# Hypertension subtypes, mortality risk, and differential effect between two hypertension guidelines

**Appendix methods**

CHARLS is an ongoing nationally representative longitudinal survey of Chinese adults (age≥45 years). The baseline survey was conducted between June 2011 and March 2012. CHARLS covered 28 provinces, 150 counties/districts, and 450 village/urban communities across the country. The sampling strategy was through multistage probability sampling and stratified by region and within region by rural counties or urban districts and per capita statistics on gross domestic product, county-level units with the exception of Tibet were randomly chosen with a probability-proportional-to-size sampling technique. Furthermore, 3 PSUs were selected in each county and villages (rural)/neighborhoods (urban) were used as primary sampling units (PSUs). Detailed information including demographic characteristics, medical history, prescription drug use, clinical measurement and laboratory testing were collected by standard questionnaires[1].

CHNS is an ongoing longitudinal survey and used a multistage random-cluster sampling process to select samples from nine provinces across China for all age population and conducted from 1989 to 2015. There were nine provinces across four regions were included: East Coast region (Jiangsu and Shandong), Northeast region (Heilongjiang and Liaoning), West region (Guizhou and Gunagxi), Central region (Hennan, Hubei, and Hunan). Basically, nine selected provinces of CHNS vary according to geography, economic development and health indicators in China. CHNS used a weighted sampling scheme and were stratified by income (poor, middle and rich) to randomly select two cities and four counties in each province. Furthermore, 2 urban and 2 suburban neighborhoods within each city and one community in the capital city and three rural villages within each county were randomly selected. All subsequent surveys in CHNS have

obtained anthropometric, dietary, clinical, and all other individual data from each household member[2].

**Appendix Table 1. Blood pressure threshold used to recommend antihypertensive medication according to the 2017 ACC/AHA Guideline and the 2018 CHL Guideline**

| Characteristic | 2017 ACC/AHA | 2018 CHL |
|---|---|---|
| **Systolic Blood Pressure** | | |
| General population | ≥140 | ≥140 |
| Aged ≥65 years | ≥130 | ≥150 |
| High cardiovascular disease risk[1] or CKD | ≥130 | ≥140 |
| Diabetes | ≥130 | ≥130 |
| **Diastolic Blood Pressure** | | |
| General population | ≥90 | ≥90 |
| Aged ≥65 years | ≥80 | ≥90 |
| High cardiovascular disease risk[1] or CKD | ≥80 | ≥90 |
| Diabetes | ≥80 | ≥80 |

ACC/AHA, American College of Cardiology /American Heart Association; CHL, Chinese Hypertension League Blood Pressure Guideline

[1]High cardiovascular risk for ACC/AHA is defined as a history of cardiovascular disease (coronary heart disease, stroke or heart failure) or 10-year predicted cardiovascular disease risk of at least 10% using the pooled cohort risk equations.

**Appendix Table 2. Comparison of Proportion, Numbers of SDH, ISH or IDH, recommended medication between CHL and ACC/AHA by age and sex[1]**

| Description | 2018 CHL Guideline | | 2017 ACC/AHA Guideline | | Difference between CHL and ACC/AHA | |
|---|---|---|---|---|---|---|
| | Proportion (95%CI) , % | Numbers (95%CI) , million | Proportion (95%CI) , % | Numbers (95%CI) , million | Proportion (95%CI) , % | Numbers (95%CI) , million |
| **Age<65** | | | | | | |
| **SDH** | | | | | | |
| SDH in total population | 9.01 (7.61, 10.64) | 29.41 (24.63, 34.18) | 25.54 (22.87, 28.40) | 83.37 (75.44, 91.30) | -16.53 NA | -53.96 NA |
| Recommended antihypertensive medication in total population | 9.01 (7.61, 10.64) | 29.41 (24.63, 34.18) | 21.15 (18.83, 23.68) | 69.05 (61.15, 76.95) | -12.14 NA | -39.58 NA |
| **ISH** | | | | | | |
| ISH in total population | 10.04 (8.12, 12.36) | 32.78 (26.25, 39.31) | 9.99 (8.43, 11.80) | 32.61 (28.32, 36.91) | 0.05 (-2.89, 2.99) | 0.16 (-9.43, 9.76) |
| Recommended antihypertensive medication in total population | 10.04 (8.12, 12.36) | 32.78 (26.25, 39.31) | 5.97 (5.27, 6.75) | 19.49 (16.71, 22.26) | 4.07 (1.80, 6.35) | 13.27 (5.87, 20.70) |
| **IDH** | | | | | | |
| IDH in total population | 2.85 (1.81, 4.46) | 9.29 (5.32, 13.27) | 8.24 (7.20, 9.41) | 26.90 (23.96, 29.83) | -5.39 (-6.91, -3.88) | -17.59 (-22.56,-12.67) |
| Recommended antihypertensive medication in total population | 2.85 (1.81, 4.46) | 9.29 (5.32, 13.27) | 3.54 (2.81, 4.45) | 11.56 (9.40, 13.71) | -0.69 (-1.97, 0.58) | -2.25 (-6.42, 1.89) |
| **Age≥65** | | | | | | |
| **SDH** | | | | | | |
| SDH in total population | 7.45 (6.14, 9.02) | 7.51 (6.15, 8.87) | 25.76 (23.36, 28.31) | 25.95 (23.59, 28.31) | -18.31 NA | -18.44 NA |
| Recommended antihypertensive medication in total population | 7.45 (6.14, 9.02) | 7.51 (6.15, 8.87) | 25.76 (23.36, 28.31) | 25.95 (23.59, 28.31) | -18.31 NA | -18.44 NA |
| **ISH** | | | | | | |
| ISH in total population | 31.16 (28.40, 34.06) | 31.39 (28.79,33.99) | 30.38 (27.98, 32.90) | 30.61 (27.87, 33.35) | 0.78 (-2.22, 3.77) | 0.79 (-2.24,3.80) |
| Recommended antihypertensive medication in total population | 18.32 (16.06, 20.83) | 18.46 (16.15, 20.78) | 30.38 (27.98, 32.90) | 30.61 (27.87, 33.35) | -12.06 (-14.74, -9.38) | -12.18 (-14.89, -9.47) |
| **IDH** | | | | | | |
| IDH in total population | 1.03 | 1.04 | 2.67 | 2.69 | -1.65 | -1.67 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.42, 2.51) | (0.20, 1.87) | (1.79, 3.98) | (1.69, 3.70) | (-2.29, -1.00) | (-2.31, -1.01) |
| Recommended antihypertensive | 1.03 | 1.04 | 2.67 | 2.69 | -1.65 | -1.67 |
| medication in total population | (0.42, 2.51) | (0.20, 1.87) | (1.79, 3.98) | (1.69, 3.70) | (-2.29, -1.00) | (-2.31, -1.01) |

**Male**

**SDH**

| | | | | | | |
|---|---|---|---|---|---|---|
| SDH in total population | 9.76 | 20.11 | 26.24 | 54.04 | -16.48 | -33.93 |
| | (8.54, 11.15) | (17.25, 22.97) | (24.15, 28.44) | (49.41, 58.66) | NA | NA |
| Recommended antihypertensive | 9.76 | 20.11 | 23.77 | 48.95 | -14.01 | -28.86 |
| medication in total population | (8.53, 11.15) | (17.25, 22.97) | (21.60, 26.08) | (44.53, 53.37) | NA | NA |

**ISH**

| | | | | | | |
|---|---|---|---|---|---|---|
| ISH in total population | 13.13 | 27.05 | 15.63 | 32.18 | -2.50 | -5.13 |
| | (11.56, 14.88) | (24.39, 29.70) | (12.72, 19.05) | (27.77, 36.60) | (-6.45, 1.46) | (-13.28, 3.01) |
| Recommended antihypertensive | 10.14 | 20.88 | 12.35 | 25.43 | -2.21 | -4.55 |
| medication in total population | (8.76, 11.70) | (18.45, 23.31) | (10.82, 14.06) | (22.03, 28.84) | (-4.30, -0.13) | (-8.86, -0.27) |

**IDH**

| | | | | | | |
|---|---|---|---|---|---|---|
| IDH in total population | 2.55 | 5.26 | 8.23 | 16.94 | -5.67 | -11.68 |
| | (1.26, 5.10) | (1.63,8.90) | (7.09, 9.53) | (14.83, 19.05) | (-7.87, -3.47) | (-16.21, -7.15) |
| Recommended antihypertensive | 2.55 | 5.26 | 4.34 | 8.94 | -1.79 | -3.69 |
| medication in total population | (1.26, 5.10) | (1.63, 8.90) | (3.62, 5.20) | (7.43, 10.45) | (-3.75, 0.18) | (-7.73, 0.37) |

**Female**

**SDH**

| | | | | | | |
|---|---|---|---|---|---|---|
| SDH in total population | 7.60 | 16.81 | 24.99 | 55.28 | -17.39 | -38.47 |
| | (5.99, 9.60) | (12.72, 20.89) | (21.69, 28.61) | (48.40, 62.17) | NA | NA |
| Recommended antihypertensive | 7.60 | 16.81 | 20.82 | 46.05 | -13.22 | -29.22 |
| medication in total population | (5.99, 9.60) | (12.72, 20.89) | (17.76, 24.24) | (39.10, 53.00) | NA | NA |

**ISH**

| | | | | | | |
|---|---|---|---|---|---|---|
| ISH in total population | 16.78 | 37.13 | 14.03 | 31.04 | 2.75 | 6.09 |
| | (14.05, 19.92) | (30.87, 43.38) | (12.69, 15.49) | (28.27, 33.81) | (-0.49, 5.99) | (-1.08, 13.25) |
| Recommended antihypertensive | 13.73 | 30.37 | 11.15 | 24.66 | 2.58 | -5.70 |
| medication in total population | (11.03, 16.95) | (24.05, 36.68) | (9.93,12.49) | (22.16, 27.16) | (-0.65, 5.81) | (-1.44, 12.84) |

**IDH**

| | | | | | | |
|---|---|---|---|---|---|---|
| IDH in total population | 2.29 | 5.07 | 5.72 | 12.65 | -3.43 | -7.58 |
| | (1.31, 3.98) | (3.23, 6.91) | (4.47, 7.30) | (10.40, 14.89) | (-4.30, -2.55) | (-9.51, -5.64) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Recommended antihypertensive medication in total population | 2.29 (1.31, 3.98) | 5.07 (3.23, 6.91) | 2.40 (1.40, 4.09) | 5.31 (3.47, 7.15) | -0.11 (-0.69, 0.47) | -0.24 (-1.52, 1.04) |

ACC/AHA, American College of Cardiology /American Heart Association; BP, Blood Pressure; CHL, Chinese Hypertension League Blood Pressure Guideline; IDH, Isolated diastolic hypertension; ISH, Isolated systolic hypertension;
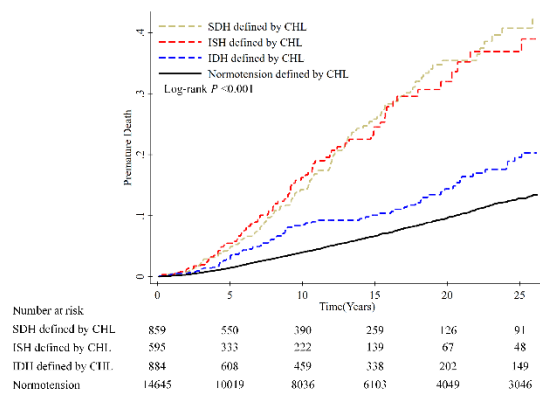
[1]Estimates of proportion and difference between CHL and ACC/AHA Blood Pressure Guideline from CHARLS data.

**Appendix Table 3. Proportion of Chinese adults meeting the definitions for normotension, SDH, ISH, IDH according to 2017 ACC/AHA guideline and 2018 CHL guideline[1]**
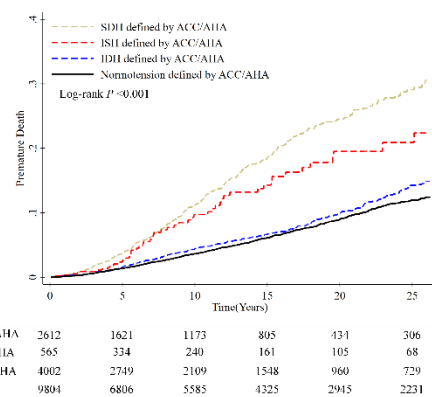
| | 2018 CHL Guideline | | | |
| --- | --- | --- | --- | --- |
| | SBP<140 and DBP<90 mm Hg (Normotension) | SBP≥140 and DBP≥90 mm Hg (SDH) | SBP≥140 and DBP<90 mm Hg (ISH) | SBP<140 and DBP<90 mm Hg (IDH) |
| **2017 ACC/AHA Guideline** | | | | |
| SBP<130 and DBP<80 mm Hg (Normotension) | 52.68(50.06, 55.29) | NA | NA | NA |
| SBP≥130 and DBP≥80 mm Hg (SDH) | 6.55(5.52, 7.75) | 8.64(7.51, 9.93) | 8.76(7.23, 10.58) | 1.64(0.96, 2.79) |
| SBP≥130 and DBP<80 mm Hg (ISH) | 8.54(7.08, 10.27) | NA | 6.26(5.54, 7.06) | NA |
| SBP<130 and DBP≥80 mm Hg (IDH) | 6.15(5.46, 6.91) | NA | NA | 0.78(0.33, 1.81) |

Abbreviation: ACC, American College of Cardiology; AHA, American Heart Association; CHL, Chinese Hypertension League; DBP, Diastolic Blood Pressure; IDH, Isolated Diastolic Hypertension; ISH, Isolated Systolic Hypertension; NA, not applicable; SBP, Systolic Blood Pressure; SDH, Systolic and Diastolic Hypertension.

[1]Numbers of Chinese Adults meeting each criterion of hypertension definition and 95%CI were reported.
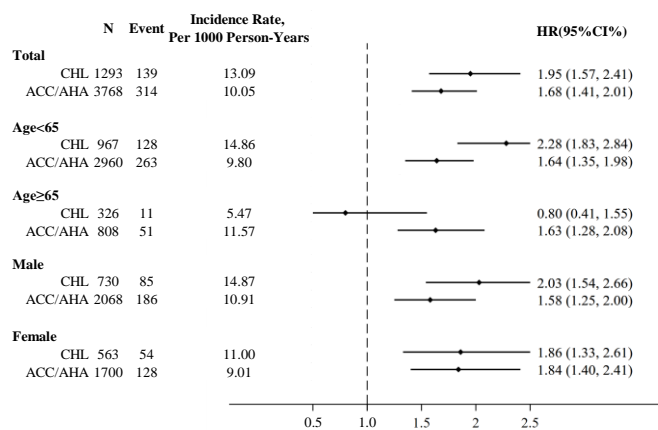
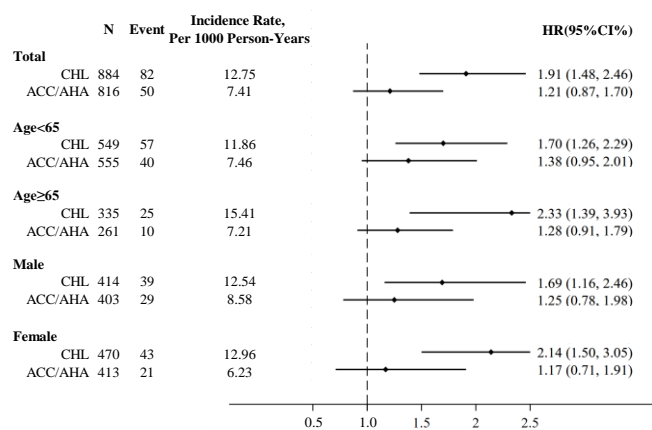**Appendix Figure 1A**      **Appendix Figure 1B**

**Appendix Figure 1.** Cumulative incidence of premature death according to different definition guideline of hypertension.

Data used for calculating Hazards Ratios of premature death were from CHNS.
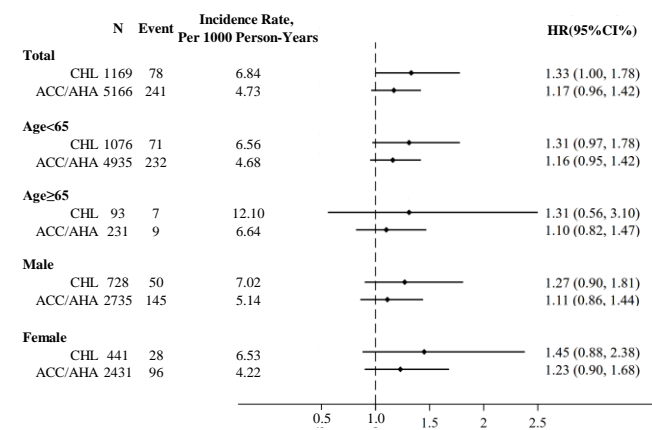
**Appendix Figure 2A.** SDH and premature death

| | N | Event | Incidence Rate, Per 1000 Person-Years | HR(95%CI%) |
|---|---|---|---|---|
| **Total** | | | | |
| CHL | 1293 | 139 | 13.09 | 1.95 (1.57, 2.41) |
| ACC/AHA | 3768 | 314 | 10.05 | 1.68 (1.41, 2.01) |
| **Age<65** | | | | |
| CHL | 967 | 128 | 14.86 | 2.28 (1.83, 2.84) |
| ACC/AHA | 2960 | 263 | 9.80 | 1.64 (1.35, 1.98) |
| **Age≥65** | | | | |
| CHL | 326 | 11 | 5.47 | 0.80 (0.41, 1.55) |
| ACC/AHA | 808 | 51 | 11.57 | 1.63 (1.28, 2.08) |
| **Male** | | | | |
| CHL | 730 | 85 | 14.87 | 2.03 (1.54, 2.66) |
| ACC/AHA | 2068 | 186 | 10.91 | 1.58 (1.25, 2.00) |
| **Female** | | | | |
| CHL | 563 | 54 | 11.00 | 1.86 (1.33, 2.61) |
| ACC/AHA | 1700 | 128 | 9.01 | 1.84 (1.40, 2.41) |

**Appendix Figure 2B.** ISH and premature death

| | N | Event | Incidence Rate, Per 1000 Person-Years | HR(95%CI%) |
|---|---|---|---|---|
| **Total** | | | | |
| CHL | 884 | 82 | 12.75 | 1.91 (1.48, 2.46) |
| ACC/AHA | 816 | 50 | 7.41 | 1.21 (0.87, 1.70) |
| **Age<65** | | | | |
| CHL | 549 | 57 | 11.86 | 1.70 (1.26, 2.29) |
| ACC/AHA | 555 | 40 | 7.46 | 1.38 (0.95, 2.01) |
| **Age≥65** | | | | |
| CHL | 335 | 25 | 15.41 | 2.33 (1.39, 3.93) |
| ACC/AHA | 261 | 10 | 7.21 | 1.28 (0.91, 1.79) |
| **Male** | | | | |
| CHL | 414 | 39 | 12.54 | 1.69 (1.16, 2.46) |
| ACC/AHA | 403 | 29 | 8.58 | 1.25 (0.78, 1.98) |
| **Female** | | | | |
| CHL | 470 | 43 | 12.96 | 2.14 (1.50, 3.05) |
| ACC/AHA | 413 | 21 | 6.23 | 1.17 (0.71, 1.91) |

**Appendix Figure 2C.** IDH and premature death

| | N | Event | Incidence Rate, Per 1000 Person-Years | HR(95%CI%) |
|---|---|---|---|---|
| **Total** | | | | |
| CHL | 1169 | 78 | 6.84 | 1.33 (1.00, 1.78) |
| ACC/AHA | 5166 | 241 | 4.73 | 1.17 (0.96, 1.42) |
| **Age<65** | | | | |
| CHL | 1076 | 71 | 6.56 | 1.31 (0.97, 1.78) |
| ACC/AHA | 4935 | 232 | 4.68 | 1.16 (0.95, 1.42) |
| **Age≥65** | | | | |
| CHL | 93 | 7 | 12.10 | 1.31 (0.56, 3.10) |
| ACC/AHA | 231 | 9 | 6.64 | 1.10 (0.82, 1.47) |
| **Male** | | | | |
| CHL | 728 | 50 | 7.02 | 1.27 (0.90, 1.81) |
| ACC/AHA | 2735 | 145 | 5.14 | 1.11 (0.86, 1.44) |
| **Female** | | | | |
| CHL | 441 | 28 | 6.53 | 1.45 (0.88, 2.38) |
| ACC/AHA | 2431 | 96 | 4.22 | 1.23 (0.90, 1.68) |

**Appendix Figure 2.** SDH, ISH and IDH defined as CHL and ACC/AHA associated with Hazard Ratios of premature death.

SDH, ISH and IDH defined as CHL compared with Normotension defined as CHL (SBP<140 and DBP<90); SDH, ISH and IDH defined as ACC/AHA compared with Normotension defined as ACC/AHA (SBP<130 and DBP<80).

HRs adjusted for age, sex, educational level, marital status, whether rural residents, history of drinking or smoking, body mass index, previous history of diabetes mellitus, CVD or cancer.

**Appendix Table 4. SDH, ISH and IDH associated with Hazard Ratios of all-cause mortality and premature death**

| | N | Event | Incidence Rate, Per 1000 Person-Years | Model 1** HR | Model 1** 95%CI | Model 2† HR | Model 2† 95%CI | Model 3‡ HR | Model 3‡ 95%CI |
|---|---|---|---|---|---|---|---|---|---|
| **All-cause mortality** | | | | | | | | | |
| **CHL** | | | | | | | | | |
| Normotension | 18838 | 1221 | 6.24 | Reference | | Reference | | Reference | |
| SDH | 1293 | 258 | 24.29 | 1.51 | (1.31, 1.74) | 1.56 | (1.34, 1.82) | 1.76 | (1.50, 2.06) |
| ISH | 884 | 159 | 24.73 | 1.30 | (1.10, 1.54) | 1.49 | (1.24, 1.79) | 1.66 | (1.38, 2.00) |
| IDH | 1169 | 121 | 10.61 | 1.19 | (0.99, 1.44) | 1.23 | (0.99, 1.53) | 1.34 | (1.08, 1.67) |
| **ACC/AHA** | | | | | | | | | |
| Normotension | 12434 | 763 | 5.64 | Reference | | Reference | | Reference | |
| SDH | 3768 | 565 | 18.08 | 1.30 | (1.16, 1.45) | 1.39 | (1.22, 1.59) | 1.56 | (1.36, 1.79) |
| ISH | 816 | 115 | 17.03 | 1.10 | (0.90, 1.35) | 1.26 | (1.01, 1.57) | 1.29 | (1.03, 1.61) |
| IDH | 5166 | 316 | 6.20 | 0.99 | (0.87, 1.13) | 1.07 | (0.91, 1.25) | 1.15 | (0.98, 1.35) |
| **Premature death** | | | | | | | | | |
| **CHL** | | | | | | | | | |
| Normotension | 18838 | 871 | 4.45 | Reference | | Reference | | Reference | |
| SDH | 1293 | 139 | 13.09 | 1.62 | (1.35, 1.96) | 1.72 | (1.40, 2.12) | 1.95 | (1.57, 2.41) |
| ISH | 884 | 82 | 12.75 | 1.45 | (1.14, 1.83) | 1.70 | (1.32, 2.19) | 1.91 | (1.48, 2.46) |
| IDH | 1169 | 78 | 6.84 | 1.20 | (0.95, 1.52) | 1.21 | (0.91, 1.60) | 1.33 | (1.00, 1.78) |
| **ACC/AHA** | | | | | | | | | |
| Normotension | 12434 | 565 | 4.18 | Reference | | Reference | | Reference | |
| SDH | 3768 | 314 | 10.05 | 1.37 | (1.18, 1.59) | 1.48 | (1.24, 1.76) | 1.68 | (1.41, 2.01) |
| ISH | 816 | 50 | 7.41 | 0.99 | (0.74, 1.33) | 1.19 | (0.85, 1.65) | 1.21 | (0.87, 1.70) |
| IDH | 5166 | 241 | 4.73 | 1.03 | (0.88, 1.20) | 1.07 | (0.88, 1.29) | 1.17 | (0.96, 1.42) |
| **Age<65** | | | | | | | | | |
| **All cause mortality** | | | | | | | | | |
| **CHL** | | | | | | | | | |
| Normotension | 17709 | 930 | 4.92 | Reference | | Reference | | Reference | |
| SDH | 967 | 153 | 17.76 | 1.83 | (1.53, 2.18) | 1.94 | (1.60, 2.35) | 2.14 | (1.76, 2.61) |
| ISH | 549 | 75 | 15.60 | 1.28 | (1.01, 1.64) | 1.51 | (1.17, 1.95) | 1.65 | (1.27, 2.14) |
| IDH | 1076 | 88 | 8.13 | 1.21 | (0.97, 1.51) | 1.29 | (0.99, 1.67) | 1.41 | (1.08, 1.84) |
| **ACC/AHA** | | | | | | | | | |

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 11851 | 602 | 4.58 | Reference | | Reference | | Reference | |
| SDH | 2960 | 329 | 12.26 | 1.35 | (1.17, 1.56) | 1.47 | (1.25, 1.73) | 1.61 | (1.36, 1.91) |
| ISH | 555 | 53 | 9.88 | 1.17 | (0.88, 1.55) | 1.39 | (1.01, 1.90) | 1.40 | (1.02, 1.93) |
| IDH | 4935 | 262 | 5.28 | 1.01 | (0.87, 1.16) | 1.06 | (0.88, 1.27) | 1.12 | (0.93, 1.35) |

**Premature death**

**CHL**

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 17709 | 802 | 4.24 | Reference | | Reference | | Reference | |
| SDH | 967 | 128 | 14.86 | 1.94 | (1.60, 2.35) | 2.04 | (1.64, 2.52) | 2.28 | (1.83, 2.84) |
| ISH | 549 | 57 | 11.86 | 1.31 | (0.99, 1.73) | 1.53 | (1.14, 2.05) | 1.70 | (1.26, 2.29) |
| IDH | 1076 | 71 | 6.56 | 1.17 | (0.92, 1.49) | 1.18 | (0.87, 1.59) | 1.31 | (0.97, 1.78) |

**ACC/AHA**

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 11851 | 523 | 3.98 | Reference | | Reference | | Reference | |
| SDH | 2960 | 263 | 9.80 | 1.37 | (1.17, 1.60) | 1.46 | (1.21, 1.75) | 1.64 | (1.35, 1.98) |
| ISH | 555 | 40 | 7.46 | 1.13 | (0.82, 1.56) | 1.37 | (0.95, 1.97) | 1.38 | (0.95, 2.01) |
| IDH | 4935 | 232 | 4.68 | 1.03 | (0.88, 1.20) | 1.08 | (0.88, 1.32) | 1.16 | (0.95, 1.42) |

**Age≥65**

**All cause mortality**

**CHL**

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 1129 | 291 | 43.69 | Reference | | Reference | | Reference | |
| SDH | 326 | 105 | 52.26 | 1.21 | (0.97, 1.51) | 1.21 | (0.95, 1.55) | 1.37 | (1.07, 1.77) |
| ISH | 335 | 84 | 51.78 | 1.31 | (1.03, 1.67) | 1.43 | (1.09, 1.87) | 1.61 | (1.22, 2.11) |
| IDH | 93 | 33 | 57.02 | 1.12 | (0.78, 1.62) | 1.10 | (0.74, 1.64) | 1.14 | (0.76, 1.71) |

**ACC/AHA**

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 583 | 161 | 43.30 | Reference | | Reference | | Reference | |
| SDH | 808 | 236 | 53.53 | 1.23 | (1.00, 1.51) | 1.30 | (1.04, 1.63) | 1.46 | (1.16, 1.85) |
| ISH | 261 | 62 | 44.72 | 0.99 | (0.74, 1.33) | 1.11 | (0.81, 1.52) | 1.14 | (0.83, 1.56) |
| IDH | 231 | 54 | 39.83 | 0.94 | (0.68, 1.28) | 1.09 | (0.78, 1.53) | 1.21 | (0.86, 1.71) |

**Premature death**

**CHL**

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 1129 | 69 | 10.36 | Reference | | Reference | | Reference | |
| SDH | 326 | 11 | 5.47 | 0.54 | (0.29, 1.03) | 0.66 | (0.34, 1.27) | 0.80 | (0.41, 1.55) |
| ISH | 335 | 25 | 15.41 | 1.45 | (0.92, 2.29) | 1.83 | (1.10, 3.04) | 2.33 | (1.39, 3.93) |
| IDH | 93 | 7 | 12.10 | 1.22 | (0.56, 2.66) | 1.29 | (0.55, 3.02) | 1.31 | (0.56, 3.10) |

**ACC/AHA**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 583 | 42 | 11.29 | Reference | | Reference | | Reference | |
| SDH | 808 | 51 | 11.57 | 1.18 | (0.75, 1.86) | 1.45 | (0.91, 2.33) | 1.63 | (1.28, 2.08) |
| ISH | 261 | 10 | 7.21 | 0.80 | (0.38, 1.67) | 0.94 | (0.45, 2.00) | 1.28 | (0.91, 1.79) |
| IDH | 231 | 9 | 6.64 | 0.47 | (0.20, 1.12) | 0.53 | (0.22, 1.27) | 1.10 | (0.82, 1.47) |

**Male**

**All cause mortality**

**CHL**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 8137 | 692 | 7.58 | Reference | | Reference | | Reference | |
| SDH | 730 | 151 | 26.42 | 1.53 | (1.27, 1.83) | 1.67 | (1.36, 2.04) | 1.86 | (1.52, 2.29) |
| ISH | 414 | 79 | 25.39 | 1.26 | (0.99, 1.60) | 1.55 | (1.19, 2.01) | 1.71 | (1.31, 2.23) |
| IDH | 728 | 81 | 11.38 | 1.17 | (0.93, 1.47) | 1.32 | (1.01, 1.71) | 1.40 | (1.08, 1.82) |

**ACC/AHA**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 4803 | 426 | 7.27 | Reference | | Reference | | Reference | |
| SDH | 2068 | 334 | 19.60 | 1.27 | (1.09, 1.48) | 1.43 | (1.20, 1.70) | 1.57 | (1.31, 1.88) |
| ISH | 403 | 55 | 16.28 | 1.01 | (0.76, 1.35) | 1.17 | (0.85, 1.62) | 1.24 | (0.89, 1.71) |
| IDH | 2735 | 188 | 6.66 | 0.91 | (0.77, 1.08) | 1.03 | (0.84, 1.27) | 1.11 | (0.90, 1.37) |

**Premature death**

**CHL**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 8137 | 501 | 5.49 | Reference | | Reference | | Reference | |
| SDH | 730 | 85 | 14.87 | 1.63 | (1.28, 2.08) | 1.81 | (1.39, 2.37) | 2.03 | (1.54, 2.66) |
| ISH | 414 | 39 | 12.54 | 1.28 | (0.91, 1.79) | 1.53 | (1.06, 2.22) | 1.69 | (1.16, 2.46) |
| IDH | 728 | 50 | 7.02 | 1.10 | (0.82, 1.47) | 1.19 | (0.84, 1.68) | 1.27 | (0.90, 1.81) |

**ACC/AHA**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 4803 | 315 | 5.38 | Reference | | Reference | | Reference | |
| SDH | 2068 | 186 | 10.91 | 1.31 | (1.08, 1.59) | 1.43 | (1,14, 1.80) | 1.58 | (1,25, 2.00) |
| ISH | 403 | 29 | 8.58 | 1.05 | (0.71, 1.54) | 1.22 | (0.77, 1.91) | 1.25 | (0.78, 1.98) |
| IDH | 2735 | 145 | 5.14 | 0.94 | (0.77, 1.14) | 1.03 | (0.80, 1.33) | 1.11 | (0.86, 1.44) |

**Female**

**All cause mortality**

**CHL**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Normotension | 10701 | 529 | 5.06 | Reference | | Reference | | Reference | |
| SDH | 563 | 107 | 21.80 | 1.49 | (1.21, 1.85) | 1.47 | (1.16, 1.86) | 1.69 | (1.32, 2.15) |

| | N | | Rate | Model 1** | | Model 2† | | Model 3‡ | |
|---|---|---|---|---|---|---|---|---|---|
| ISH | 470 | 80 | 24.10 | 1.33 | (1.04, 1.69) | 1.43 | (1.10, 1.85) | 1.61 | (1.23, 2.09) |
| IDH | 441 | 40 | 9.33 | 1.25 | (0.90, 1.72) | 1.10 | (0.74, 1.64) | 1.27 | (0.85, 1.89) |
| **ACC/AHA** | | | | | | | | | |
| Normotension | 7631 | 337 | 4.40 | Reference | | Reference | | Reference | |
| SDH | 1700 | 231 | 16.26 | 1.33 | (1.11, 1.59) | 1.37 | (1.12, 1.67) | 1.58 | (1.28, 1.94) |
| ISH | 413 | 60 | 17.79 | 1.19 | (0.90, 1.58) | 1.34 | (0.99, 1.82) | 1.36 | (1.00, 1.85) |
| IDH | 2431 | 128 | 5.62 | 1.11 | (0.91, 1.37) | 1.12 | (0.87, 1.43) | 1.21 | (0.94, 1.56) |
| **Premature death** | | | | | | | | | |
| **CHL** | | | | | | | | | |
| Normotension | 10701 | 370 | 3.54 | Reference | | Reference | | Reference | |
| SDH | 563 | 54 | 11.00 | 1.61 | (1.19, 2.16) | 1.62 | (1.17, 2.26) | 1.86 | (1.33, 2.61) |
| ISH | 470 | 43 | 12.96 | 1.64 | (1.18, 2.29) | 1.86 | (1.31, 2.65) | 2.14 | (1.50, 3.05) |
| IDH | 441 | 28 | 6.53 | 1.42 | (0.97, 2.09) | 1.23 | (0.75, 2.01) | 1.45 | (0.88, 2.38) |
| **ACC/AHA** | | | | | | | | | |
| Normotension | 7631 | 250 | 3.26 | Reference | | Reference | | Reference | |
| SDH | 1700 | 128 | 9.01 | 1.45 | (1.15, 1.82) | 1.54 | (1.18, 2.00) | 1.84 | (1.40, 2.41) |
| ISH | 413 | 21 | 6.23 | 0.92 | (0.58, 1.45) | 1.15 | (0.71, 1.86) | 1.17 | (0.71, 1.91) |
| IDH | 2431 | 96 | 4.22 | 1.17 | (0.92, 1.48) | 1.10 | (0.81, 1.49) | 1.23 | (0.90, 1.68) |

ACC/AHA, American College of Cardiology /American Heart Association; BP, Blood Pressure; CHL, Chinese Hypertension League Blood Pressure Guideline;   IDH, Isolated diastolic hypertension; ISH, Isolated systolic hypertension.

[1]ISH was defined as SBP≥140 and DBP<90; IDH was defined as SBP<140 and DBP≥90.

[2]ISH was defined as SBP≥130 and DBP<80; IDH was defined as SBP<130 and DBP≥80.

[3]Data used for calculating Hazards Ratios of all-cause mortality and premature death were from CHARLS.

**Model 1: adjusted for age and sex.

†Model 2: adjusted for age, sex, educational level, marital status, whether rural residents, history of drinking or smoking.

‡Model 3: adjusted for age, sex, educational level, marital status, whether rural residents, history of drinking or smoking, body mass index, previous history of diabetes mellitus, CVD or cancer.

**Appendix Table 5. SDH, ISH and IDH associated with Hazard Ratios of all-cause mortality and premature death with optimal BP as reference group***

| | N | Event | Incidence Rate, Per 100 Person-Years | Model 1** | | Model 2† | | Model 3‡ | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | HR | 95%CI | HR | 95%CI | HR | 95%CI |
| **All-cause mortality** | | | | | | | | | |
| **CHL** | | | | | | | | | |
| Optimal | 10342 | 609 | 5.25 | Reference | | Reference | | Reference | |
| SDH | 1293 | 258 | 24.29 | 1.53 | (1.31, 1.78) | 1.60 | (1.35, 1.90) | 1.87 | (1.57, 2.23) |
| ISH | 884 | 159 | 24.73 | 1.31 | (1.10, 1.58) | 1.53 | (1.25, 1.87) | 1.76 | (1.44, 2.16) |
| IDH | 1169 | 121 | 10.61 | 1.20 | (0.99, 1.47) | 1.26 | (1.00, 1.58) | 1.42 | (1.13, 1.80) |
| **ACC/AHA** | | | | | | | | | |
| Optimal | 10342 | 609 | 5.25 | Reference | | Reference | | Reference | |
| SDH | 3768 | 565 | 18.08 | 1.31 | (1.16, 1.48) | 1.39 | (1.21, 1.60) | 1.58 | (1.36, 1.82) |
| ISH | 816 | 115 | 17.03 | 1.12 | (0.91, 1.37) | 1.26 | (1.01, 1.58) | 1.30 | (1.04, 1.64) |
| IDH | 5166 | 316 | 6.20 | 1.01 | (0.88, 1.15) | 1.07 | (0.90, 1.26) | 1.16 | (0.98, 1.37) |
| **Premature death** | | | | | | | | | |
| **CHL** | | | | | | | | | |
| Optimal | 10342 | 466 | 4.02 | Reference | | Reference | | Reference | |
| SDH | 1293 | 139 | 13.09 | 1.64 | (1.34, 2.00) | 1.72 | (1.37, 2.16) | 2.04 | (1.61, 2.57) |
| ISH | 884 | 82 | 12.75 | 1.46 | (1.14, 1.87) | 1.70 | (1.30, 2.23) | 2,00 | (1.52, 2.63) |
| IDH | 1169 | 78 | 6.84 | 1.21 | (0.96, 1.55) | 1.21 | (0.90, 1.63) | 1.39 | (1.03, 1.89) |
| **ACC/AHA** | | | | | | | | | |
| Optimal | 10342 | 466 | 4.02 | Reference | | Reference | | Reference | |
| SDH | 3768 | 314 | 10.05 | 1.38 | (1.18, 1.61) | 1.45 | (1.21, 1.74) | 1.67 | (1.39, 2.02) |
| ISH | 816 | 50 | 7.41 | 1.00 | (0.74, 1.35) | 1.17 | (0.83, 1.63) | 1.20 | (0.85, 1.70) |
| IDH | 5166 | 241 | 4.73 | 1.03 | (0.88, 1.21) | 1.05 | (0.86, 1.28) | 1.16 | (0.95, 1.42) |
| **Age<65** | | | | | | | | | |
| **All cause mortality** | | | | | | | | | |
| **CHL** | | | | | | | | | |
| Optimal | 9961 | 493 | 4.35 | Reference | | Reference | | Reference | |
| SDH | 967 | 153 | 17.76 | 1.85 | (1.53, 2.23) | 1.96 | (1.59, 2.42) | 2.22 | (1.79, 2.76) |
| ISH | 549 | 75 | 15.60 | 1.30 | (1.01, 1.67) | 1.53 | (1.16, 2.00) | 1.71 | (1.30, 2.25) |
| IDH | 1076 | 88 | 8.13 | 1.22 | (0.97, 1.54) | 1.30 | (0.99, 1.71) | 1.47 | (1.11, 1.94) |

## ACC/AHA

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Optimal | 9961 | 493 | 4.35 | Reference | | Reference | | Reference | |
| SDH | 2960 | 329 | 12.26 | 1.37 | (1.19, 1.59) | 1.47 | (1.24, 1.74) | 1.62 | (1.36, 1.93) |
| ISH | 555 | 53 | 9.88 | 1.19 | (0.89, 1.58) | 1.39 | (1.01, 1.91) | 1.41 | (1.02, 1.95) |
| IDH | 4935 | 262 | 5.28 | 1.02 | (0.88, 1.18) | 1.06 | (0.88, 1.28) | 1.13 | (0.93, 1.36) |

## Premature death

### CHL

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Optimal | 9961 | 434 | 3.83 | Reference | | Reference | | Reference | |
| SDH | 967 | 128 | 14.86 | 1.95 | (1.59, 2.40) | 2.03 | (1.60, 2.56) | 2.35 | (1.85, 3.00) |
| ISH | 549 | 57 | 11.86 | 1.32 | (0.99, 1.75) | 1.52 | (1.12, 2.07) | 1.75 | (1.28, 2.40) |
| IDH | 1076 | 71 | 6.56 | 1.17 | (0.91, 1.51) | 1.17 | (0.86, 1.61) | 1.35 | (0.98, 1.86) |

## ACC/AHA

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Optimal | 9961 | 434 | 3.83 | Reference | | Reference | | Reference | |
| SDH | 2960 | 263 | 9.80 | 1.38 | (1.17, 1.62) | 1.43 | (1.18, 1.74) | 1.62 | (1.33, 1.98) |
| ISH | 555 | 40 | 7.46 | 1.14 | (0.82, 1.58) | 1.35 | (0.93, 1.95) | 1.37 | (0.94, 2.01) |
| IDH | 4935 | 232 | 4.68 | 1.03 | (0.88, 1.21) | 1.06 | (0.86, 1.31) | 1.15 | (0.93, 1.42) |

## Age≥65

## All cause mortality

### CHL

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Optimal | 381 | 116 | 44.06 | Reference | | Reference | | Reference | |
| SDH | 326 | 105 | 52.26 | 1.21 | (0.92, 1.57) | 1.28 | (0.96, 1.72) | 1.54 | (1.14, 2.09) |
| ISH | 335 | 84 | 51.78 | 1.30 | (0.98, 1.73) | 1.51 | (1.11, 2.08) | 1.80 | (1.31, 2.48) |
| IDH | 93 | 33 | 57.02 | 1.12 | (0.75, 1.66) | 1.16 | (0.76, 1.79) | 1.28 | (0.83, 1.97) |

## ACC/AHA

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Optimal | 381 | 116 | 44.06 | Reference | | Reference | | Reference | |
| SDH | 808 | 236 | 53.53 | 1.23 | (0.98, 1.55) | 1.32 | (1.03, 1.70) | 1.54 | (1.19, 2.01) |
| ISH | 261 | 62 | 44.72 | 0.99 | (0.73, 1.35) | 1.13 | (0.81, 1.58) | 1.20 | (0.86, 1.68) |
| IDH | 231 | 54 | 39.83 | 0.94 | (0.68, 1.30) | 1.11 | (0.78, 1.59) | 1.28 | (0.89, 1.84) |

## Premature death

### CHL

| | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|
| Optimal | 381 | 32 | 12.16 | Reference | | Reference | | Reference | |
| SDH | 326 | 11 | 5.47 | 0.48 | (0.24, 0.96) | 0.59 | (0.29, 1.19) | 0.76 | (0.37, 1.58) |
| ISH | 335 | 25 | 15.41 | 1.29 | (0.76, 2.17) | 1.62 | (0.90, 2.90) | 2.22 | (1.21, 4.08) |

|  |  | N | Events | Rate | HR | 95% CI | HR | 95% CI | HR | 95% CI |
|---|---|---|---|---|---|---|---|---|---|---|
|  | IDH | 93 | 7 | 12.10 | 1.08 | (0.47, 2.46) | 1.14 | (0.46, 2.81) | 1.25 | (0.50, 3.11) |
| **ACC/AHA** |  |  |  |  |  |  |  |  |  |  |
|  | Optimal | 381 | 32 | 12.16 | Reference |  | Reference |  | Reference |  |
|  | SDH | 808 | 51 | 11.57 | 1.02 | (0.65, 1.59) | 1.13 | (0.69, 1.85) | 1.44 | (0.86, 2.42) |
|  | ISH | 261 | 10 | 7.21 | 0.66 | (0.33, 1.35) | 0.77 | (0.36, 1.65) | 0.94 | (0.43, 2.04) |
|  | IDH | 231 | 9 | 6.64 | 0.53 | (0.25, 1.11) | 0.45 | (0.18, 1.10) | 0.52 | (0.21, 1.29) |
| **Male** |  |  |  |  |  |  |  |  |  |  |
| **All cause mortality** |  |  |  |  |  |  |  |  |  |  |
| **CHL** |  |  |  |  |  |  |  |  |  |  |
|  | Optimal | 3766 | 333 | 6.88 | Reference |  | Reference |  | Reference |  |
|  | SDH | 730 | 151 | 26.42 | 1.52 | (1.24, 1.86) | 1.71 | (1.36, 2.15) | 1.98 | (1.56, 2.50) |
|  | ISH | 414 | 79 | 25.39 | 1.26 | (0.97, 1.62) | 1.59 | (1.19, 2.11) | 1.81 | (1.36, 2.42) |
|  | IDH | 728 | 81 | 11.38 | 1.16 | (0.91, 1.48) | 1.35 | (1.02, 1.79) | 1.48 | (1.11, 1.97) |
| **ACC/AHA** |  |  |  |  |  |  |  |  |  |  |
|  | Optimal | 3766 | 333 | 6.88 | Reference |  | Reference |  | Reference |  |
|  | SDH | 2068 | 334 | 19.60 | 1.31 | (1.11, 1.53) | 1.46 | (1.21, 1.77) | 1.61 | (1.32, 1.95) |
|  | ISH | 403 | 55 | 16.28 | 1.04 | (0.78, 1.39) | 1.20 | (0.86, 1.67) | 1.27 | (0.91, 1.77) |
|  | IDH | 2735 | 188 | 6.66 | 0.93 | (0.78, 1.12) | 1.06 | (0.85, 1.31) | 1.14 | (0.91, 1.42) |
| **Premature death** |  |  |  |  |  |  |  |  |  |  |
| **CHL** |  |  |  |  |  |  |  |  |  |  |
|  | Optimal | 3766 | 255 | 5.27 | Reference |  | Reference |  | Reference |  |
|  | SDH | 730 | 85 | 14.87 | 1.62 | (1.25, 2.10) | 1.79 | (1.33, 2.41) | 2.07 | (1.52, 2.81) |
|  | ISH | 414 | 39 | 12.54 | 1.26 | (0.89, 1.79) | 1.52 | (1.03, 2.25) | 1.73 | (1.16, 2.57) |
|  | IDH | 728 | 50 | 7.02 | 1.09 | (0.80, 1.48) | 1.17 | (0.81, 1.70) | 1.30 | (1.02, 1.04) |
| **ACC/AHA** |  |  |  |  |  |  |  |  |  |  |
|  | Optimal | 3766 | 255 | 5.27 | Reference |  | Reference |  | Reference |  |
|  | SDH | 2068 | 186 | 10.91 | 1.32 | (1.08, 1.61) | 1.41 | (1.10, 1.79) | 1.55 | (1.21, 2.00) |
|  | ISH | 403 | 29 | 8.58 | 1.05 | (0.71, 1.56) | 1.20 | (0.75, 1.90) | 1.23 | (0.77, 1.97) |
|  | IDH | 2735 | 145 | 5.14 | 0.94 | (0.77, 1.16) | 1.02 | (0.78, 1.32) | 1.10 | (0.84, 1.44) |
| **Female** |  |  |  |  |  |  |  |  |  |  |
| **All cause mortality** |  |  |  |  |  |  |  |  |  |  |
| **CHL** |  |  |  |  |  |  |  |  |  |  |
|  | Optimal | 6576 | 276 | 4.08 | Reference |  | Reference |  | Reference |  |

| | N | Events | Rate | Model 1** HR | (95% CI) | Model 2† HR | (95% CI) | Model 3‡ HR | (95% CI) |
|---|---|---|---|---|---|---|---|---|---|
| SDH | 563 | 107 | 21.80 | 1.53 | (1.21, 1.93) | 1.50 | (1.16, 1.95) | 1.79 | (1.37, 2.35) |
| ISH | 470 | 80 | 24.10 | 1.36 | (1.05, 1.77) | 1.46 | (1.10, 1.94) | 1.71 | (1.28, 2.28) |
| IDH | 441 | 40 | 9.33 | 1.27 | (0.91, 1.78) | 1.13 | (0.75, 1.70) | 1.34 | (0.89, 2.04) |
| **ACC/AHA** | | | | | | | | | |
| Optimal | 6576 | 276 | 4.08 | Reference | | Reference | | Reference | |
| SDH | 1700 | 231 | 16.26 | 1.32 | (1.10, 1.59) | 1.33 | (1.08, 1.64) | 1.56 | (1.25, 1.94) |
| ISH | 413 | 60 | 17.79 | 1.18 | (0.89, 1.58) | 1.31 | (0.96, 1.78) | 1.34 | (0.98, 1.84) |
| IDH | 2431 | 128 | 5.62 | 1.11 | (0.90, 1.37) | 1.09 | (0.84, 1.41) | 1.20 | (0.92, 1.55) |
| **Premature death** | | | | | | | | | |
| **CHL** | | | | | | | | | |
| Optimal | 6576 | 211 | 3.12 | Reference | | Reference | | Reference | |
| SDH | 563 | 54 | 11.00 | 1.65 | (1.21, 2.27) | 1.63 | (1.14, 2.33) | 1.99 | (1.37, 2.87) |
| ISH | 470 | 43 | 12.96 | 1.69 | (1.19, 2.40) | 1.88 | (1.29, 2.74) | 2.28 | (1.55, 3.36) |
| IDH | 441 | 28 | 6.53 | 1.46 | (0.98, 2.17) | 1.24 | (0.74, 2.06) | 1.54 | (0.92, 2.58) |
| **ACC/AHA** | | | | | | | | | |
| Optimal | 6576 | 211 | 3.12 | Reference | | Reference | | Reference | |
| SDH | 1700 | 128 | 9.01 | 1.45 | (1.14, 1.84) | 1.50 | (1.14, 1.98) | 1.83 | (1.37, 2.43) |
| ISH | 413 | 21 | 6.23 | 0.92 | (0.58, 1.46) | 1.12 | (0.69, 1.83) | 1.16 | (0.70, 1.91) |
| IDH | 2431 | 96 | 4.22 | 1.17 | (0.92, 1.49) | 1.08 | (0.79, 1.47) | 1.23 | (0.89, 1.69) |

ACC/AHA, American College of Cardiology /American Heart Association; BP, Blood Pressure; CHL, Chinese Hypertension League Blood Pressure Guideline; IDH, Isolated diastolic hypertension; ISH, Isolated systolic hypertension.

*Data used for calculating Hazards Ratios of all-cause mortality and premature death were from CHARLS.

**Model 1: adjusted for age and sex.

†Model 2: adjusted for age, sex, educational level, marital status, whether rural residents, history of drinking or smoking.

‡Model 3: adjusted for age, sex, educational level, marital status, whether rural residents, history of drinking or smoking, body mass index, previous history of diabetes mellitus, CVD or cancer.

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