**Predicted cardiovascular risk and blood pressure for Americans with diabetes, chronic kidney disease, and ≥65 years of age**

**Shakia T. Hardy, Byron C. Jaeger, Paul Muntner, Paul Whelton**

**MAIN RESULTS**

Table 1: Characteristics of US adults overall and with diabetes, chronic kidney disease, ≥ 65 years of age, and any of the preceding conditions

|  | | **Sub-groups** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Characteristic\*** | **Overall  N = 14,335** | **Diabetes  N = 2,357†** | **Chronic kidney disease  N = 2,288‡** | **Diabetes and chronic kidney disease  N = 860** | **Age 65+ years  N = 3,338** | **Any preceding condition  N = 5,436** |
| Age, years | 47.8 (0.33) | 59.6 (0.43) | 59.1 (0.47) | 63.3 (0.66) | 72.6 (0.18) | 63.2 (0.31) |
| Male | 48.5 | 54.3 | 42.3 | 52.0 | 45.5 | 46.0 |
| Race / ethnicity | | | | | | |
| Hispanic | 15.2 | 16.2 | 13.5 | 15.8 | 7.4 | 11.8 |
| Non-Hispanic Asian | 5.5 | 6.8 | 5.0 | 6.1 | 4.2 | 5.1 |
| Non-Hispanic White | 64.9 | 59.9 | 64.3 | 60.0 | 78.4 | 69.2 |
| Non-Hispanic Black | 10.7 | 13.8 | 13.9 | 15.3 | 7.6 | 10.8 |
| Other Race - Including Multi-Racial | 3.7 | 3.2 | 3.3 | 2.8 | 2.4 | 3.0 |
| Total cholesterol, mg/dl | 190.7 (0.83) | 182.8 (1.5) | 190.9 (1.3) | 185.3 (2.4) | 187.4 (1.1) | 189.6 (1.0) |
| HDL-cholesterol, mg/dl | 54.1 (0.32) | 46.8 (0.47) | 53.4 (0.63) | 46.3 (0.58) | 56.8 (0.59) | 54.0 (0.44) |
| Systolic blood pressure, mm Hg | 122.8 (0.26) | 130.7 (0.56) | 133.0 (0.64) | 137.3 (1.0) | 133.6 (0.59) | 131.1 (0.44) |
| Diastolic blood pressure, mm Hg | 71.2 (0.26) | 71.1 (0.38) | 70.8 (0.35) | 70.7 (0.57) | 67.4 (0.35) | 70.1 (0.32) |
| Antihypertensive medication use | 23.8 | 57.4 | 49.3 | 65.4 | 54.4 | 49.0 |
| Diabetes | 12.2 | 100.0 | 32.0 | 100.0 | 24.2 | 38.6 |
| Chronic kidney disease | 12.5 | 32.9 | 100.0 | 100.0 | 29.9 | 39.6 |
| Aged 65+ years | 19.3 | 38.4 | 46.1 | 50.5 | 100.0 | 61.1 |
| Current smoker | 18.4 | 14.5 | 17.4 | 14.0 | 8.5 | 13.8 |
| Prevalent CVD§ | 8.1 | 22.6 | 22.3 | 30.6 | 24.1 | 19.6 |
| \*Table values are mean (standard error) or proportion. | | | | | | |
| †Diabetes was defined by fasting serum glucose ≥ 126 mg/dL, non-fasting glucose ≥ 200 mg/dL, HbA1c ≥ 6.5%, or self-reported use of insulin or oral glucose lowering medication. | | | | | | |
| ‡Chronic kidney disease is defined by an albumin-to-creatinine ratio ≥ 30 mg/dl or an estimated glomerular filtration rate <60 ml/min/1.73m² | | | | | | |
| §Prevalent cardiovascular disease was defined by self-report of previous heart failure, coronary heart disease, stroke, or myocardial infarction | | | | | | |
| CVD = cardiovascular disease; HDL = High density lipoprotein | | | | | | |

Table 2: Estimated distribution of blood pressure categories among US adults, overall and for subgroups with diabetes, chronic kidney disease, ≥ years of age, or any of the preceding three conditions.

|  | | **Sub-groups** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Blood pressure category\*** | **Overall  N = 14,335** | **Diabetes  N = 2,357†** | **Chronic kidney disease  N = 2,288‡** | **Diabetes and chronic kidney disease  N = 860** | **Age 65+ years  N = 3,338** | **Any preceding condition  N = 5,436** |
| Normal blood pressure | 40.8 | 13.7 | 19.8 | 6.9 | 13.5 | 18.0 |
| Elevated blood pressure | 12.7 | 8.1 | 7.0 | 4.6 | 10.5 | 10.1 |
| Stage 1 hypertension | 13.8 | 11.2 | 9.5 | 8.8 | 8.8 | 10.6 |
| Stage 2 hypertension | 8.9 | 9.6 | 14.3 | 14.4 | 12.8 | 12.3 |
| Taking antihypertensive medication | 23.8 | 57.4 | 49.3 | 65.4 | 54.4 | 49.0 |
| \*Normal blood pressure: systolic/diastolic blood pressure < 120/80 mm Hg; Elevated blood pressure: systolic/diastolic blood pressure 120-129/<80 mm Hg; Stage 1 hypertension: systolic/diastolic blood pressure 130-139/80-89 mm Hg; Stage 2 hypertension: systolic/diastolic blood pressure ≥ 140/90 mm Hg. | | | | | | |
| †Diabetes was defined by fasting serum glucose ≥ 126 mg/dL, non-fasting glucose ≥ 200 mg/dL, HbA1c ≥ 6.5%, or self-reported use of insulin or oral glucose lowering medication. | | | | | | |
| ‡Chronic kidney disease is defined by an albumin-to-creatinine ratio ≥ 30 mg/dl or an estimated glomerular filtration rate <60 ml/min/1.73m² | | | | | | |

Table 3: Predicted atherosclerotic cardiovascular risk among US adults with diabetes, chronic kidney disease, ≥ 65 years of age, and any of the preceding conditions, overall and by BP category.

|  | | **Sub-groups** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Blood pressure category\*** | **Overall  N = 14,335** | **Diabetes  N = 2,357†** | **Chronic kidney disease  N = 2,288‡** | **Diabetes and chronic kidney disease  N = 860** | **Age 65+ years  N = 3,338** | **Any preceding condition  N = 5,436** |
| *Proportion (95% confidence interval) with predicted risk ≥ 10% or prevalent cardiovascular disease§‖* | | | | | | |
| Overall | 27.0 (25.5, 28.6) | 70.3 (67.5, 73.2) | 60.1 (57.3, 62.8) | 80.3 (76.1, 84.4) | 87.2 (85.3, 89.2) | 68.5 (66.6, 70.3) |
| Normal blood pressure | 7.8 (6.6, 8.9) | 43.2 (36.2, 50.2) | 20.2 (14.5, 25.9) | 56.4 (38.5, 74.3) | 68.9 (63.2, 74.6) | 38.1 (34.0, 42.3) |
| Elevated blood pressure | 18.9 (16.2, 21.7) | 55.8 (48.7, 62.8) | 43.1 (34.0, 52.2) | 58.9 (41.0, 76.8) | 74.7 (65.9, 83.5) | 57.4 (51.5, 63.3) |
| Stage 1 hypertension | 18.4 (16.1, 20.8) | 49.6 (39.7, 59.4) | 32.6 (24.5, 40.6) | 43.0 (27.6, 58.3) | 77.6 (69.2, 86.0) | 52.8 (45.7, 59.8) |
| Stage 2 hypertension | 43.1 (38.8, 47.4) | 76.6 (67.7, 85.5) | 63.3 (55.7, 71.0) | 81.8 (70.7, 93.0) | 93.0 (88.3, 97.8) | 75.1 (70.2, 79.9) |
| Taking antihypertensive medication | 63.2 (61.0, 65.4) | 81.9 (78.6, 85.2) | 82.9 (79.7, 86.1) | 89.0 (83.9, 94.0) | 94.4 (93.0, 95.8) | 83.6 (81.6, 85.6) |
| *Median (25th - 75th percentile) predicted risk¶* | | | | | | |
| Overall | 2.1 (0.42, 7.9) | 13.7 (5.8, 28.3) | 9.1 (1.9, 24.5) | 20.5 (9.0, 36.9) | 20.6 (12.8, 32.9) | 13.7 (5.9, 25.5) |
| Normal blood pressure | 0.59 (0.18, 2.1) | 5.4 (1.7, 14.8) | 0.78 (0.16, 4.4) | 7.3 (2.3, 24.9) | 12.1 (7.0, 20.1) | 4.7 (0.69, 11.3) |
| Elevated blood pressure | 1.8 (0.39, 6.1) | 9.7 (4.0, 17.3) | 4.4 (0.81, 14.3) | 8.9 (4.3, 18.8) | 15.8 (8.3, 23.8) | 11.4 (4.9, 19.4) |
| Stage 1 hypertension | 2.4 (0.71, 6.6) | 7.9 (2.8, 18.9) | 4.5 (1.4, 9.9) | 7.4 (3.0, 17.0) | 15.4 (9.8, 27.8) | 9.2 (3.6, 18.7) |
| Stage 2 hypertension | 6.8 (2.5, 16.4) | 18.5 (7.0, 31.4) | 13.8 (3.6, 28.7) | 19.1 (9.9, 33.5) | 26.7 (17.4, 36.7) | 18.5 (8.4, 32.3) |
| Taking antihypertensive medication | 10.8 (4.7, 22.4) | 18.6 (9.8, 34.4) | 19.8 (9.9, 36.4) | 26.1 (12.3, 45.2) | 25.1 (16.1, 37.4) | 18.9 (10.5, 31.7) |
| \*Normal blood pressure: systolic/diastolic blood pressure < 120/80 mm Hg; Elevated blood pressure: systolic/diastolic blood pressure 120-129/<80 mm Hg; Stage 1 hypertension: systolic/diastolic blood pressure 130-139/80-89 mm Hg; Stage 2 hypertension: systolic/diastolic blood pressure ≥ 140/90 mm Hg. | | | | | | |
| †Diabetes was defined by fasting serum glucose ≥ 126 mg/dL, non-fasting glucose ≥ 200 mg/dL, HbA1c ≥ 6.5%, or self-reported use of insulin or oral glucose lowering medication. | | | | | | |
| ‡Chronic kidney disease is defined by an albumin-to-creatinine ratio ≥ 30 mg/dl or an estimated glomerular filtration rate <60 ml/min/1.73m² | | | | | | |
| §Prevalent cardiovascular disease was defined by self-report of previous heart failure, coronary heart disease, stroke, or myocardial infarction | | | | | | |
| ‖Predicted risk for cardiovascular disease was computed using the Pooled Cohort Risk equations, based on the guideline by American College of Cardiology / American Heart Association, 2013 | | | | | | |
| ¶Data from survey participants with prevalent cardiovascular disease were not included for these statistics | | | | | | |

**SUPPLEMENT**

Table S1: Characteristics of US adults with stage 1 hypertension, overall and with diabetes, chronic kidney disease, ≥ 65 years of age, or any of the three preceding conditions

|  | | **Sub-groups** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Characteristic\*** | **Overall  N = 1,966** | **Diabetes  N = 250†** | **Chronic kidney disease  N = 220‡** | **Diabetes and chronic kidney disease  N = 72** | **Age 65+ years  N = 301** | **Any preceding condition  N = 594** |
| Age, years | 46.5 (0.44) | 53.2 (1.3) | 50.5 (1.3) | 51.4 (2.5) | 71.6 (0.52) | 58.8 (0.98) |
| Male | 58.2 | 58.2 | 51.3 | 70.9 | 50.4 | 51.2 |
| Race / ethnicity | | | | | | |
| Hispanic | 16.2 | 20.8 | 21.1 | 32.5 | 9.4 | 15.5 |
| Non-Hispanic Asian | 5.9 | 8.6 | 6.8 | 4.1 | 4.2 | 6.4 |
| Non-Hispanic White | 63.0 | 58.1 | 56.8 | 51.5 | 76.4 | 65.0 |
| Non-Hispanic Black | 11.0 | 11.4 | 12.4 | 9.6 | 6.5 | 10.1 |
| Other Race - Including Multi-Racial | 3.8 | 1.1 | 2.9 | 2.4 | 3.6 | 3.0 |
| Total cholesterol, mg/dl | 198.7 (1.9) | 189.1 (4.3) | 197.5 (3.7) | 201.4 (6.7) | 194.6 (3.1) | 194.6 (2.6) |
| HDL-cholesterol, mg/dl | 52.3 (0.54) | 46.5 (1.2) | 50.3 (1.7) | 44.5 (2.3) | 57.7 (1.2) | 52.7 (0.92) |
| Systolic blood pressure, mm Hg | 128.9 (0.29) | 130.1 (0.66) | 130.7 (0.58) | 130.6 (1.2) | 132.7 (0.49) | 131.0 (0.40) |
| Diastolic blood pressure, mm Hg | 78.3 (0.34) | 76.3 (0.94) | 77.1 (0.62) | 76.8 (1.3) | 71.1 (0.90) | 74.9 (0.58) |
| Antihypertensive medication use | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Diabetes | 9.8 | 100.0 | 29.4 | 100.0 | 19.6 | 40.7 |
| Chronic kidney disease | 8.6 | 25.7 | 100.0 | 100.0 | 16.1 | 35.6 |
| Aged 65+ years | 12.2 | 24.3 | 22.9 | 17.0 | 100.0 | 50.5 |
| Current smoker | 20.6 | 17.8 | 23.9 | 20.4 | 8.8 | 16.1 |
| Prevalent CVD§ | 4.2 | 12.5 | 10.0 | 13.2 | 12.3 | 9.8 |
| \*Table values are mean (standard error) or proportion. | | | | | | |
| †Diabetes was defined by fasting serum glucose ≥ 126 mg/dL, non-fasting glucose ≥ 200 mg/dL, HbA1c ≥ 6.5%, or self-reported use of insulin or oral glucose lowering medication. | | | | | | |
| ‡Chronic kidney disease is defined by an albumin-to-creatinine ratio ≥ 30 mg/dl or an estimated glomerular filtration rate <60 ml/min/1.73m² | | | | | | |
| §Prevalent cardiovascular disease was defined by self-report of previous heart failure, coronary heart disease, stroke, or myocardial infarction | | | | | | |
| CVD = cardiovascular disease; HDL = High density lipoprotein | | | | | | |

Table S2: Predicted atherosclerotic cardiovascular risk among US adults aged 40-79 years with diabetes, chronic kidney disease, ≥ 65 years of age, and any of the preceding conditions, overall and by BP category.

|  | | **Sub-groups** | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Blood pressure category\*** | **Overall  N = 8,797** | **Diabetes  N = 1,998†** | **Chronic kidney disease  N = 1,566‡** | **Diabetes and chronic kidney disease  N = 689** | **Age 65+ years  N = 2,501** | **Any preceding condition  N = 4,183** |
| *Proportion (95% confidence interval) with predicted risk ≥ 10% or prevalent cardiovascular disease§‖* | | | | | | |
| Overall | 36.6 (34.7, 38.6) | 72.5 (69.3, 75.6) | 65.4 (61.7, 69.0) | 81.2 (76.7, 85.8) | 83.8 (81.6, 86.0) | 70.3 (68.0, 72.7) |
| Normal blood pressure | 13.7 (11.4, 16.0) | 46.8 (39.0, 54.6) | 32.3 (21.6, 43.0) | 58.6 (38.4, 78.7) | 64.4 (57.7, 71.2) | 46.3 (40.5, 52.1) |
| Elevated blood pressure | 27.4 (23.3, 31.5) | 57.7 (49.6, 65.8) | 47.9 (36.9, 59.0) | 58.5 (42.4, 74.6) | 69.8 (59.6, 79.9) | 57.9 (50.5, 65.3) |
| Stage 1 hypertension | 24.3 (20.7, 27.9) | 55.0 (43.7, 66.4) | 38.5 (27.4, 49.6) | 48.7 (30.2, 67.3) | 72.6 (63.2, 81.9) | 55.2 (47.0, 63.3) |
| Stage 2 hypertension | 45.7 (40.4, 51.0) | 79.0 (69.3, 88.7) | 65.6 (54.7, 76.4) | 84.4 (73.0, 95.8) | 90.2 (83.8, 96.6) | 75.6 (69.5, 81.7) |
| Taking antihypertensive medication | 61.9 (59.4, 64.5) | 81.6 (78.0, 85.2) | 79.9 (75.9, 84.0) | 88.1 (82.0, 94.2) | 92.8 (91.0, 94.5) | 81.8 (79.4, 84.2) |
| *Median (95% confidence interval) predicted risk¶* | | | | | | |
| Overall | 5.1 (1.9, 11.4) | 14.4 (7.0, 27.3) | 12.1 (4.8, 22.8) | 19.3 (9.3, 31.6) | 17.9 (11.2, 27.3) | 13.6 (7.0, 22.3) |
| Normal blood pressure | 2.0 (0.79, 4.8) | 6.8 (2.9, 15.8) | 3.0 (0.96, 8.1) | 9.1 (3.3, 24.6) | 10.6 (6.7, 16.0) | 7.0 (3.3, 12.9) |
| Elevated blood pressure | 4.3 (1.9, 9.3) | 11.4 (4.2, 17.3) | 6.2 (1.5, 13.8) | 9.2 (3.4, 17.2) | 14.6 (7.5, 19.9) | 11.8 (5.8, 17.4) |
| Stage 1 hypertension | 4.2 (1.9, 8.5) | 8.9 (4.5, 19.3) | 6.8 (2.6, 12.3) | 8.5 (4.6, 18.9) | 13.8 (8.6, 22.3) | 9.8 (5.3, 16.6) |
| Stage 2 hypertension | 8.1 (4.2, 16.0) | 18.8 (10.1, 30.2) | 13.9 (5.7, 21.3) | 19.0 (10.9, 30.3) | 20.4 (16.0, 29.6) | 17.3 (9.2, 25.4) |
| Taking antihypertensive medication | 10.5 (5.2, 19.8) | 17.2 (9.8, 31.6) | 17.0 (9.0, 29.0) | 22.4 (12.0, 36.5) | 21.2 (14.0, 31.6) | 17.2 (10.1, 27.3) |
| \*Normal blood pressure: systolic/diastolic blood pressure < 120/80 mm Hg; Elevated blood pressure: systolic/diastolic blood pressure 120-129/<80 mm Hg; Stage 1 hypertension: systolic/diastolic blood pressure 130-139/80-89 mm Hg; Stage 2 hypertension: systolic/diastolic blood pressure ≥ 140/90 mm Hg. | | | | | | |
| †Diabetes was defined by fasting serum glucose ≥ 126 mg/dL, non-fasting glucose ≥ 200 mg/dL, HbA1c ≥ 6.5%, or self-reported use of insulin or oral glucose lowering medication. | | | | | | |
| ‡Chronic kidney disease is defined by an albumin-to-creatinine ratio ≥ 30 mg/dl or an estimated glomerular filtration rate <60 ml/min/1.73m² | | | | | | |
| §Prevalent cardiovascular disease was defined by self-report of previous heart failure, coronary heart disease, stroke, or myocardial infarction | | | | | | |
| ‖Predicted risk for cardiovascular disease was computed using the Pooled Cohort Risk equations, based on the guideline by American College of Cardiology / American Heart Association, 2013 | | | | | | |
| ¶Data from survey participants with prevalent cardiovascular disease were not included for these statistics | | | | | | |