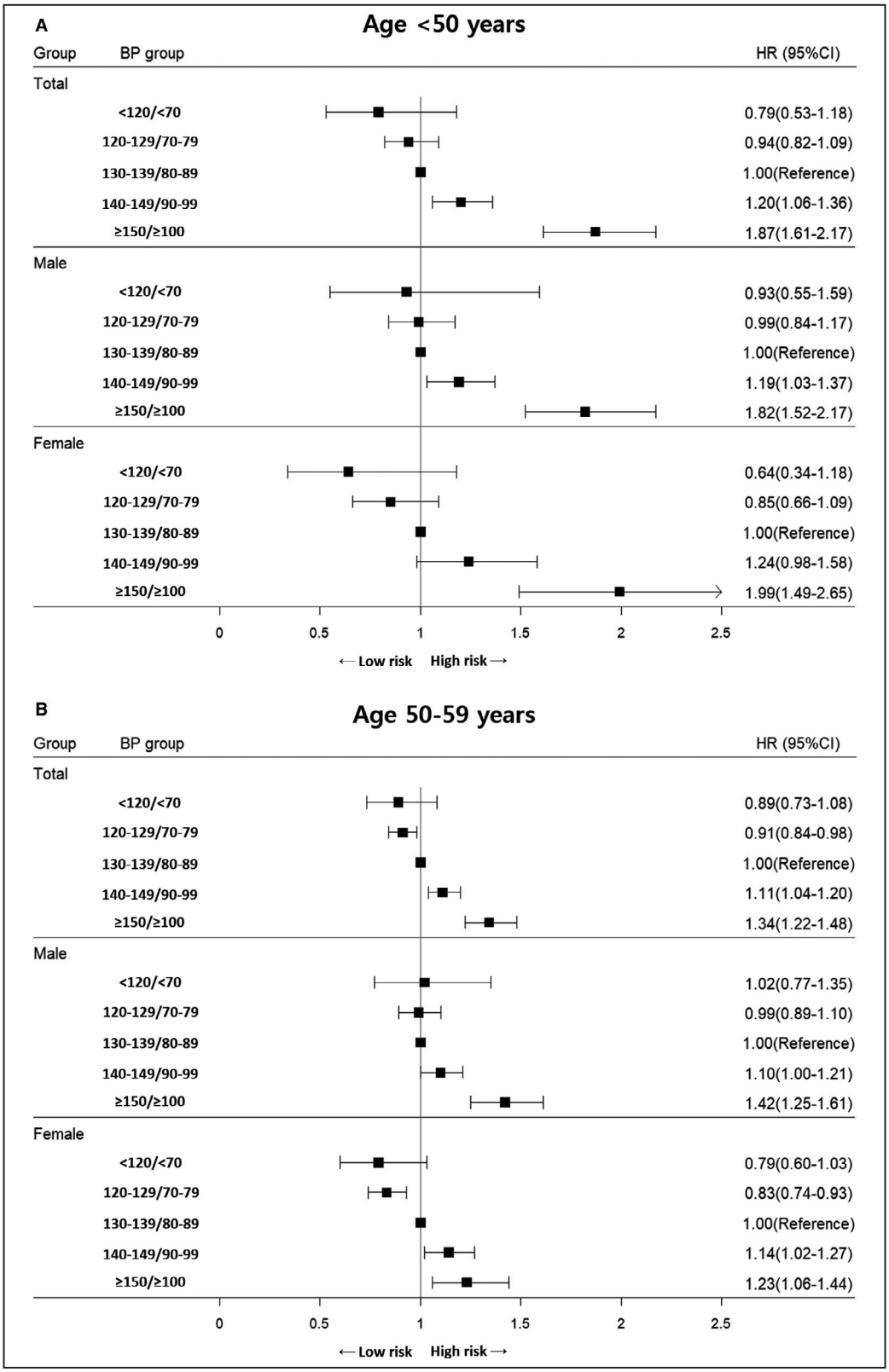

Figure 3. Baseline blood pressure levels and adjusted hazard ratios for major cardiovascular events in patients treated for hypertension according to age category.
A, Aged <50 years, (**B**) aged 50 to 59 years, (**C**) aged 60 to 69 years, (**D**) aged ≥70 years. Major cardiovascular events were defined as a composite of cardiovascular death, myocardial infarction, and stroke. BP indicates blood pressure; and HR, hazard ratio.

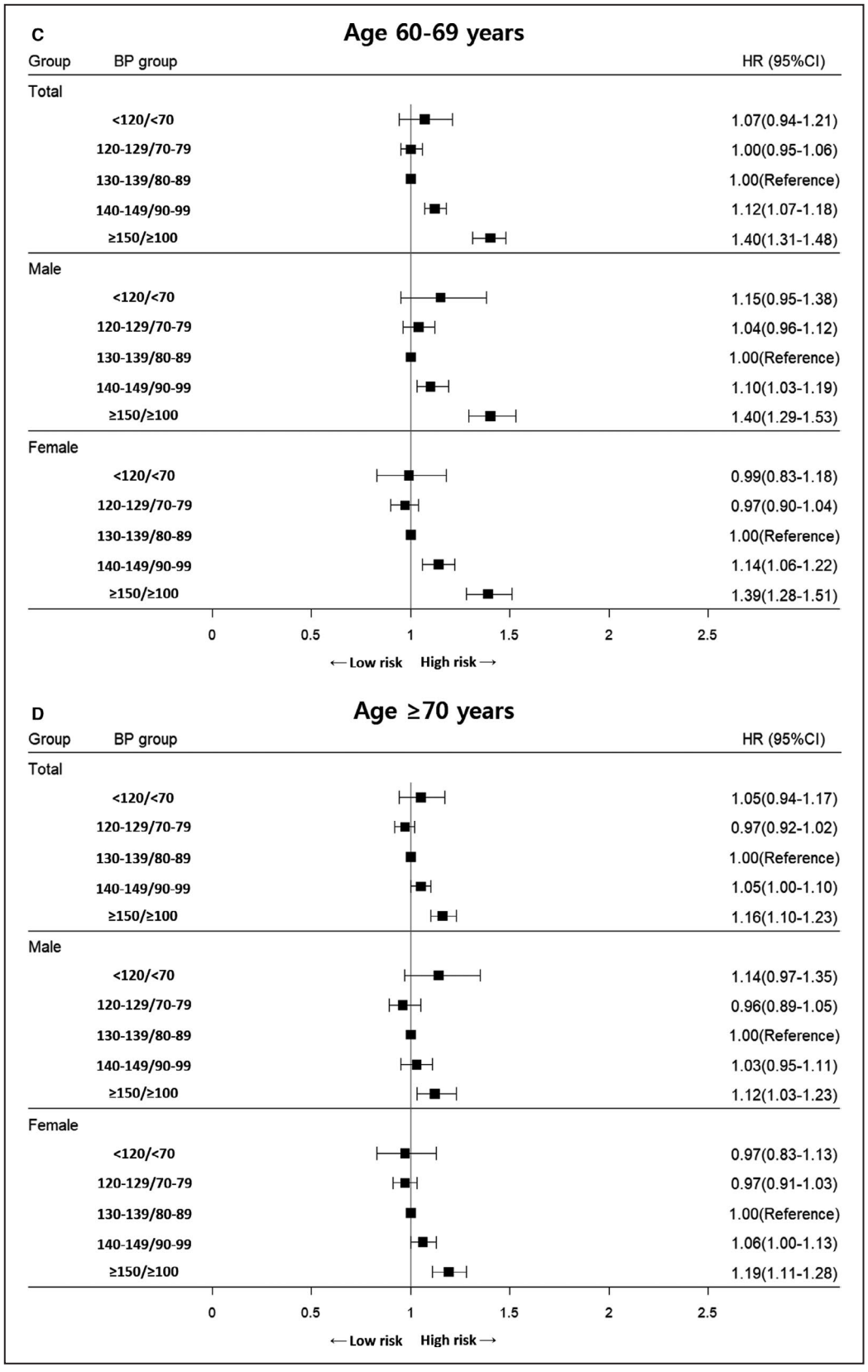

Figure 3. **Continued**

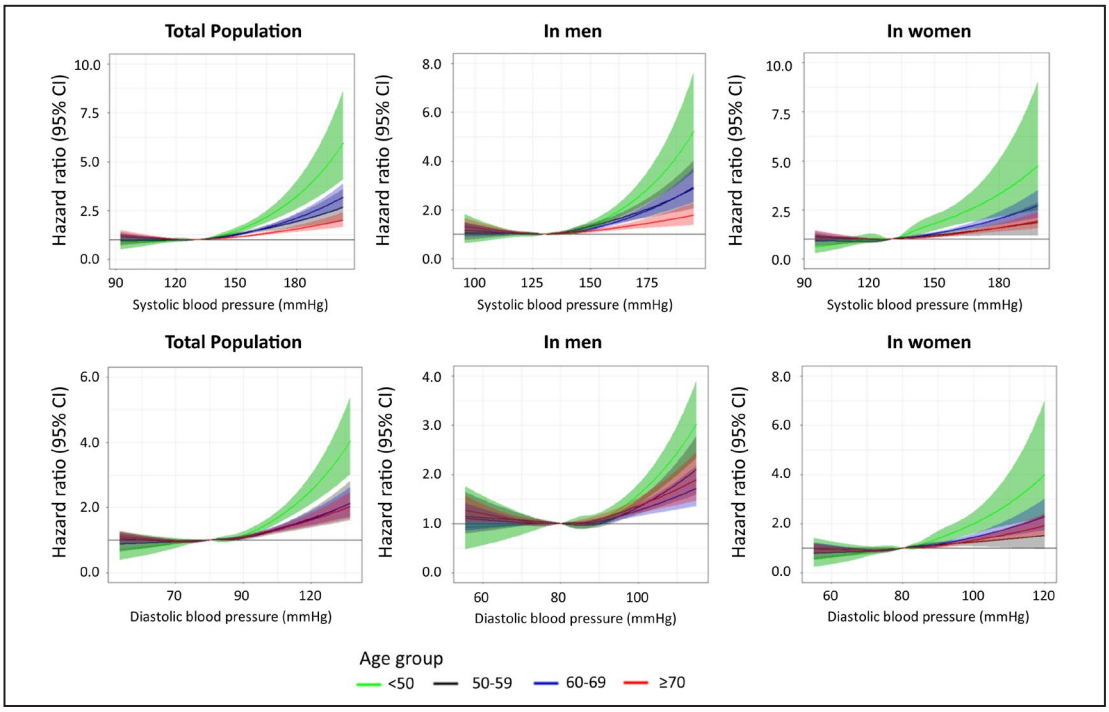

Figure 4. The relationship between baseline systolic and diastolic blood pressures and major cardiovascular events in patients treated for hypertension.

an early hypertension stage and/or in young patients with hypertension. This result is consistent with previous Korean analyses, which showed that normal BP range (<120/<80 mm Hg) is associated with the lowest cardiovascular risk in comparison with the upper BP ranges in the general population[21,22] and in young patients with hypertension.[23,24] In young patients with hypertension and at an early stage of the disease, lowering BP below the normal BP level should be beneficial regardless of medication or lifestyle modification.

In our study, no benefit of low BP <130/80 mm Hg for prevention of MACE was observed in treated patients with hypertension. Moreover, low BP <120/70 mm Hg was associated with increased risk of all-cause or cardiovascular death in all age categories. The lower safety boundary of BP control has not been decided yet in high-cardiovascular-risk or elderly patients. Previous studies on high-risk patients reported that lowering systolic BP to <130 mm Hg significantly reduces the risk of cardiovascular disease,[9,10] but reduction of systolic BP to <120 mm Hg or diastolic BP to <70 mm Hg is associated with an increase in the incidence of cardiovascular events.[12] A Korean study using NHIS data showed a J-curve pattern between BP levels and ischemic heart disease or acute myocardial infarction in patients aged 70 to 80 years without known hypertension.[25] Furthermore, lower baseline diastolic BP is reportedly associated with increased risk of cardiovascular events.[26,27] Currently, American and European guidelines recommend that the target BP should be 130/80 mm Hg, but the target systolic BP should not be <120 mm Hg in elderly patients (>65 years).[5,6] Our results support these recommendations. Thus, it is recommended to should be careful when performing intensive BP control in elderly patients.

This study has several limitations. First, it was a retrospective cohort study, and thus had the inherent limitations of this type of analysis. However, the use of the national registration data ensured that the treatment status of the study population was known, no cardiovascular outcomes were missed, and the chance of attrition bias was low. Seconds, since this is an observational study, it is inevitable to be criticized for whether the low BP at a single point reflects the strict controlled BP. It was also impossible to exclude all other systemic conditions at single point. Especially, we could not exclude the reverse causality between all-cause mortality, to some extent cardiovascular death, and low BP levels. Therefore, it cannot be concluded by generalizing the target BP in patients treated for hypertension based on the results of our study. Third, it was not possible to determine exactly what are the events that drive the increase in CV death in our study. Indeed, there was no signal of increase in MI or stroke, indeed for the latter it was beneficial. However, our study is sufficient to support that low BP below 120/70 mm Hg might not at least be beneficial in patients treated with antihypertensive medication. Fourth, this study

population was of homogeneous Korean ethnicity, and hypertensive patients with the past MACE were excluded, so caution is required to generalize the findings of this study to other ethnic groups or high-risk populations. Fifth, we used only baseline BP, but did not incorporate the follow-up BP data in our analysis. Thus, we evaluated the longitudinal effect of baseline BP levels, but could not evaluate the effect of follow-up BP. Sixth, prescription of anti-hypertensive medication was evaluated at baseline time. However, we did not evaluate continuous prescription of medication during follow-up. Thus, we could not incorporate the effect of medication compliance in our analysis. In addition, we could not evaluate treatment pattern or dose of medication, which might influence BP levels. Seventh, we extracted patients with hypertension between 2002 and 2012. At this period, hypertension was defined as ≥140 and/or ≥90 mm Hg according to The Sixth and Seventh Reports of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure.[28,29] So, there is inconsistency of hypertension definition between this study and current American guidelines. Finally, even subgroup analysis of patients without heart failure had consistent results, but we could not exclude all the patients with any cardiovascular disease like angina, peripheral arterial disease or patients with history of revascularization. Therefore, it cannot be concluded by generalizing the target BP in patients treated for hypertension based on the results of our study. However, our study was worthwhile because that it was a nationwide study with a large sample size and long-term follow-up periods and we had consistent results that low BP <120/70 mm Hg might not at least be beneficial, even when we reanalyzed the subgroup without heart failure. Based on our findings, well-designed studies related to the BP goal in patients treated for hypertension are needed.

CONCLUSIONS

Elevated BP is a strong predictor for future MACE in all Korean patients with hypertension. However, in patients treated with antihypertensive medication, low BP <120/70 mm Hg might not at least be beneficial for the prevention of MACE.

ARTICLE INFORMATION

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Disclosures

The authors have no conflicts of interest relevant to the manuscript to disclose.

Supplementary Material

Tables S1–S12
Figure S1

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SUPPLEMENTAL MATERIAL

Table S1. Baseline Characteristics of the Study Population According to Blood Pressure Level among Men.

	Blood Pressure Level (mmHg)				
	<120/<70	120–129/70–79	130–139/80–89	140–149/90–99	≥150/≥100
Number of patients (%)	6,232 (2.99)	45,274 (22.40)	88,658 (43.86)	46,719 (23.11%)	21,492 (10.63)
Age (years)	58 (48–68)	57 (48–66)	57 (48–65)	58 (4–66)	60 (50–68)
Blood pressure (mmHg)					
Systolic blood pressure	110.52 ± 5.93	121.44 ± 5.41	131.74 ± 5.06	142.45 ± 4.40	156.88 ± 8.23
Diastolic blood pressure	65.85 ± 3.12	75.01 ± 3.24	82.38 ± 3.98	88.08 ± 5.51	93.95 ± 8.16
Household income (%)					
First (highest)	2,314 (37.13)	16,119 (35.60)	31,216 (35.21)	15,573 (33.33)	6,348 (29.54)
Second	1,624 (26.06)	11,759 (25.97)	23,037 (25.98)	12,107 (25.91)	5,478 (25.49)
Third	1,191 (19.11)	9,080 (20.06)	17,338 (19.56)	9,316 (19.94)	4,699 (21.86)
Fourth (lowest)	1,103 (17.70)	8,316 (18.37)	17,067 (19.25)	9,723 (20.81)	4,967 (23.11)
Smoking (%)					
Never	2,162 (34.69)	15,864 (35.04)	33,189 (37.43)	18,227 (39.01)	8,992 (41.84)

Past	1,813 (29.09)	14,472 (31.97)	29,286 (33.03)	15,086 (32.29)	6,080 (28.29)
Current	2,257 (36.22)	14,938 (32.99)	26,183 (29.53)	13,406 (28.69)	6,420 (29.87)
Physical activity, times/week (%)					
0	3,070 (49.26)	20,712 (45.75)	38,818 (43.78)	21,200 (45.38)	10,717 (49.87)
1–2	1,078 (17.30)	8,007 (17.69)	15,619 (17.62)	8,053 (17.24)	3,675 (17.10)
3–4	806 (12.93)	6,186 (13.66)	12,514 (14.11)	6,419 (13.74)	2,550 (11.86)
5–6	520 (8.34)	4,406 (9.73)	9,077 (10.24)	4,501 (9.63)	1,721 (8.01)
7	758 (12.16)	5,963 (13.17)	12,630 (14.25)	6,546 (14.01)	2,829 (13.16)
Alcohol consumption, times/week (%)					
0	3,301 (52.97)	20,111 (44.42)	34,759 (39.21)	17,096 (36.59)	7,713 (35.89)
<1	1,133 (18.18)	8,575 (18.94)	16,503 (18.61)	7,934 (16.98)	3,233 (15.04)
1–2	1,171 (18.79)	10,939 (24.16)	24,524 (27.66)	13,454 (28.80)	6,095 (28.36)
3–4	347 (5.57)	3,092 (6.83)	7,199 (8.12)	4,373 (9.36)	2,271 (10.57)
≥5	280 (4.49)	2,557 (5.65)	5,673 (6.40)	3,862 (8.27)	2,180 (10.14)
Body mass index (kg/m^2)	23.18 ± 2.87	24.40 ± 2.99	25.01 ± 3.03	25.22 ± 3.19	25.11 ± 3.38

Glucose (mg/dl)	103.81 ± 35.60	105.95 ± 32.29	107.81 ± 31.56	110.17 ± 33.49	113.24 ± 38.54
Total cholesterol (mg/dl)	182.96 ± 47.69	187.47 ± 37.80	190.77 ± 39.66	192.85 ± 40.19	195.02 ± 40.69
Diabetes mellitus (%)	1,011 (16.22)	6,197 (13.69)	9,852 (11.11)	4,868 (10.42)	2,194 (10.21)
Aspirin (%)	1,675 (26.88)	11,912 (26.31)	24,070 (27.15)	12,346 (26.43)	5,385 (25.06)
Statin (%)	908 (14.57)	6,192 (13.68)	10,720 (12.09)	4,917 (10.52)	1,990 (9.26)
Anti-hypertensive medication (%)	2,169 (34.80)	19,939 (44.04)	44,284 (49.95)	24,186 (51.77)	11,153 (51.89)

Data are expressed as mean ± standard deviation, median (interquartile range), or number (percentage).

Table S2. Baseline Characteristics of the Study Population According to Blood Pressure Level among Women.

	Blood Pressure Level (mmHg)				
	<120/<70	120–129/70–79	130–139/80–89	140–149/90–99	≥150/≥100
Number of patients (%)	17,524 (6.47)	72,667 (28.67)	104,894 (41.38)	51,874 (20.47)	24,025 (9.48)
Age (years)	53 (44–62)	58 (51–66)	60 (53–68)	62 (55–70)	66 (57–72)
Blood pressure (mmHg)					
Systolic blood pressure	108.64 ± 6.48	121.07 ± 5.76	132.01 ± 5.00	142.93 ± 4.01	156.78 ± 7.65
Diastolic blood pressure	65.36 ± 3.28	74.52 ± 3.31	25.09 ± 3.35	86.54 ± 5.57	91.45 ± 7.52
Household income (%)					
First (highest)	6,063 (34.60)	24,801 (34.13)	35,466 (33.81)	17,487 (33.71)	7,960 (33.13)
Second	4,197 (23.95)	17,319 (23.83)	25,211 (24.03)	12,724 (24.53)	5,797 (24.13)
Third	3,402 (19.41)	13,551 (18.65)	19,445 (18.54)	9,745 (18.79)	4,626 (19.25)
Fourth (lowest)	3,862 (22.04)	16,996 (23.39)	24,772 (23.62)	11,918 (22.97)	5,642 (23.48)
Smoking (%)					
Never	16,408 (93.63)	69,498 (95.64)	101,479 (96.74)	50,442 (97.24)	23,358 (97.22)

Past	334 (1.91)	950 (1.31)	1,053 (1.00)	462 (0.89)	199 (0.83)
Current	782 (4.46)	2,219 (3.05)	2,362 (2.25)	970 (1.87)	468 (1.95)
Physical activity, times/week (%)					
0	9,789 (55.86)	43,196 (59.44)	63,519 (60.56)	32,763 (63.16)	15,866 (66.04)
1–2	2,763 (15.77)	9,247 (12.73)	12,790 (12.19)	6,038 (11.64)	2,722 (11.33)
3–4	2,046 (11.68)	7,783 (10.71)	10,866 (10.36)	4,859 (9.37)	2,007 (8.35)
5–6	1,364 (7.78)	5,454 (7.51)	7,752 (7.39)	3,488 (6.72)	1,330 (5.54)
7	1,562 (8.91)	6,987 (9.62)	9,967 (9.50)	4,726 (9.11)	2,100 (8.74)
Alcohol consumption, times/week (%)					
0	14,506 (82.78)	62,330 (85.77)	91,148 (86.90)	45,567 (87.84)	21,205 (88.26)
<1	1,881 (10.73)	6,198 (8.53)	7,964 (7.59)	3,531 (6.81)	1,499 (6.24)
1–2	868 (4.95)	3,174 (4.37)	4,337 (4.13)	2,076 (4.00)	965 (4.02)
3–4	139 (0.79)	491 (0.68)	682 (0.65)	320 (0.62)	171 (0.71)
≥5	130 (0.74)	474 (0.65)	763 (0.73)	380 (0.73)	185 (0.77)
Body mass index (kg/m^2)	23.09 ± 3.08	24.43 ± 3.25	25.09 ± 3.35	25.38 ± 3.47	25.47 ± 3.70

Glucose (mg/dl)	96.39 ± 23.08	101.23 ± 26.80	103.38 ± 27.25	105.53 ± 29.01	108.04 ± 32.24
Total cholesterol (mg/dl)	194.21 ± 37.50	199.55 ± 40.46	202.35 ± 40.96	204.46 ± 43.41	207.61 ± 48.24
Diabetes mellitus (%)	1,881 (10.73)	8,626 (11.87)	10,952 (11.54)	5,229 (10.08)	2,608 (10.86)
Aspirin (%)	2,538 (14.48)	15,801 (21.74)	26,518 (25.28)	13,781 (26.57)	6,417 (26.71)
Statin (%)	2,367 (13.51)	11,042 (15.20)	14,929 (14.23)	6,999 (13.49)	3,095 (12.88)
Anti-hypertensive medication (%)	4,386 (25.03)	31,365 (43.16)	55,828 (53.22)	29,887 (57.61)	14,395 (59.92)

Data are expressed as mean ± standard deviation, median (interquartile range), or number (percentage).

Table S3. Incidences of Major Cardiovascular Events According to Blood Pressure Level and Sex in All Hypertensive Patients.

Blood pressure (mmHg)	Events (n)	Person-years	Incidence (events/100,000 person-years)	Adjusted HR (95% CI)
In men				
Cardiovascular death				
<120/<70	220	52,019	423	1.32 (1.14–1.51)
120–129/70–79	1,131	412,540	274	1.03 (0.95–1.10)
130–139/80–89	2,126	849,679	250	1.00 (reference)
140–149/90–99	1,476	443,447	333	1.21 (1.14–1.30)
≥150/≥100	1,047	189,449	553	1.65 (1.53–1.78)
MI				
<120/<70	169	55,612	304	1.06 (0.90–1.24)
120–129/70–79	1,182	428,001	276	1.06 (0.99–1.14)
130–139/80–89	2,183	879,137	248	1.00 (reference)
140–149/90–99	1,170	465,919	251	1.01 (0.94–1.08)

≥150/≥100	588	207,148	284	1.08 (0.99–1.19)
Stroke				
<120/<70	418	54,055	773	0.74 (0.67–0.82)
120–129/70–79	3,465	414,244	836	0.91 (0.88–0.95)
130–139/80–89	7,375	846,043	872	1.00 (reference)
140–149/90–99	4,645	442,992	1,049	1.14 (1.10–1.18)
≥150/≥100	2,758	193,099	1,428	1.37 (1.31–1.43)
Cardiovascular death or MI or stroke				
<120/<70	714	52,464	1,361	0.90 (0.83–0.97)
120–129/70–79	5,192	404,558	1,283	0.96 (0.93–0.99)
130–139/80–89	10,541	828,466	1,272	1.00 (reference)
140–149/90–99	6,439	433,203	1,486	1.11 (1.08–1.15)
≥150/≥100	3,810	187,252	2,035	1.35 (1.30–1.40)
In women				
Cardiovascular death				
<120/<70	220	151,230	145	1.15 (1.00–1.33)

120–129/70–79	1,239	655,273	189	1.02 (0.95–1.09)
130–139/80–89	2,094	970,441	216	1.00 (reference)
140–149/90–99	1,431	478,468	299	1.17 (1.09–1.25)
≥150/≥100	1,103	213,163	517	1.55 (1.44–1.67)
MI				
<120/<70	160	153,981	104	0.93 (0.79–1.09)
120–129/70–79	942	667,878	141	1.00 (0.93–1.09)
130–139/80–89	1,505	991,865	152	1.00 (reference)
140–149/90–99	888	493,678	180	1.08 (1.00–1.18)
≥150/≥100	537	225,048	239	1.26 (1.14–1.40)
Stroke				
<120/<70	677	151,122	448	0.67 (0.62–0.73)
120–129/70–79	4,691	645,443	727	0.87 (0.84–0.90)
130–139/80–89	8,554	948,891	901	1.00 (reference)
140–149/90–99	5,210	466,687	1,116	1.13 (1.09–1.17)
≥150/≥100	2,981	209,448	1,423	1.25 (1.20–1.31)

Cardiovascular death or MI or stroke				
<120/<70	962	149,583	643	0.78 (0.73–0.83)
120–129/70–79	6,170	638,209	967	0.91 (0.88–0.94)
130–139/80–89	10,919	937,020	1,165	1.00 (reference)
140–149/90–99	6,673	459,318	1,453	1.12 (1.09–1.16)
≥150/≥100	3,981	204,186	1,950	1.29 (1.24–1.34)

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S4. Incidences of Major Cardiovascular Events including Heart Failure According to Blood Pressure Level in All Hypertensive Patients without baseline heart failure.

Blood pressure (mmHg)	Events (n)	Person-years	Incidence (events/100,000 person-years)	Adjusted HR (95% CI)
In total population				
Cardiovascular death				
<120/<70	303	192,246	158	1.02 (0.90–1.14)
120–129/70–79	1,964	1,023,864	192	0.98 (0.93–1.03)
130–139/80–89	3,730	1,763,644	211	1.00 (reference)
140–149/90–99	2,616	894,075	293	1.21 (1.15–1.27)
≥150/≥100	1,944	389,510	499	1.63 (1.54–1.72)
MI				

<120/<70	269	197,313	136	0.92 (0.82–1.05)
120–129/70–79	1,868	1,048,385	178	1.03 (0.97–1.09)
130–139/80–89	3,292	1,810,760	182	1.00 (reference)
140–149/90–99	1,835	929,072	198	1.04 (0.98–1.10)
≥150/≥100	985	417,192	236	1.16 (1.08–1.24)
Stroke				
<120/<70	911	193,623	471	0.67 (0.62–0.71)
120–129/70–79	7,192	1,016,272	708	0.88 (0.85–0.90)
130–139/80–89	14,484	1,740,804	832	1.00 (reference)
140–149/90–99	8,943	883,074	1,013	1.13 (1.10–1.16)
≥150/≥100	5,185	389,953	1,330	1.30 (1.26–1.34)
Heart failure				

<120/<70	578	195,815	295	1.30 (1.19–1.42)
120–129/70–79	3,190	1,042,018	306	1.13 (1.08–1.18)
130–139/80–89	5,089	1,802,330	282	1.00 (reference)
140–149/90–99	2,901	923,436	314	1.03 (0.98–1.07)
≥150/≥100	1,633	413,916	395	1.13 (1.07–1.20)
Cardiovascular death or MI or stroke or heart failure				
<120/<70	1939	188,038	1,031	0.86 (0.82–0.90)
120–129/70–79	13,200	983,397	1,342	0.96 (0.94–0.98)
130–139/80–89	24,626	1,685,373	1,461	1.00 (reference)
140–149/90–99	14,869	850,720	1,748	1.11 (1.08–1.13)
≥150/≥100	8,723	370,389	2,355	1.30 (1.27–1.33)
In men				

Cardiovascular death				
<120/<70	154	49,113	314	1.09 (0.92–1.28)
120–129/70–79	966	398,810	242	0.99 (0.92–1.07)
130–139/80–89	1,925	831,251	232	1.00 (reference)
140–149/90–99	1,369	434,534	315	1.24 (1.16–1.33)
≥150/≥100	965	185,549	520	1.67 (1.54–1.80)
MI				
<120/<70	142	52,111	272	1.04 (0.88–1.23)
120–129/70–79	1,069	412,720	259	1.06 (0.99–1.15)
130–139/80–89	2,011	859,099	234	1.00 (reference)
140–149/90–99	1,076	455,901	236	1.00 (0.93–1.08)
≥150/≥100	537	202,387	265	1.08 (0.98–1.19)

Stroke				
<120/<70	353	50,765	695	0.71 (0.64–0.79)
120–129/70–79	3,147	400,140	786	0.91 (0.87–0.94)
130–139/80–89	6,880	827,989	831	1.00 (reference)
140–149/90–99	4,329	434,348	997	1.13 (1.09–1.18)
≥150/≥100	2,559	189,270	1,352	1.35 (1.29–1.41)
Heart failure				
<120/<70	206	51,791	398	1.51 (1.31–1.75)
120–129/70–79	1,224	412,314	297	1.23 (1.14–1.32)
130–139/80–89	2,025	859,889	235	1.00 (reference)
140–149/90–99	1,259	454,874	277	1.12 (1.04–1.20)
≥150/≥100	677	201,792	335	1.23 (1.13–1.34)

Cardiovascular death or MI or stroke or heart failure				
<120/<70	796	48,377	1,645	0.95 (0.88–1.02)
120–129/70–79	5,912	384,330	1,538	1.00 (0.96–1.03)
130–139/80–89	11,842	800,222	1,480	1.00 (reference)
140–149/90–99	7,300	417,784	1,747	1.21 (1.09–1.16)
≥150/≥100	4,230	179,862	2,352	1.34 (1.30–1.39)
In women				
Cardiovascular death				
<120/<70	149	143,133	104	0.99 (0.84–1.17)
120–129/70–79	998	625,053	160	0.98 (0.91–1.06)
130–139/80–89	1,805	932,392	194	1.00 (reference)
140–149/90–99	1,247	459,541	271	1.17 (1.09–1.26)

≥150/≥100	979	203,961	480	1.57 (1.45–1.70)
MI				
<120/<70	127	145,201	87	0.88 (0.73–1.06)
120–129/70–79	799	635,664	126	1.01 (0.93–1.10)
130–139/80–89	1,281	951,661	135	1.00 (reference)
140–149/90–99	759	473,171	160	1.09 (1.00–1.20)
≥150/≥100	448	214,805	209	1.26 (1.13–1.40)
Stroke				
<120/<70	558	142,857	391	0.64 (0.58–0.69)
120–129/70–79	4,045	616,131	657	0.85 (0.82–0.89)
130–139/80–89	7,604	912,815	833	1.00 (reference)
140–149/90–99	4,614	448,726	1,028	1.13 (1.09–1.17)

≥150/≥100	2,626	200,683	1,309	1.25 (1.20–1.31)
Heart failure				
<120/<70	372	144,024	258	1.23 (1.11–1.38)
120–129/70–79	1,966	629,703	312	1.08 (1.02–1.15)
130–139/80–89	3,064	942,440	325	1.00 (reference)
140–149/90–99	1,642	468,561	350	0.96 (0.91–1.02)
≥150/≥100	956	212,124	451	1.07 (0.99–1.15)
Cardiovascular death or MI or stroke or heart failure				
<120/<70	1,143	139,661	818	0.83 (0.78–0.88)
120–129/70–79	7,288	599,066	1,217	0.93 (0.90–0.96)
130–139/80–89	12,784	885,150	1,444	1.00 (reference)
140–149/90–99	7,569	432,936	1,748	1.09 (1.06–1.12)

≥150/≥100	4,493	190,526	2,358	1.26 (1.21–1.30)

Major cardiovascular event was defined as a composite of cardiovascular death, myocardial infarction, stroke, or heart failure.

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S5. Incidences of Major Cardiovascular Events including Heart Failure According to Blood Pressure Level in Treated Hypertensive Patients without baseline heart failure.

Blood pressure (mmHg)	Events (n)	Person-years	Incidence (events/100,000 person-years)	Adjusted HR (95% CI)
In total population				
Cardiovascular death				
<120/<70	157	47,921	328	1.39 (1.18–1.64)
120–129/70–79	997	427,274	233	1.05 (0.98–1.14)
130–139/80–89	1,919	878,877	218	1.00 (reference)
140–149/90–99	1,369	469,968	291	1.19 (1.11–1.28)
≥150/≥100	1,022	211,504	483	1.58 (1.46–1.70)
MI				

<120/<70	105	49,832	211	1.10 (0.91–1.35)
120–129/70–79	895	438,111	204	1.10 (1.01–1.19)
130–139/80–89	1,674	902,028	186	1.00 (reference)
140–149/90–99	931	487,955	191	0.99 (0.92–1.08)
≥150/≥100	545	225,351	242	1.18 (1.07–1.30)
Stroke				
<120/<70	346	48,525	713	0.79 (0.71–0.88)
120–129/70–79	3,296	424,112	777	0.90 (0.86–0.94)
130–139/80–89	7,336	868,068	845	1.00 (reference)
140–149/90–99	4,625	465,180	994	1.11 (1.07–1.15)
≥150/≥100	2,715	211,700	1,282	1.26 (1.21–1.32)
Heart failure				

<120/<70	244	49,201	496	1.63 (1.43–1.86)
120–129/70–79	1,541	435,307	354	1.20 (1.12–1.28)
130–139/80–89	2,608	898,217	290	1.00 (reference)
140–149/90–99	1,581	485,072	326	1.05 (0.99–1.12)
≥150/≥100	915	223,739	409	1.16 (1.07–1.25)
Cardiovascular death or MI or stroke or heart failure				
<120/<70	795	46,140	1,723	1.09 (1.01-1.17)
120–129/70–79	6,249	408,803	1,529	1.00 (0.97-1.04)
130–139/80–89	12,540	841,436	1,490	1.00 (reference)
140–149/90–99	7,783	449,098	1,733	1.09 (1.06-1.12)
≥150/≥100	4,672	201,614	2,317	1.28 (1.24-1.32)
In men				

Cardiovascular death				
<120/<70	84	15,274	550	1.55 (1.24–1.94)
120–129/70–79	468	168,214	278	1.05 (0.94–1.17)
130–139/80–89	953	399,418	239	1.00 (reference)
140–149/90–99	686	215,834	318	1.23 (1.12–1.36)
≥150/≥100	469	93,290	503	1.60 (1.43–1.79)
MI				
<120/<70	69	16,374	421	1.41 (1.11–1.81)
120–129/70–79	519	173,870	298	1.15 (1.03–1.28)
130–139/80–89	998	412,749	242	1.00 (reference)
140–149/90–99	548	226,496	242	1.00 (0.90–1.11)
≥150/≥100	290	101,155	287	1.14 (1.00–1.30)

Stroke				
<120/<70	142	15,929	891	0.79 (0.66–0.93)
120–129/70–79	1,461	168,548	867	0.93 (0.88–0.98)
130–139/80–89	3,435	397,784	864	1.00 (reference)
140–149/90–99	2,171	216,032	1.005	1.11 (1.05–1.17)
≥150/≥100	1,254	95,087	1,319	1.29 (1.21–1.38)
Heart failure				
<120/<70	100	16,277	614	2.01 (1.63–2.47)
120–129/70–79	582	173,834	335	1.28 (1.15–1.42)
130–139/80–89	1,014	413,221	245	1.00 (reference)
140–149/90–99	665	226,034	294	1.16 (1.05–1.28)
≥150/≥100	366	100,819	363	1.30 (1.15–1.47)

Cardiovascular death or MI or stroke or heart failure				
<120/<70	367	14,740	2,490	1.23 (1.10-1.37)
120–129/70–79	2,809	161,090	1,744	1.04 (1.00-1.09)
130–139/80–89	5,911	384,686	1,537	1.00 (reference)
140–149/90–99	3,704	208,065	1,780	1.11 (1.07-1.16)
≥150/≥100	2,144	90,364	2,373	1.33 (1.26-1.40)
In women				
Cardiovascular death				
<120/<70	73	32,646	224	1.28 (1.01–1.63)
120–129/70–79	529	259,059	204	1.06 (0.96–1.18)
130–139/80–89	966	479,459	201	1.00 (reference)
140–149/90–99	683	254,134	269	1.15 (1.05–1.27)

≥150/≥100	553	118,214	468	1.56 (1.40–1.73)
MI				
<120/<70	36	33,457	108	0.81 (0.58–1.14)
120–129/70–79	376	264,240	142	1.05 (0.92–1.19)
130–139/80–89	676	489,279	138	1.00 (reference)
140–149/90–99	383	261,459	146	0.98 (0.87–1.11)
≥150/≥100	255	124,195	205	1.21 (1.05–1.40)
Stroke				
<120/<70	204	32,595	626	0.78 (0.68–0.90)
120–129/70–79	1,835	255,564	718	0.88 (0.83–0.93)
130–139/80–89	3,901	470,283	830	1.00 (reference)
140–149/90–99	2,454	249,148	985	1.10 (1.05–1.16)

≥150/≥100	1,461	116,613	1,253	1.23 (1.16–1.31)
Heart failure				
<120/<70	144	32,923	437	1.47 (1.24–1.75)
120–129/70–79	959	261,472	367	1.16 (1.07–1.25)
130–139/80–89	1,594	484,995	329	1.00 (reference)
140–149/90–99	916	259,038	354	0.98 (0.91–1.07)
≥150/≥100	549	122,919	447	1.07 (0.97–1.18)
Cardiovascular death or MI or stroke or heart failure				
<120/<70	428	31,400	1,363	1.00 (0.91-1.11)
120–129/70–79	3,440	247,713	1,389	0.98 (0.94-1.02)
130–139/80–89	6,629	456,750	1,451	1.00 (reference)
140–149/90–99	4,079	241,032	1,692	1.07 (1.03-1.11)

≥150/≥100	2,528	111,250	2,272	1.23 (1.18-1.29)

Major cardiovascular event was defined as a composite of cardiovascular death, myocardial infarction, stroke, or heart failure.

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S6. Incidences of Major Cardiovascular Events According to Blood Pressure Level and Sex in Patients with <50 Years.

	In all hypertensive patients				In treated hypertensive patients			
Blood pressure (mmHg)	Events (n)	Person-years	Incidence (n/100,000 person-years)	Adjusted HR (95% CI)	Events (n)	Person-years	Incidence (n/100,000 person-years)	Adjusted HR (95% CI)
In men								
All-cause death								
<120/<70	41	15,892	258	1.09 (0.79–1.51)	9	2,535	355	1.34 (0.68–2.61)
120–129/70–79	251	126,818	198	0.90 (0.77–1.04)	99	35,702	277	1.10 (0.87–1.40)
130–139/80–89	562	252,602	222	1.00 (reference)	227	94,297	241	1.00 (reference)
140–149/90–99	364	120,294	303	1.31 (1.15–1.50)	179	47,746	375	1.53 (1.25–1.86)
≥150/≥100	220	46,370	474	1.98 (1.69–2.32)	92	17,996	511	2.01 (1.57–2.57)
Cardiovascular death								
<120/<70	10	15,892	63	1.20 (0.62–2.32)	3	2,535	118	1.61 (0.50–5.19)

120–129/70–79	42	126,818	33	0.69 (0.49–0.99)	25	35,702	70	1.08 (0.67–1.74)
130–139/80–89	119	252,602	47	1.00 (reference)	57	94,297	60	1.00 (reference)
140–149/90–99	103	120,294	86	1.80 (1.38–2.35)	49	47,746	103	1.70 (1.16–2.49)
≥150/≥100	72	46,370	155	3.19 (2.37–4.29)	34	17,996	189	2.96 (1.92–4.57)
MI								
<120/<70	15	16,017	94	0.69 (0.41–1.15)	6	2,556	235	1.20 (0.53–2.72)
120–129/70–79	187	126,666	148	1.00 (0.84–1.19)	81	35,547	228	1.24 (0.95–1.63)
130–139/80–89	396	252,828	157	1.00 (reference)	162	94,393	172	1.00 (reference)
140–149/90–99	193	121,096	159	1.03 (0.87–1.22)	81	48,191	168	1.00 (0.77–1.31)
≥150/≥100	82	47,191	174	1.17 (0.92–1.49)	31	18,327	169	1.02 (0.69–1.50)
Stroke								
<120/<70	22	15,996	138	0.51 (0.33–0.78)	5	2,563	195	0.55 (0.23–1.32)
120–129/70–79	279	126,144	221	0.82 (0.71–0.95)	95	35,547	267	0.7890.62–0.99)
130–139/80–89	709	250,786	283	1.00 (reference)	308	93,412	330	1.00 (reference)
140–149/90–99	432	119,510	361	1.27 (1.12–1.43)	192	47,474	404	1.25 (1.04–1.49)
≥150/≥100	307	45,970	668	2.37 (2.07–2.72)	121	17,855	678	2.12 (0.71–2.63)

Cardiovascular death or MI or stroke								
<120/<70	46	15,850	290	0.65 (0.49–0.88)	14	2,499	560	0.93 (0.55–1.59)
120–129/70–79	493	124,767	395	0.88 (0.79–0.97)	195	34,926	558	0.99 (0.84–1.17)
130–139/80–89	1173	248,000	473	1.00 (reference)	499	92,299	541	1.00 (reference)
140–149/90–99	675	118,113	571	1.20 (1.10–1.32)	297	46,884	633	1.19 (1.03–1.37)
≥150/≥100	426	45,330	940	2.02 (1.80–2.25)	170	17,620	965	1.82 (1.52–2.17)
In women								
All-cause death								
<120/<70	59	57,401	103	1.01 (0.73–1.39)	14	5,606	250	2.07 (1.14–3.77)
120–129/70–79	113	131,235	86	0.80 (0.62–1.02)	31	34,258	90	0.78 (0.51–1.19)
130–139/80–89	159	139,311	114	1.00 (reference)	68	59,839	114	1.00 (reference)
140–149/90–99	76	54,561	139	1.19 (0.91–1.57)	39	26,537	147	1.30 (0.87–1.92)
≥150/≥100	45	19,459	231	1.94 (1.39–2.70)	29	9,946	292	2.53 (1.64–3.92)
Cardiovascular								

death								
<120/<70	9	57,401	16	0.59 (0.27–1.27)	3	5,606	54	1.63 (0.46–5.77)
120–129/70–79	19	131,235	14	0.57 (0.32–1.00)	8	34,258	23	0.78 (0.34–1.82)
130–139/80–89	35	139,311	25	1.00 (reference)	17	59,839	28	1.00 (reference)
140–149/90–99	19	54,561	35	1.40 (0.80–2.44)	8	26,537	30	1.09 (0.47–2.53)
≥150/≥100	21	19,459	108	4.30 (2.50–7.41)	10	9,946	101	3.45 (1.57–7.56)
MI								
<120/<70	16	57,594	28	0.88 (0.50–1.57)	0	5,663	0	0
120–129/70–79	61	131,402	46	1.18 (0.83–1.69)	17	34,284	50	1.02 (0.56–1.86)
130–139/80–89	63	139,570	45	1.00 (reference)	30	59,966	50	1.00 (reference)
140–149/90–99	36	54,687	66	1.40 (0.93–2.10)	17	26,593	64	1.26 (0.70–2.29)
≥150/≥100	11	19,584	56	1.17 (0.61–2.21)	5	10,048	50	0.96 (0.37–2.47)
Stroke								
<120/<70	60	57,398	105	0.48 (0.36–0.64)	8	5,639	142	0.57 (0.28–1.18)
120–129/70–79	272	130,162	209	0.86 (0.73–1.01)	73	33,996	215	0.85 (0.64–1.12)
130–139/80–89	363	137,976	263	1.00 (reference)	150	59,251	253	1.00 (reference)

140–149/90–99	198	53,763	368	1.37 (1.16–1.64)	84	26,262	320	1.27 (0.97–1.66)
≥150/≥100	111	19,078	582	2.16 (1.75–2.68)	52	9,779	532	2.09 (1.52–2.87)
Cardiovascular death or MI or stroke								
<120/<70	83	57,265	145	0.56 (0.44–0.71)	11	5,617	196	0.64 (0.34–1.18)
120–129/70–79	341	129,778	263	0.90 (0.78–1.04)	92	33,894	271	0.85 (0.66–1.09)
130–139/80–89	439	137,489	319	1.00 (reference)	188	59,033	318	1.00 (reference)
140–149/90–99	236	53,548	441	0.35 (1.15–1.58)	103	26,134	394	1.24 (0.98–1.58)
≥150/≥100	130	18,945	686	2.09 (1.72–2.54)	62	9,701	639	1.99 (1.49–2.65)

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S7. Incidences of Major Cardiovascular Events According to Blood Pressure Level and Sex in Patients with 50-59 Years.

	In all hypertensive patients				In treated hypertensive patients			
Blood pressure (mmHg)	Events (n)	Person-years	Incidence (n/100,000 person-years)	Adjusted HR (95% CI)	Events (n)	Person-years	Incidence (n/100,000 person-years)	Adjusted HR (95% CI)
In men								
All-cause death								
<120/<70	104	12870	808	1.24 (1.01–1.52)	49	4,413	1,110	1.81 (1.35–2.43)
120–129/70–79	632	115607	547	0.95 (0.87–1.05)	283	54,269	521	0.95 (0.83–1.09)
130–139/80–89	1425	261264	545	1.00 (reference)	702	133,517	526	1.00 (reference)
140–149/90–99	875	129946	673	1.23 (1.13–1.34)	434	67,436	644	1.22 (1.08–1.37)
≥150/≥100	533	47825	1114	1.88 (1.70–2.07)	253	24,499	1,033	1.82 (1.57–2.10)
Cardiovascular death								
<120/<70	21	12870	163	1.30 (0.83–2.03)	14	4,413	317	2.74 (1.57–4.79)

120–129/70–79	129	115607	112	0.99 (0.80–1.21)	67	54,269	123	1.21 (0.90–1.63)
130–139/80–89	281	261264	108	1.00 (reference)	128	133,517	96	1.00 (reference)
140–149/90–99	166	129946	128	1.21 (0.99–1.46)	81	67,436	120	1.28 (0.97–1.69)
≥150/≥100	124	47825	259	2.26 (1.83–2.80)	57	24,499	233	2.43 (1.78–3.32)
MI								
<120/<70	39	13174	296	1.07 (0.77–1.48)	19	4,541	418	1.51 (0.95–2.41)
120–129/70–79	306	116447	263	1.00 (0.87–1.150	152	54,487	279	1.10 (0.91–1.34)
130–139/80–89	650	263660	247	1.00 (reference)	317	134,617	235	1.00 (reference)
140–149/90–99	289	132452	218	0.93 (0.81–1.06)	152	68,628	221	0.99 (0.81–1.20)
≥150/≥100	118	50051	236	1.00 (0.82–1.22)	62	25,584	242	1.09 (0.83–1.43)
Stroke								
<120/<70	73	12973	563	0.72 (0.57–0.91)	25	4,479	558	0.72 (0.48–1.08)
120–129/70–79	703	114160	616	0.90 (0.82–0.98)	328	53,447	614	0.92 (0.81–1.04)
130–139/80–89	1645	257026	640	1.00 (reference)	826	131,305	629	1.00 (reference)
140–149/90–99	957	127944	748	1.19 (1.10–1.29)	474	66,488	713	1.15 (1.03–1.29)
≥150/≥100	514	47421	1084	1.66 (1.50–1.83)	240	24,367	985	1.53 (1.32–1.77)

Cardiovascular death or MI or stroke								
<120/<70	123	12709	968	0.83 (0.69–1.00)	51	4,347	1,173	1.02(0.77–1.35)
120–129/70–79	1078	111886	963	0.93 (0.86–0.99)	521	52,342	995	0.99(0.89–1.10)
130–139/80–89	2455	252261	973	1.00 (reference)	1,215	129,136	941	1.00 (reference)
140–149/90–99	1324	125810	1052	1.11 (1.04–1.18)	660	65,464	1,008	1.10(1.00–1.21)
≥150/≥100	680	46509	1462	1.49 (1.37–1.62)	321	23,956	1,340	1.42(1.25–1.61)
In women								
All-cause death								
<120/<70	86	46662	184	0.99 (0.79–1.24)	30	11,817	254	1.27 (0.87–1.85)
120–129/70–79	408	213945	191	0.99 (0.87–1.12)	181	88,571	204	1.03 (0.86–1.24)
130–139/80–89	599	308523	194	1.00 (reference)	308	156,533	197	1.00 (reference)
140–149/90–99	326	132175	247	1.25 (1.10–1.44)	177	72,378	245	1.24 (1.03–1.49)
≥150/≥100	173	46328	373	1.87 (1.58–2.22)	100	25,984	385	1.90 (1.51–2.38)
Cardiovascular								

death								
<120/<70	18	46662	39	0.95 (0.58–1.56)	8	11,817	68	1.47 (0.70–3.01)
120–129/70–79	81	213945	38	0.90 (0.68–1.19)	36	88,571	41	0.91 (0.60–1.35)
130–139/80–89	131	308523	42	1.00 (reference)	70	156,533	45	1.00 (reference)
140–149/90–99	78	132175	59	1.38 (1.04–1.82)	51	72,378	70	1.60 (1.11–2.29)
≥150/≥100	54	46328	117	2.68 (1.95–3.69)	35	25,984	135	3.00 (1.99–4.52)
MI								
<120/<70	47	46691	101	1.15 (0.84–1.57)	7	11,879	59	0.67 (0.31–1.43)
120–129/70–79	198	214498	92	1.03 (0.86–1.24)	74	88,890	83	1.00 (0.75–1.33)
130–139/80–89	273	309267	88	1.00 (reference)	127	157,015	81	1.00 (reference)
140–149/90–99	143	132754	108	1.21 (0.99–1.48)	71	72,653	98	1.20 (0.90–1.60)
≥150/≥100	58	46822	124	1.34 (1.01–1.78)	27	26,295	103	1.16 (0.77–1.77)
Stroke								
<120/<70	139	46197	301	0.60 (0.51–0.72)	43	11,687	368	0.73 (0.53–0.99)
120–129/70–79	822	210670	390	0.77 (0.71–0.84)	350	87,157	402	0.80 (0.71–0.91)
130–139/80–89	1515	301458	503	1.00 (reference)	754	153,150	492	1.00 (reference)

140–149/90–99	736	128912	571	1.12 (1.03–1.22)	397	70,648	562	1.12 (1.00–1.27)
≥150/≥100	302	45276	667	1.27 (1.12–1.44)	155	25,495	608	1.17 (0.99–1.40)
Cardiovascular death or MI or stroke								
<120/<70	198	45827	432	0.71 (0.61–0.82)	57	11,618	491	0.79(0.60–1.03)
120–129/70–79	1047	209455	500	0.81 (0.75–0.87)	438	86,692	505	0.83(0.74–0.93)
130–139/80–89	1845	299554	616	1.00 (reference)	913	152,345	599	1.00 (reference)
140–149/90–99	904	127897	707	1.13 (1.05–1.23)	485	70,084	692	1.14(1.02–1.27)
≥150/≥100	381	44878	849	1.32 (1.18–1.47)	197	25,277	779	1.23(1.06–1.44)

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S8. Incidences of Major Cardiovascular Events According to Blood Pressure Level and Sex in Patients with 60-69 Years.

	In all hypertensive patients				In treated hypertensive patients			
Blood pressure (mmHg)	Events (n)	Person-years	Incidence (n/100,000 person-years)	Adjusted HR (95% CI)	Events (n)	Person-years	Incidence (n/100,000 person-years)	Adjusted HR (95% CI)
In men								
All-cause death								
<120/<70	287	14,230	2,017	1.24 (1.10–1.40)	128	5,912	2,165	1.31 (1.09–1.57)
120–129/70–79	1,707	113,987	1,498	1.02 (0.96–1.08)	826	58,090	1,422	0.97 (0.89–1.06)
130–139/80–89	3,239	231,183	1,401	1.00 (reference)	1,743	125,673	1,387	1.00 (reference)
140–149/90–99	1,999	129,409	1,545	1.08 (1.02–1.14)	1,099	71,115	1,545	1.08 (1.00–1.17)
≥150/≥100	1,306	58,936	2,216	1.48 (1.38–1.58)	698	32,865	2,124	1.46 (1.33–1.59)
Cardiovascular death								
<120/<70	66	14,230	464	1.42 (1.10–1.83)	41	5,912	694	2.11 (1.52–2.93)

120–129/70–79	366	113,987	321	1.10 (0.96–1.25)	198	58,090	341	1.17 (0.98–1.39)
130–139/80–89	644	231,183	279	1.00 (reference)	347	125,673	276	1.00 (reference)
140–149/90–99	450	129,409	348	1.23 (1.09–1.39)	253	71,115	356	1.25 (1.07–1.48)
≥150/≥100	303	58,936	514	1.76 (1.54–2.02)	166	32,865	505	1.78 (1.47–2.14)
MI								
<120/<70	48	15,216	315	0.93 (0.70–1.26)	20	6,306	317	0.96 (0.61–1.51)
120–129/70–79	399	118,709	336	1.11 (0.98–1.25)	209	60,093	348	1.18 (1.00–1.40)
130–139/80–89	690	240,529	287	1.00 (reference)	363	130,478	278	1.00 (reference)
140–149/90–99	397	136,089	292	1.04 (0.92–1.18)	207	74,781	277	1.00 (0.84–1.19)
≥150/≥100	204	64,278	317	1.14 (0.97–1.33)	118	35,542	332	1.22 (0.99–1.50)
Stroke								
<120/<70	142	14,621	971	0.74 (0.63–0.88)	71	5,997	1,184	0.95 (0.75–1.20)
120–129/70–79	1,276	113,328	1,126	0.91 (0.85–0.98)	647	57,626	1,123	0.96 (0.87–1.05)
130–139/80–89	2,715	227,902	1,191	1.00 (reference)	1,409	124,238	1,134	1.00 (reference)
140–149/90–99	1,711	127,775	1,339	1.12 (1.06–1.19)	896	70,468	1,271	1.11 (1.02–1.21)
≥150/≥100	985	59,214	1,663	1.36 (1.26–1.46)	532	32,969	1,614	1.38 (1.25–1.53)

Cardiovascular death or MI or stroke								
<120/<70	228	14,165	1,610	0.86 (0.75–0.98)	118	5,767	2,046	1.15 (0.95–1.38)
120–129/70–79	1,867	110,199	1,694	0.98 (0.93–1.04)	958	56,015	1,710	1.04 (0.96–1.12)
130–139/80–89	3,685	222,532	1,656	1.00 (reference)	1,920	121,559	1,579	1.00 (reference)
140–149/90–99	2,296	124,731	1,841	1.11 (1.06–1.17)	1,212	68,867	1,760	1.10 (1.03–1.19)
≥150/≥100	1,312	57,376	2,287	1.36 (1.27–1.45)	722	31,962	2,259	1.40 (1.29–1.53)
In women								
All-cause death								
<120/<70	238	31,624	753	1.29 (1.12–1.47)	99	11,586	854	1.45 (1.18–1.79)
120–129/70–79	1,092	200,081	546	0.94 (0.87–1.01)	526	94,695	555	0.97 (0.87–1.08)
130–139/80–89	1,921	329,033	584	1.00 (reference)	1,007	175,652	573	1.00 (reference)
140–149/90–99	1,184	175,256	676	1.11 (1.04–1.20)	661	99,112	667	1.12 (1.02–1.24)
≥150/≥100	752	78,399	959	1.54 (1.41–1.68)	443	46,895	945	1.55 (1.38–1.73)
Cardiovascular								

death								
<120/<70	45	31,624	142	0.97 (0.72–1.33)	25	11,586	216	1.45 (0.96–2.19)
120–129/70–79	273	200,081	136	0.94 (0.81–1.09)	145	94,695	153	1.05 (0.85–1.28)
130–139/80–89	482	329,033	146	1.00 (reference)	257	175,652	146	1.00 (reference)
140–149/90–99	352	175,256	201	1.32 (1.15–1.51)	185	99,112	187	1.22 (1.01–1.48)
≥150/≥100	220	78,399	281	1.79 (1.52–2.10)	125	46,895	267	1.70 (1.37–2.11)
MI								
<120/<70	53	32,255	164	1.00 (0.75–1.32)	26	11,803	220	1.28 (0.86–1.92)
120–129/70–79	340	202,214	168	1.02 (0.89–1.17)	187	95,565	196	1.17 (0.97–1.40)
130–139/80–89	550	333,540	165	1.00 (reference)	297	177,901	167	1.00 (reference)
140–149/90–99	338	178,253	190	1.13 (0.99–1.29)	168	100,880	167	0.98 (0.81–1.18)
≥150/≥100	194	80,538	241	1.40 (1.19–1.65)	118	48,189	245	1.40 (1.13–1.73)
Stroke								
<120/<70	232	31,272	742	0.73 (0.64–0.84)	92	11,448	804	0.82 (0.66–1.01)
120–129/70–79	1,694	194,071	873	0.88 (0.83–0.93)	781	92,085	848	0.90 (0.83–0.98)
130–139/80–89	3,138	317,384	989	1.00 (reference)	1,589	170,167	934	1.00 (reference)

140–149/90–99	1,973	168,030	1,174	1.17 (1.10–1.24)	1,054	95,681	1,102	1.16 (1.07–1.26)
≥150/≥100	1,045	75,015	1,393	1.35 (1.26–1.45)	598	45,172	1,324	1.36 (1.24–1.50)
Cardiovascular death or MI or stroke								
<120/<70	316	30,830	1,025	0.82 (0.73–0.92)	137	11,204	1,223	0.99 (0.83–1.18)
120–129/70–79	2,154	191,687	1,124	0.91 (0.86–0.96)	1,044	90,805	1,150	0.97 (0.90–1.04)
130–139/80–89	3,856	313,729	1,229	1.00 (reference)	1,981	168,241	1,177	1.00 (reference)
140–149/90–99	2,436	165,654	1,471	1.18 (1.12–1.24)	1,292	94,600	1,366	1.14 (1.06–1.22)
≥150/≥100	1,307	73,550	1,777	1.39 (1.30–1.48)	757	44,334	1,707	1.39 (1.28–1.51)

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S9. Incidences of Major Cardiovascular Events According to Blood Pressure Level and Sex in Patients with ≥70 Years.

	In all hypertensive patients				In treated hypertensive patients			
Blood pressure (mmHg)	Events (n)	Person-years	Incidence (n/100,000 person-years)	Adjusted HR (95% CI)	Events (n)	Person-years	Incidence (n/100,000 person-years)	Adjusted HR (95% CI)
In men								
All-cause death								
<120/<70	530	9,028	5,871	1.22 (1.12–1.34)	238	4,079	5,835	1.28 (1.12–1.46)
120–129/70–79	2,690	56,128	4,793	1.06 (1.01–1.11)	1,219	27,964	4,359	1.01 (0.95–1.09)
130–139/80–89	4,630	104,631	4,425	1.00 (reference)	2,351	56,247	4,180	1.00 (reference)
140–149/90–99	3,092	63,798	4,847	1.09 (1.05–1.15)	1,585	34,839	4,549	1.08 (1.02–1.15)
≥150/≥100	2,101	36,318	5,785	1.24 (1.18–1.31)	1,054	20,292	5,194	1.16 (1.08–1.25)
Cardiovascular death								
<120/<70	123	9,028	1,362	1.24 (1.03–1.50)	73	4,079	1,790	1.69 (1.32–2.16)

120–129/70–79	594	56,128	1,058	1.01 (0.91–1.12)	276	27,964	987	1.01 (0.88–1.17)
130–139/80–89	1,082	104,631	1,034	1.00 (reference)	535	56,247	951	1.00 (reference)
140–149/90–99	757	63,798	1,187	1.14 (1.04–1.25)	359	34,839	1,030	1.08 (0.95–1.24)
≥150/≥100	548	36,318	1,509	1.37 (1.23–1.51)	262	20,292	1,291	1.27 (1.09–1.47)
MI								
<120/<70	67	11,205	598	1.48 (1.14–1.91)	36	4,970	724	1.72 (1.21–2.45)
120–129/70–79	290	66,180	438	1.16 (1.00–1.34)	138	32,348	427	1.10 (0.89–1.36)
130–139/80–89	447	122,120	366	1.00 (reference)	240	64,505	372	1.00 (reference)
140–149/90–99	291	76,281	381	1.06 (0.91–1.23)	150	40,746	368	1.00 (0.81–1.22)
≥150/≥100	184	45,627	403	1.11 (0.93–1.32)	103	24,579	419	1.12 (0.89–1.41)
Stroke								
<120/<70	181	10,465	1,730	0.79 (0.68–0.92)	77	4,768	1,615	0.78 (0.62–0.98)
120–129/70–79	1,207	60,611	1,991	0.94 (0.88–1.01)	559	29,947	1,867	0.94 (0.85–1.04)
130–139/80–89	2,306	110,329	2,090	1.00 (reference)	1,149	59,007	1,947	1.00 (reference)
140–149/90–99	1,545	67,763	2,280	1.10 (1.03–1.17)	763	36,842	2,071	1.06 (0.97–1.16)
≥150/≥100	952	40,494	2,351	1.11 (1.03–1.20)	474	22,232	2,132	1.08 (0.97–1.20)

Cardiovascular death or MI or stroke								
<120/<70	317	9,740	3,255	0.99 (0.88–1.11)	160	4,325	3,699	1.14 (0.97–1.35)
120–129/70–79	1,754	57,705	3,040	0.98 (0.92–1.03)	830	28,500	2,912	0.96 (0.89–1.05)
130–139/80–89	3,228	105,674	3,055	1.00 (reference)	1,649	56,541	2,916	1.00 (reference)
140–149/90–99	2,144	64,549	3,322	1.09 (1.03–1.15)	1,066	35,365	3,014	1.03 (0.95–1.11)
≥150/≥100	1,392	38,037	3,660	1.17 (1.10–1.25)	707	21,003	3,366	1.12 (1.03–1.23)
In women								
All-cause death								
<120/<70	492	15,542	3,166	1.23 (1.13–1.36)	233	7,243	3,217	1.30 (1.14–1.49)
120–129/70–79	2,923	110,013	2,657	1.07 (1.02–1.12)	1,493	56,851	2,626	1.09 (1.02–1.16)
130–139/80–89	4,916	193,574	2,540	1.00 (reference)	2,626	108,267	2,425	1.00 (reference)
140–149/90–99	3,283	116,477	2,819	1.08 (1.03–1.13)	1,851	67,451	2,744	1.10 (1.04–1.17)
≥150/≥100	2,427	68,977	3,519	1.25 (1.19–1.31)	1,376	40,860	3,368	1.26 (1.18–1.34)
Cardiovascular								

death								
<120/<70	148	15,542	952	1.27 (1.07–1.50)	84	7,243	1,160	1.61 (1.28–2.01)
120–129/70–79	866	110,013	787	1.08 (0.99–1.17)	470	56,851	827	1.16 (1.04–1.30)
130–139/80–89	1,446	193,574	747	1.00 (reference)	772	108,267	713	1.00 (reference)
140–149/90–99	982	116,477	843	1.10 (1.01–1.19)	559	67,451	829	1.13 (1.01–1.26)
≥150/≥100	808	68,977	1,171	1.40 (1.28–1.53)	448	40,860	1,096	1.39 (1.24–1.56)
MI								
<120/<70	44	17,441	252	0.82 (0.60–1.11)	20	8,115	246	0.82 (0.52–1.29)
120–129/70–79	343	119,765	286	0.96 (0.84–1.10)	176	61,892	284	0.9890.72–1.18)
130–139/80–89	619	209,488	295	1.00 (reference)	336	116,536	288	1.00 (reference)
140–149/90–99	371	127,984	290	0.97 (0.85–1.10)	197	73,684	267	0.91 (0.76–1.09)
≥150/≥100	274	78,103	351	1.15 (0.99–1.32)	159	45,751	348	1.15 (0.95–1.39)
Stroke								
<120/<70	246	16,255	1,513	0.80 (0.70–0.91)	117	7,570	1,546	0.85 (0.71–1.03)
120–129/70–79	1,903	110,539	1,722	0.93 (0.88–0.98)	951	57,362	1,658	0.93 (0.86–1.01)
130–139/80–89	3,538	192,073	1,842	1.00 (reference)	1,906	107,792	1,768	1.00 (reference)

140–149/90–99	2,303	115,982	1,986	1.08 (1.02–1.14)	1,267	67,430	1,879	1.06 (0.99–1.14)
≥150/≥100	1,523	70,080	2,173	1.16 (1.09–1.23)	856	41,493	2,063	1.15 (1.06–1.24)
Cardiovascular death or MI or stroke								
<120/<70	365	15,662	2,330	0.87 (0.78–0.97)	180	7,282	2,472	0.97 (0.83–1.13)
120–129/70–79	2,628	107,291	2,449	0.95 (0.91–1.00)	1,340	55,746	2,404	0.97 (0.91–1.03)
130–139/80–89	4,779	186,248	2,566	1.00 (reference)	2,578	104,785	2,460	1.00 (reference)
140–149/90–99	3,097	112,218	2,760	1.07 (1.02–1.12)	1,728	65,287	2,647	1.06 (1.00–1.13)
≥150/≥100	2,163	66,813	3,237	1.21 (1.15–1.27)	1,215	39,768	3,055	1.19 (1.11–1.28)

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S10. Incidences of Major Cardiovascular Events According to Blood Pressure Level and Sex among Treated Hypertensive Patients.

Blood pressure (mmHg)	Events (n)	Person-years	Incidence (events/100,000 person-years)	Adjusted HR (95% CI)
In men				
Cardiovascular death				
<120/<70	131	16,939	773	1.94 (1.61–2.33)
120–129/70–79	566	176,025	322	1.10 (0.99–1.21)
130–139/80–89	1,067	409,734	260	1.00 (reference)
140–149/90–99	742	221,136	336	1.20 (1.09–1.32)
≥150/≥100	521	95,652	545	1.60 (1.44–1.78)
MI				
<120/<70	81	18,373	441	1.35 (1.08–1.70)
120–129/70–79	580	182,475	318	1.15 (1.04–1.27)
130–139/80–89	1,082	423,992	255	1.00 (reference)
140–149/90–99	590	232,346	254	0.99 (0.90–1.10)

≥150/≥100	314	104,032	302	1.13 (0.99–1.28)
Stroke				
<120/<70	178	17,808	1,000	0.82 (0.71–0.96)
120–129/70–79	1,629	176,567	923	0.93 (0.88–0.99)
130–139/80–89	3,692	407,960	905	1.00 (reference)
140–149/90–99	2,325	221,272	1,051	1.11 (1.06–1.17)
≥150/≥100	1,367	97,423	1,403	1.32 (1.24–1.40)
Cardiovascular death or MI or stroke				
<120/<70	343	16,939	2,025	1.12 (1.01–1.25)
120–129/70–79	2,504	171,783	1,458	1.00 (0.96–1.05)
130–139/80–89	5,283	399,536	1,322	1.00 (reference)
140–149/90–99	3,235	216,580	1,494	1.09 (1.04–1.14)
≥150/≥100	1,920	94,541	2,031	1.32 (1.25–1.39)
In women				
Cardiovascular death				
<120/<70	120	36,251	331	1.57 (1.30–1.90)

120–129/70–79	659	274,375	240	1.11 (1.01–1.22)
130–139/80–89	1,116	500,291	223	1.00 (reference)
140–149/90–99	803	265,477	302	1.18 (1.08–1.29)
≥150/≥100	618	123,776	499	1.53 (1.39–1.69)
MI				
<120/<70	53	37,460	141	0.92 (0.70–1.22)
120–129/70–79	454	280,631	162	1.06 (0.94–1.18)
130–139/80–89	790	511,418	154	1.00 (reference)
140–149/90–99	453	273,809	165	0.99 (0.88–1..11)
≥150/≥100	309	130,282	237	1.25 (1.09–1.42)
Stroke				
<120/<70	260	36,344	715	0.81 (0.71–0.91)
120–129/70–79	2,155	270,600	796	0.89 (0.85–0.94)
130–139/80–89	4,399	490,359	897	1.00 (reference)
140–149/90–99	2,802	260,021	1,078	1.12 (1.06–1.17)
≥150/≥100	1,661	121,939	1,362	1.24 (1.17–1.31)

Cardiovascular death or MI or stroke				
<120/<70	385	35,721	1,078	0.93 (0.84–1.03)
120–129/70–79	2,914	267,137	1,091	0.94 (0.90–0.98)
130–139/80–89	5,660	484,404	1,168	1.00 (reference)
140–149/90–99	3,608	256,106	1,409	1.11 (1.06–1.16)
≥150/≥100	2,231	119,080	1,874	1.28 (1.22–1.34)

HR was adjusted for age, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, diabetes mellitus, and medication (aspirin or statin). CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S11. Incidences of Major Cardiovascular Events According to Blood Pressure Level in Patients without antihypertensive medications.

Blood pressure (mmHg)	Events (n)	Person-years	Incidence (events/100,000 person-years)	Adjusted HR (95% CI)
In total population				
All-cause death				
<120/<70	1,037	150,058	691	1.09 (1.02-1.16)
120–129/70–79	5,158	617,412	835	1.00 (0.97-1.04)
130–139/80–89	8,419	910,095	925	1.00 (reference)
140–149/90–99	5,174	435,302	1,189	1.11 (1.07-1.15)
≥150/≥100	3,512	183,183	1,917	1.44 (1.38-1.49)
Cardiovascular death				
<120/<70	189	150,058	126	0.86 (0.74-1.00)
120–129/70–79	1,145	617,412	185	0.93 (0.86-1.00)
130–139/80–89	2,037	910,095	224	1.00 (reference)

140–149/90–99	1,362	435,302	313	1.19 (1.11-1.28)
≥150/≥100	1,011	183,183	552	1.65 (1.53-1.78)
MI				
<120/<70	195	153,759	127	0.82 (0.71-0.95)
120–129/70–79	1,090	632,773	172	0.94 (0.87-1.02)
130–139/80–89	1,816	935,592	194	1.00 (reference)
140–149/90–99	1,015	453,442	224	1.10 (1.01-1.18)
≥150/≥100	502	197,880	254	1.16 (1.05-1.28)
Stroke				
<120/<70	657	151,025	435	0.62 (0.58-0.68)
120–129/70–79	4,372	612,519	714	0.86 (0.83-0.89)
130–139/80–89	7,838	896,614	874	1.00 (reference)
140–149/90–99	4,728	428,386	1,104	1.17 (1.12-1.21)
≥150/≥100	2,711	183,185	1,480	1.36 (1.30-1.42)
Cardiovascular death or MI or stroke				
<120/<70	948	149,387	635	0.68 (0.63-0.73)

120–129/70–79	5,944	603,847	984	0.88 (0.85-0.91)
130–139/80–89	10,517	881,545	1,193	1.00 (reference)
140–149/90–99	6,269	419,834	1,493	1.15 (1.12-1.19)
≥150/≥100	3,640	177,816	2,047	1.37 (1.32-1.43)
In Men				
All-cause death				
<120/<70	538	35,080	1,534	1.17 (1.07-1.28)
120–129/70–79	2,853	236,514	1,206	1.06 (1.01-1.11)
130–139/80–89	4,833	439,945	1,099	1.00 (reference)
140–149/90–99	3,033	222,311	1,364	1.12 (1.07-1.17)
≥150/≥100	2,063	93,796	2,199	1.48 (1.41-1.56)
Cardiovascular death				
<120/<70	89	35,080	254	0.91 (0.73-1.13)
120–129/70–79	565	236,514	239	0.97 (0.88-1.07)
130–139/80–89	1,059	439,945	241	1.00 (reference)
140–149/90–99	734	222,311	330	1.23 (1.12-1.35)

≥150/≥100	526	93,796	561	1.69 (1.52-1.87)
MI				
<120/<70	88	37,238	236	0.89 (0.72-1.11)
120–129/70–79	602	245,525	245	0.99 (0.90-1.10)
130–139/80–89	1,101	455,145	242	1.00 (reference)
140–149/90–99	580	233,572	248	1.01 (0.92-1.12)
≥150/≥100	274	103,115	266	1.04 (0.91-1.19)
Stroke				
<120/<70	240	36,247	662	0.69 (0.61-0.79)
120–129/70–79	1,836	237,676	772	0.90 (0.85-0.95)
130–139/80–89	3,683	438,082	841	1.00 (reference)
140–149/90–99	2,320	221,720	1,046	1.17 (1.11-1.23)
≥150/≥100	1,391	95,676	1,454	1.42 (1.33-1.51)
Cardiovascular death or MI or stroke				
<120/<70	371	35,525	1,044	0.75 (0.67-0.83)
120–129/70–79	2,688	232,775	1,155	0.92 (0.88-0.96)

130–139/80–89	5,258	428,929	1,226	1.00 (reference)
140–149/90–99	3,204	216,622	1,479	1.14 (1.10-1.20)
≥150/≥100	1,890	92,710	2,039	1.39 (1.32-1.47)
In Women				
All-cause death				
<120/<70	499	114,978	434	1.17 (1.07-1.29)
120–129/70–79	2,305	380,897	605	1.00 (0.95-1.06)
130–139/80–89	3,586	470,149	763	1.00 (reference)
140–149/90–99	2,141	212,990	1,005	1.08 (1.03-1.14)
≥150/≥100	1,449	89,386	1,621	1.33 (1.25-1.42)
Cardiovascular death				
<120/<70	100	114,978	87	0.91 (0.74-1.12)
120–129/70–79	580	380,897	152	0.94 (0.85-1.05)
130–139/80–89	978	470,149	208	1.00 (reference)
140–149/90–99	628	212,990	295	1.15 (1.04-1.27)
≥150/≥100	485	89,386	543	1.58 (1.41-1.76)

MI				
<120/<70	107	116,521	92	0.93 (0.76-1.15)
120–129/70–79	488	387,247	126	0.96 (0.86-1.08)
130–139/80–89	715	480,447	149	1.00 (reference)
140–149/90–99	435	219,869	198	1.20 (1.07-1.36)
≥150/≥100	228	94,765	241	1.29 (1.11-1.50)
Stroke				
<120/<70	417	114,778	363	0.61 (0.55-0.67)
120–129/70–79	2,536	374,842	677	0.85 (0.81-0.89)
130–139/80–89	4,155	458,532	906	1.00 (reference)
140–149/90–99	2,408	206,666	1,165	1.16 (1.10-1.22)
≥150/≥100	1,320	87,509	1,508	1.29 (1.21-1.37)
Cardiovascular death or MI or stroke				
<120/<70	577	113,862	507	0.69 (0.63-0.75)
120–129/70–79	3,256	371,071	877	0.87 (0.83-0.91)
130–139/80–89	5,259	452,615	1,162	1.00 (reference)

140–149/90–99	3,065	203,211	1,508	1.15 (1.10-1.21)
≥150/≥100	1,750	85,106	2,056	1.33 (1.26-1.41)

HR was adjusted for age, sex, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, and medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Table S12. Incidences of Major Cardiovascular Events According to Blood Pressure Level in Patients without Diabetes.

Blood pressure (mmHg)	Events (n)	Person-years	Incidence (events/100,000 person-years)	Adjusted HR (95% CI)
In total population				
All-cause death				
<120/<70	1,465	179,776	815	1.20 (1.14-1.27)
120–129/70–79	8,079	939,591	860	1.01 (0.98-1.04)
130–139/80–89	14,731	1,636,421	900	1.00 (reference)
140–149/90–99	9,488	833,369	1,139	1.11 (1.08-1.14)
≥150/≥100	6,505	362,596	1,794	1.39 (1.35-1.44)
Cardiovascular death				
<120/<70	371	179,776	206	1.25 (1.12-1.39)
120–129/70–79	1,992	939,591	212	1.01 (0.96-1.07)
130–139/80–89	3,623	1,636,421	221	1.00 (reference)
140–149/90–99	2,511	833,369	301	1.18 (1.12-1.24)

≥150/≥100	1,901	362,596	524	1.61 (1.53-1.71)
MI				
<120/<70	273	184,722	148	0.95 (0.83-1.07)
120–129/70–79	1,720	962,972	179	0.99 (0.94-1.05)
130–139/80–89	3,117	1,679,385	186	Ref
140–149/90–99	1,762	865,297	204	1.05 (0.99-1.11)
≥150/≥100	950	388,354	245	1.16 (1.08-1.25)
Stroke				
<120/<70	883	181,277	487	0.67 (0.62-0.72)
120–129/70–79	6,782	932,541	727	0.87 (0.85-0.90)
130–139/80–89	13,743	1,613,191	852	1.00 (reference)
140–149/90–99	8,548	821,764	1,040	1.13 (1.10-1.16)
≥150/≥100	5,002	362,425	1,380	1.31 (1.27-1.35)
Cardiovascular death or MI or stroke				
<120/<70	1,372	178,593	768	0.79 (0.75-0.83)
120–129/70–79	9,421	918,616	1,026	0.91 (0.89-0.93)

130–139/80–89	18,439	1,588,185	1,161	1.00 (reference)
140–149/90–99	11,358	806,779	1,408	1.12 (1.10-1.15)
≥150/≥100	6,784	352,756	1,923	1.33 (1.29-1.37)
In Men				
All-cause death				
<120/<70	740	44,178	1,675	1.25 (1.16-1.35)
120–129/70–79	4,298	359,441	1,196	1.04 (1.00-1.08)
130–139/80–89	8,313	762,451	1,090	1.00 (reference)
140–149/90–99	5,353	400,574	1,336	1.11 (1.07-1.15)
≥150/≥100	3,593	171,372	2,097	1.42 (1.37-1.48)
Cardiovascular death				
<120/<70	177	44,178	401	1.33 (1.14-1.56)
120–129/70–79	943	359,441	262	1.02 (0.95-1.11)
130–139/80–89	1,843	762,451	242	1.00 (reference)
140–149/90–99	1,261	400,574	315	1.18 (1.10-1.27)
≥150/≥100	934	171,372	545	1.66 (1.53-1.80)

MI				
<120/<70	140	46,868	299	1.14 (0.96-1.35)
120–129/70–79	966	371,973	260	1.06 (0.98-1.15)
130–139/80–89	1,860	787,021	236	1.00 (reference)
140–149/90–99	1,007	419,583	240	1.00 (0.93-1.08)
≥150/≥100	507	186,707	272	1.08 (0.98-1.19)
Stroke				
<120/<70	315	45,782	688	0.71 (0.63-0.79)
120–129/70–79	2,856	360,560	792	0.91 (0.87-0.95)
130–139/80–89	6,319	758,470	833	1.00 (reference)
140–149/90–99	4,008	399,651	1,003	1.14 (1.09-1.18)
≥150/≥100	2,405	174,514	1,378	1.37 (1.30-1.43)
Cardiovascular death or MI or stroke				
<120/<70	557	44,444	1,253	0.88 (0.81-0.96)
120–129/70–79	4,289	352,524	1,217	0.96 (0.92-0.99)
130–139/80–89	9,035	743,375	1,215	1.00 (reference)

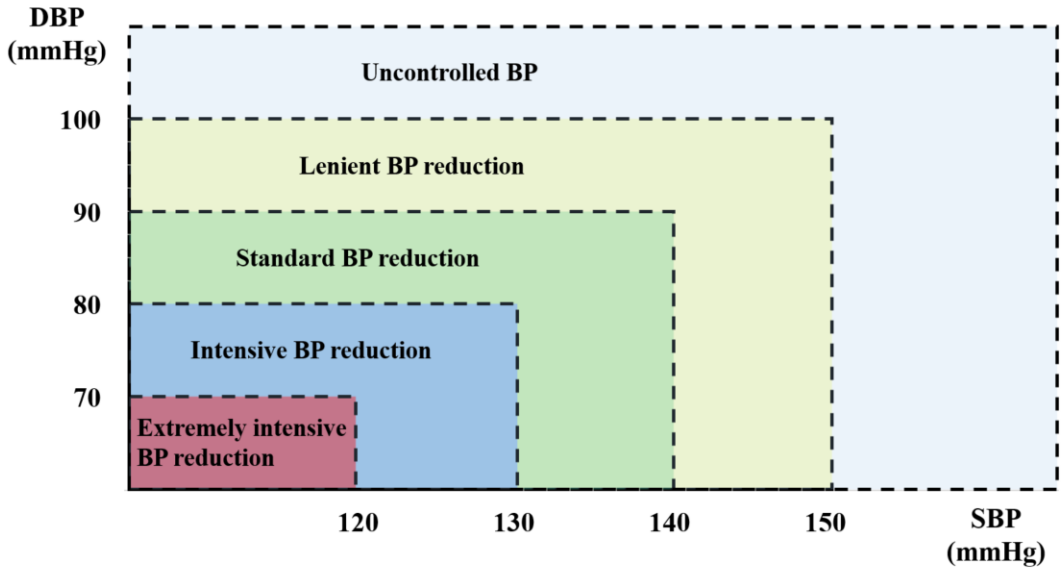
140–149/90–99	5,551	391,129	1,419	1.11 (1.07-1.15)
≥150/≥100	3,334	169,331	1,969	1.36 (1.30-1.41)
In Women				
All-cause death				
<120/<70	725	135,597	535	1.29 (1.20-1.40)
120–129/70–79	3,781	580,150	652	1.03 (0.99-1.08)
130–139/80–89	6,418	873,969	734	1.00 (reference)
140–149/90–99	4,135	432,795	955	1.09 (1.05-1.14)
≥150/≥100	2,912	191,224	1,523	1.33 (1.28-1.39)
Cardiovascular death				
<120/<70	194	135,597	143	1.28 (1.11-1.49)
120–129/70–79	1,049	580,150	181	1.04 (0.97-1.13)
130–139/80–89	1,780	873,969	204	1.00 (reference)
140–149/90–99	1,250	432,795	289	1.18 (1.10-1.27)
≥150/≥100	967	191,224	506	1.55 (1.43-1.68)
MI				

<120/<70	133	137,854	96	0.96 (0.80-1.15)
120–129/70–79	754	590,998	128	0.99 (0.90-1.08)
130–139/80–89	1,257	892,363	141	1.00 (reference)
140–149/90–99	755	445,713	169	1.09 (1.00-1.20)
≥150/≥100	443	201,647	220	1.24 (1.11-1.38)
Stroke				
<120/<70	568	135,495	419	0.66 (0.61-0.72)
120–129/70–79	3,926	571,981	686	0.86 (0.82-0.89)
130–139/80–89	7,424	854,720	869	1.00 (reference)
140–149/90–99	4,540	422,112	1,076	1.13 (1.09-1.17)
≥150/≥100	2,597	187,911	1,382	1.25 (1.20-1.31)
Cardiovascular death or MI or stroke				
<120/<70	815	134,148	608	0.78 (0.73-0.84)
120–129/70–79	5,132	566,091	907	0.89 (0.86-0.92)
130–139/80–89	9,404	844,810	1,113	1.00 (reference)
140–149/90–99	5,807	415,649	1,397	1.13 (1.10-1.17)

≥150/≥100	3,450	183,425	1,881	1.29 (1.24-1.35)

HR was adjusted for age, sex, household income, smoking, physical activity, alcohol consumption, body mass index, glucose, total cholesterol, and medication (aspirin or statin), and antihypertensive medication. CI, confidence interval; HR, hazard ratio; and MI, myocardial infarction.

Figure S1. Categorized study population according to systolic and/or diastolic blood pressure.



Uncontrolled BP was defined as SBP ≥150and/orDBP ≥100 mmHg. Lenient BP reduction group was defined as SBP ≥140and/orDBP ≥90 mmHg after excluding the uncontrolled BP group. In the same way, standard BP reduction was defined as 130–139and/or80–89 mmHg, intensive BP reduction as 120–129and/or70–79 mmHg, and extremely intensive BP reduction as <120/and70 mmHg, respectively. BP, blood pressure; SBP, systolic blood pressure; DBP, diastolic blood pressure.