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Blood Pressure Levels and Hypertension in Persons Ages 6–74 Years: United States, 1976–80

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Hypertension or substantially elevated blood pressure is one of the more prevalent chronic conditions known to increase the risk of developing circulatory diseases, particularly heart disease and stroke.[1–4] Circulatory diseases are the leading cause of death and of hospitalization in the United States. This report presents national estimates for blood pressure levels, the prevalence of known and previously undiagnosed hypertension, and the extent of use of antihypertensive medication in the general U.S. population during the period 1976–80. The data are from the second National Health and Nutrition Examination Survey, which used a probability cross-sectional sample of the civilian noninstitutionalized population ages 6–74 years in the United States, including Alaska and Hawaii.[5] Trends since 1960 in the extent of treatment, awareness, and control among those with hypertension are also shown.

Methods

The National Health and Nutrition Examination Survey of 1976–80 (NHANES II) is the fifth in a series of programs of the National Center for Health Statistics carried out over the past 20 years that were designed to collect a broad range of morbidity data and related health information through direct standardized examinations, histories, tests, and procedures used in clinical practice as previously described.[6–10]

In this latest survey, three blood pressure measurements were obtained on each person examined at the 64 sample locations throughout the country. The examining physicians used standardized methods based on recommendations of the American Heart Association.[11]

Of the 22,732 sample persons selected for the NHANES II to represent the 186.7 million persons ages 6–74 years in the U.S. population as of the midpoint of the survey (March 1, 1978), 16,204 persons or 71.3 percent were examined.

Examination surveys lose information not only through the failure to examine all sample persons, but also through the failure to obtain and record all items of information for those examined. In this survey, 1 percent of the values for systolic or diastolic or both measurements were missing for each of the three blood pressure determinations. When data were missing, imputation was used to minimize the effect on population estimates by considering the person's age, sex, race, arm girth, weight, height, and any other systolic or diastolic measurements recorded.

Additional information regarding the sample design, estimation procedure, tests of significance, sources of variation in blood pressure measures, and sampling variability of the national estimates is included in the "Technical notes."

For trend analyses, the national estimates from NHANES II blood pressure and medical history data are compared with those from the National Health Examination Surveys (NHES I, II, and III) and NHANES I, each based on findings for national probability samples of the designated civilian noninstitutionalized target population. NHES I of 1960–62 used a sample of adults 18–74 years of age; NHES II of 1963–65, children 6–11 years of age; and NHES III of 1966–70, youths 12–17 years. In NHANES I of 1971–74 the sample was for persons 6–24 years of age; NHANES I of 1971–75 and NHANES IA of 1974–75 for adults

25–74 years of age. Comparisons involving the use of antihypertensive medication are limited findings from NHANES II, NHANES IA, and NHES I because the question on medication use was identical only for these surveys. The survey data included in the trend analyses are summarized in table 1.

Findings

Systolic pressures

Age.—Mean systolic blood pressure estimates for the U.S. population in 1976–80 were higher in succeeding age groups ranging from 101.3 mm Hg among children ages 6–11 years to 144.3 mm Hg among the oldest adults in the study, those ages 65–74 years (table 2).

Sex.—At 12 through 54 years of age the mean levels of systolic pressure among males significantly exceeded those for females, but at 65 through 74 years, the mean levels for women were higher.

Race.—At 18–24 years of age, systolic mean pressures for white men exceeded those for black men, but at 35–44 and 55–64 years, the mean systolic levels of black men were higher. Mean systolic blood pressures of white females 12–17 years of age exceeded those for black females, but at 35–74 years of age, systolic levels of black women were higher.

Diastolic pressures

Age.—Mean diastolic pressure values were generally higher in succeeding age groups and ranged from 64.3 mm Hg among children ages 6–11 years to 83.5 mm Hg at ages 55–64 years (table 3).

Sex.—Mean levels for men significantly exceeded levels for women at ages 18 through 64 years.

Race.—At ages 35–74 years, mean diastolic pressures for black men and women exceeded those for white men and women, respectively.

Elevated blood pressure levels

The findings for elevated blood pressure are summarized for the variables age, sex, and race in this section. In addition, data are presented regarding the treatment (diagnosis and medication) for elevated blood pressure and the prevalence of hypertension. Elevated blood pressure level, for the purpose of this report, is defined differently for people under 25 years of age than for people 25–74 years of age. The definitions of all terms used in this section of the report (as well as in the section entitled "Secular trends") are presented in table 4 with a summary of the prevalence estimates discussed in this section.

Age.—In 1976–80, 0.4 percent of U.S. children ages 6–11 years and 3.6 percent of U.S. youths ages 12–17 years, or 0.9 million children and youths in the general population, were found to have elevated blood pressure levels as defined in table 4 (systolic pressure of at least 140 mm Hg or diastolic pressure of at least 90 mm Hg or both). Among young adults ages 18–24 years, 8.9 percent or 2.5 million had elevated blood pressure of this level.

At ages 25–74 years, 14.5 percent or 16.5 million had elevated levels—systolic pressure of at least 160 mm Hg and/or diastolic pressure of at least 95 mm Hg. Among adults the prevalence rates for this condition were higher in each succeeding age group ranging from 5.5 percent at ages 25–34 years to 26.6 percent at ages 65–74 years (table 5).

Sex.—Among young adults ages 18–24 years, prevalence of elevated blood pressure was significantly higher among men (15.0 percent) than women (3.2 percent). At ages 25–64 years the prevalence (as defined in table 4) was higher among men than women, although the differences in rates in the 10-year age groups within this age range were not consistently large enough to be significant at the 5-percent probability level.

Race.—Among white adults ages 18–24 years, the rates were higher for men than women but rates were similar for black men and women. At ages 25–74 years, elevated levels were significantly more prevalent among black than white adults (22.8 per 100 compared with 13.5). Among white, but not black, adults the rates were significantly higher for men than women at 25–74 years of age.

Treatment.—The percent of those with elevated blood pressure who were reported as never having been diagnosed by a doctor was higher among youths ages 12–17 years (90 percent) and young adults ages 18–24 years (78 percent) than among the adults ages 25–74 years (40 percent). However, an estimated 27 percent of the adults ages 25–74 years who were in the high risk group (diastolic pressure of at least 105 mm Hg) had never been told by a doctor that they had high blood pressure.

About one-third of the adults 25–74 years of age with elevated blood pressure reported they were currently taking prescribed antihypertensive medication (table 6). This would include persons for whom such treatment had been prescribed so recently that the medication had not yet taken full effect as well as those for whom the medication did not reduce their blood pressure below the level defined as elevated. Forty percent of the adults with diastolic pressures that placed them in the high risk group were on antihypertensive medication.

Hypertension

Assuming that those adults whose blood pressure was not elevated but who reported current use of antihypertensive medication were keeping their blood pressure below the critical level (systolic of 160 mm Hg

and/or diastolic of 95 mm Hg) through medication; that is, controlling their hypertension, there would have been 25.1 million U.S. adults ages 25–74 years in 1976–80 with hypertension, a rate of 22.0 per 100. This rate includes the 14.5 per 100 whose pressure was still elevated at the time of the survey and the 7.5 per 100 taking medication whose pressure was not then elevated.

Secular trends

Mean blood pressure.—Both mean systolic and diastolic blood pressure levels of U.S. children and youths in 1976–80 were similar to the levels found in 1971–74, but were lower than the levels for children and youths in 1963–65 and 1966–70, respectively.

Mean systolic blood pressure levels of adults in 1976–80 were significantly lower than mean levels at the time of the previous national surveys in 1960–62 and 1971–75.[12] The decrease in systolic pressure levels from those found among adults in 1971–75 was significant across the age range 25–74 years and from 1960–62 across ages 35–74 years (figure 1). The difference in mean levels reflects a change primarily in the systolic blood pressure of the older age groups. In 1960–62 the difference in systolic pressure between people ages 18–24 and those ages 65–74 was 38.4 mm Hg. In 1976–80 the difference was only 27.2 mm Hg.

Mean diastolic levels among adults in 1976–80 were significantly lower than the mean levels in 1971–75 but were essentially unchanged from the mean levels in 1960–62. In other words, the 1971–75 estimates were higher than estimates for the earlier and later time periods.

Mean systolic and diastolic blood pressure levels were significantly lower for both white and black adults ages 25–74 years in 1976–80 than in 1971–75. This difference was generally consistent across age groups for both men and women. Mean systolic blood pressure levels for each of the four race-sex groups of adults were also generally lower in 1976–1980 than in 1960–62, but the diastolic blood pressure levels in 1976–80 were essentially similar to the levels in 1960–1962 for each of the four race-sex groups.

Elevated blood pressure.—The prevalence of elevated blood pressure in children 6–11 years and youths 12–17 years in 1976–80 (0.4 and 3.6 per 100, respectively) was lower than in 1971–74 (0.6 for children and 6.4 for youths).[13] However, the difference was statistically significant only for youths.

For adults ages 25–74, the prevalence rate of 14.5 per 100 in 1976–80 was significantly less than the age-adjusted rates of 16.7 and 17.7 per 100 in 1960–62 and 1971–75,[12] respectively. Among the individual age groups the decrease was large enough to be statistically significant only at ages 55–74 years (figure 2). The downward trend occurred for three of the four race-sex groups. The differences in the age-adjusted prevalence of elevated blood pressure between the 1976–80 survey and the two earlier surveys were statistically significant for white and black women and black men.

High Risk.—Blood pressure high enough to put adults into the high risk category was slightly but not significantly less prevalent in 1976–80 than in 1960–62 (age-adjusted rate of 2.8 versus 3.5 per 100); however, it was significantly less than in 1971–75 (age-adjusted rate of 4.5 per 100).

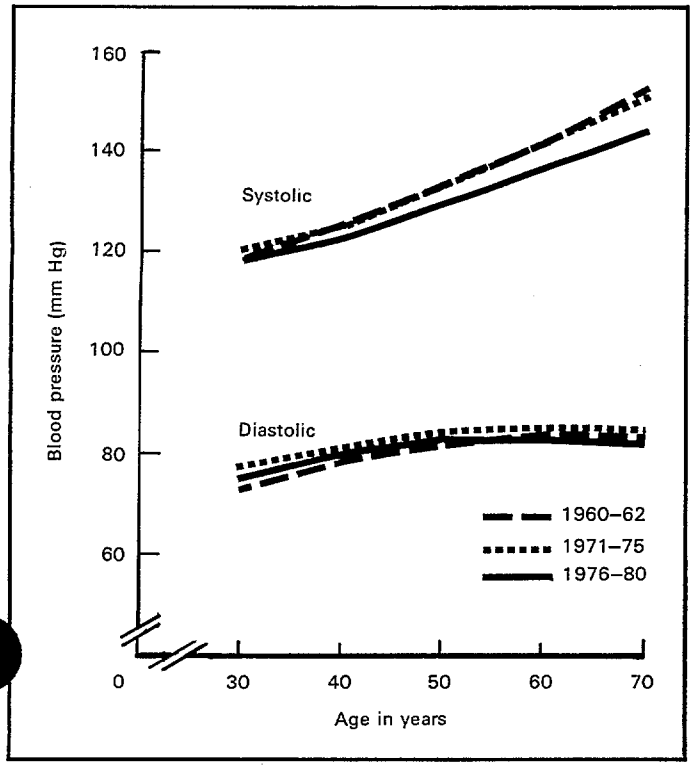


Figure 1. Mean blood pressure in adults ages 25–74 years: United States, 1960–62, 1971–75, and 1976–80

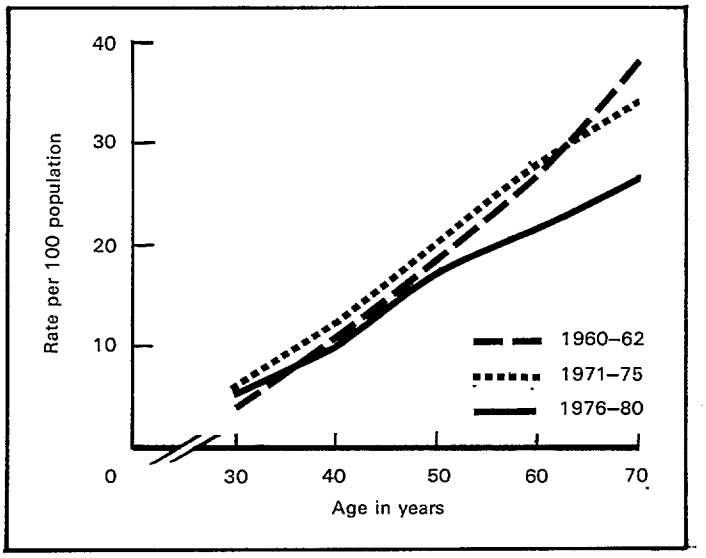
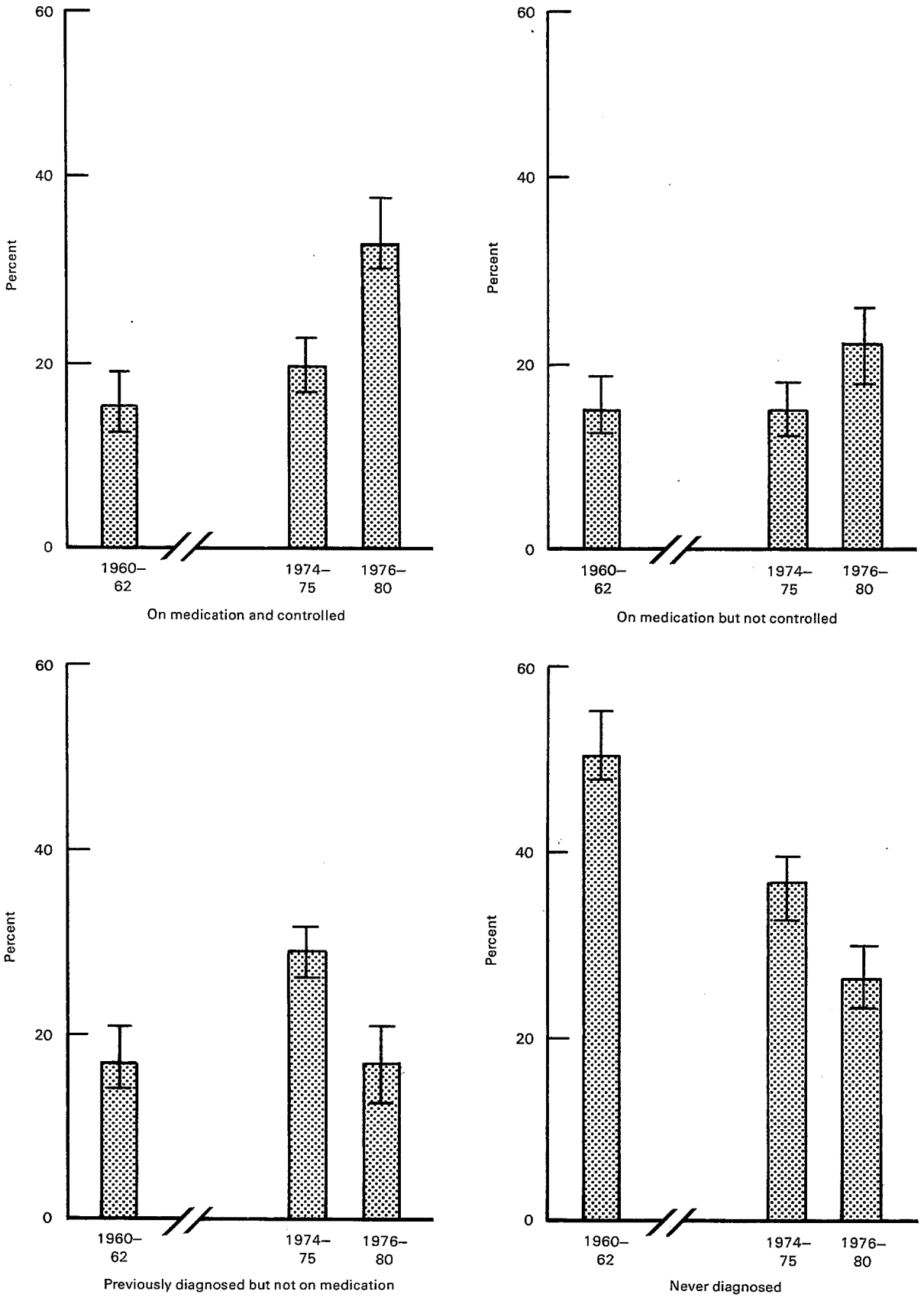


Figure 2. Prevalence rates for elevated blood pressure among adults ages 25–74 years, by age: United States, 1960–62, 1971–75, and 1976–80



NOTE: The total hypertensive group includes those with elevated blood pressure on examination and others currently taking antihypertensive medication.

Figure 3. Percent of total adults ages 25–74 years with hypertension by previous diagnosis and medication status: United States, 1960–62, 1974–75, and 1976–80

Treatment.—Among those adults 25–74 years with elevated blood pressure, a higher percent reported that they had been told by a doctor that they had high blood pressure in 1976–80 (60 percent) than in 1971–75 (51 percent) or in 1960–62 (45 percent). For the high risk group, the percent previously diagnosed was also higher in 1976–80 (73 percent) than in 1971–75 (64 percent) and in 1960–62 (59 percent). The increase in awareness of their condition among those with elevated blood pressure was large enough to be statistically significant. The percent of adults 25–74 years with elevated blood pressure who were currently taking prescribed antihypertensive medication in 1976–80 (33.5 percent) was higher than in 1974–75 (25.7 percent) and 1960–62 (23.0 percent).

Hypertension.—The prevalence of hypertension (as defined in table 4) among adults 25–74 years has not changed significantly since 1960–62 except for the increase among white men (table 7). However, among those with hypertension, the percent never diagnosed by a physician as having hypertension or high blood pressure has dropped significantly from 51 percent in 1960–62 (age-adjusted) to 27 percent in 1976–80 (figure 3). The decrease is consistent among white and black men and women. This decrease in unawareness or, conversely, increase in awareness since 1960–62 has been accompanied by an increase in the proportion of hypertensives who reported they were currently taking antihypertensive medication and an increase in the proportion taking such medication whose blood pressure at the time of the survey was below the elevated level. More than half the increase in awareness occurred prior to 1974–75; however, nearly 80 percent of the increase in the use of antihypertensive medication has occurred since the 1974–75 period.

Discussion

The findings indicate that there has been increased awareness, treatment, and control of hypertension during the 1970's. This has occurred at a time of decline in mortality from circulatory diseases and their two major components—coronary heart disease and stroke. Although many factors may be responsible for this decline, the improved control of blood pressure is considered a major contributor.[14] Kannel[15] has recently estimated that effective use of antihypertensive agents between 1968 and 1978 could be responsible for perhaps a third of the reduction in cardiovascular mortality during the same decade. Even prior to the era of decreased mortality from cardiovascular disease, Moriyama, Krueger, and Stamler[16] noted that differential trends in coronary heart disease among men and women, both black and white, in the 1940's and 1950's might be associated with the differential effects of hypertension on coronary heart disease risk and mortality.

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Table 1. Survey data used in study

Survey program	Time period	Age of examinees	Number of blood pressure measurements	Current use of antihypertensive medication
NHANES II	1976–80	12–74 years	3	Yes
NHANES II	1976–80	6–11 years	3	No
NHANES I	1971–75	25–74 years	3	No
NHANES IA	1974–75	25–74 years	3	Yes
NHANES I	1971–74	6–24 years	1	No
NHES III	1966–70	12–17 years	2	No
NHES II	1963–65	6–11 years	2	No
NHES I	1960–62	18–74 years	3	Yes

Table 2. Mean systolic blood pressure levels of persons 6–74 years by race, age, and sex, with standard errors of the means: United States, 1976–80

Race and age	Both sexes		Male		Female	
	Mean	Standard error of mean	Mean	Standard error of mean	Mean	Standard error of mean
	Blood pressure in mm Hg					
All races[1]						
6–11 years	101.3	0.73	101.2	0.74	101.4	0.89
12–17 years	112.8	0.71	114.8	0.81	110.8	0.79
18–24 years	117.1	0.62	123.7	0.82	110.9	0.64
25–34 years	118.2	0.66	124.6	0.80	112.2	0.67
35–44 years	122.6	0.78	126.1	0.99	119.4	0.85
45–54 years	129.9	0.66	131.3	0.84	128.6	0.96
55–64 years	137.4	0.83	137.3	0.89	137.4	1.03
65–74 years	144.3	0.83	142.3	0.85	145.8	0.95
White						
6–11 years	101.4	0.70	101.5	0.70	101.4	0.88
12–17 years	113.4	0.74	115.3	0.90	111.5	0.80
18–24 years	117.4	0.63	124.3	0.84	110.9	0.64
25–34 years	118.4	0.69	125.0	0.82	112.1	0.70
35–44 years	122.1	0.81	125.8	1.08	118.6	0.82
45–54 years	129.1	0.71	130.9	0.83	127.4	1.06
55–64 years	136.7	0.83	136.9	0.89	136.6	1.02
65–74 years	143.9	0.89	142.2	0.90	145.3	1.06
Black						
6–11 years	101.7	1.16	100.8	1.35	102.6	1.41
12–17 years	110.9	0.93	112.9	1.40	108.8	0.97
18–24 years	115.9	1.00	120.6	1.41	112.1	1.19
25–34 years	118.5	1.10	124.1	1.63	114.0	1.46
35–44 years	128.2	1.37	131.2	2.30	125.8	1.82
45–54 years	137.0	1.55	135.6	2.40	138.2	2.10
55–64 years	144.9	2.20	143.8	2.63	145.8	2.77
65–74 years	147.5	1.45	142.4	1.10	151.4	2.30

[1]Includes other racial groups in addition to white and black.

NOTE: All blood pressures are the average of 3 measurements.

Table 3. Mean diastolic blood pressure levels of persons 6–74 years by race, age, and sex, with standard errors of the means: United States, 1976–80

Race and age	Both sexes		Male		Female	
	Mean	Standard error of mean	Mean	Standard error of mean	Mean	Standard error of mean
	Blood pressure in mm Hg					
All races[1]						
6–11 years	64.3	0.46	64.3	0.56	64.1	0.46
12–17 years	69.8	0.44	70.1	0.40	69.5	0.57
18–24 years	72.8	0.36	75.6	0.44	70.2	0.45
25–34 years	75.9	0.51	79.2	0.64	72.8	0.53
35–44 years	80.0	0.59	82.4	0.70	77.8	0.61
45–54 years	83.4	0.58	85.3	0.63	81.6	0.71
55–64 years	83.5	0.51	85.0	0.57	82.3	0.53
65–74 years	82.2	0.49	82.5	0.53	81.9	0.58
White						
6–11 years	64.3	0.45	64.3	0.52	64.2	0.48
12–17 years	69.8	0.46	70.0	0.42	69.6	0.62
18–24 years	72.8	0.40	75.7	0.48	70.0	0.45
25–34 years	75.8	0.54	79.2	0.65	72.5	0.56
35–44 years	79.5	0.58	82.0	0.72	77.1	0.59
45–54 years	82.9	0.59	85.0	0.64	80.9	0.73
55–64 years	83.0	0.55	84.4	0.61	81.7	0.58
65–74 years	81.8	0.54	82.2	0.56	81.5	0.62
Black						
6–11 years	64.3	0.99	64.8	1.37	63.7	1.16
12–17 years	70.3	0.56	70.9	0.94	69.7	0.56
18–24 years	72.8	0.63	74.9	0.96	71.0	0.96
25–34 years	77.2	0.74	80.2	1.46	74.7	0.98
35–44 years	83.9	1.24	86.1	1.84	82.1	1.48
45–54 years	88.5	1.20	88.0	1.89	89.0	1.51
55–64 years	88.5	0.79	90.4	1.23	86.8	1.00
65–74 years	85.5	0.79	85.5	0.72	85.5	1.22

[1] Includes other racial groups in addition to white and black.

NOTE: All blood pressures are the average of 3 measurements.

Table 4. Definition of terms based on age, blood pressure measurement or questionnaire responses or both, and prevalence estimates for groups corresponding to these terms: United States, 1976–80

Term	Age	Measure	Prevalence estimate
			Percent
Normotension	25–74 years	Systolic below 140 mm Hg and diastolic below 90 mm Hg	69.3
Elevated blood pressure	6–24 years	Systolic 140 mm Hg or greater and/or diastolic 90 mm Hg or greater	0.4 (6–11 years) 3.6 (12–17 years) 8.9 (18–24 years)
	25–74 years	Systolic 160 mm Hg or greater and/or diastolic 95 mm Hg or greater	14.5
High risk	25–74 years	Diastolic at least 105 mm Hg	2.8
Hypertension	25–74 years	Systolic 160 mm Hg or greater and/or diastolic 95 mm Hg or greater, plus those with pressures below these levels at the time of examination who reported on medical history that they were currently taking antihypertensive medication	22.0
On medication	25–74 years	Persons who reported on medical history that they were currently taking antihypertensive medication regardless of blood pressure level on examination	12.3
Never diagnosed	12–74 years	Persons with elevated blood pressure among those who reported on medical history that they had never been told by a medical doctor that they had ever had hypertension (or high blood pressure)	90.0 (12–17 years) 77.7 (18–24 years) 40.4 (25–74 years)

Table 5. Prevalence rates of elevated blood pressure levels[1] for persons 25–74 years by race, age, and sex, with standard errors of the rates: United States, 1976–80

Race and age	Both sexes		Male		Female	
	Rate per 100 population	Standard error of rate	Rate per 100 population	Standard error of rate	Rate per 100 population	Standard error of rate
All races[2]	14.5	0.84	16.4	1.04	12.8	0.81
25–34 years	5.5	0.78	8.7	1.31	2.6	0.56
35–44 years	9.9	1.07	11.8	1.67	8.2	0.98
45–54 years	17.8	1.24	20.9	1.73	14.9	1.71
55–64 years	21.7	1.47	23.7	1.92	20.0	1.43
65–74 years	26.6	1.34	24.9	1.54	27.9	1.76
White	13.5	0.86	15.9	1.12	11.4	0.79
25–34 years	5.3	0.87	8.4	1.43	2.3	0.57
35–44 years	8.5	1.04	10.6	1.75	6.5	0.75
45–54 years	16.5	1.19	21.2	1.79	12.1	1.62
55–64 years	20.2	1.57	22.3	2.07	18.3	1.58
65–74 years	25.5	1.43	24.5	1.60	26.3	1.77
Black	22.8	1.62	22.4	1.87	23.2	2.29
25–34 years	7.6	1.14	11.7	2.30	4.3	1.46
35–44 years	19.6	2.74	22.3	5.01	17.6	4.18
45–54 years	30.7	4.61	23.0	5.37	37.3	5.50
55–64 years	37.6	3.97	39.2	3.89	36.4	6.06
65–74 years	36.5	3.26	27.5	3.01	43.4	5.62

[1] Systolic blood pressure of at least 160 mm Hg and/or diastolic blood pressure of at least 95 mm Hg.
[2] Includes other racial groups in addition to white and black.

NOTE: All blood pressures are the average of 3 measurements.

Table 6. Number and percent of persons ages 25–74 years by responses to selected medical history items and specified blood pressure levels, with standard error of the percent: United States, 1976–80

Medical history items	Systolic 160 mm Hg or greater and/or diastolic 95 mm Hg or greater			At least 105 mm Hg diastolic		
	Population in thousands	Percent	Standard error of percent	Population in thousands	Percent	Standard error of percent
Total 25–74 years	16,541	100.0	...	3,253	100.0	...
Have you ever been told by a doctor that you had high blood pressure or hypertension?						
Yes	9,863	59.6	1.50	2,363	72.6	3.19
During the past 12 months, about how many times have you seen or talked to a doctor about your high blood pressure or hypertension?						
One or more times	7,144	43.1	1.21	1,657	50.9	3.71
Are you now taking any medicine prescribed by a doctor for your high blood pressure or hypertension?						
Yes	5,535	33.5	1.46	1,294	39.8	3.88

NOTE: All blood pressures are the average of 3 measurements.

Table 7. Prevalence rates of hypertension for persons 25–74 years of age by treatment history, race, and sex, with standard errors of the percent: United States, 1960–62, 1974–75, and 1976–80

Race and sex	*Hypertensive*[1]			*Never diagnosed*[2]			*On medication*			*On medication and controlled*[3]		
	1960–62	*1974–75*	*1976–80*	*1960–62*	*1974–75*	*1976–80*	*1960–62*	*1974–75*	*1976–80*	*1960–62*	*1974–75*	*1976–80*
	Percent of population[4]			Percent of total with hypertension[1,4]								
All people 25–74 years[5]	20.3	22.1	22.0	51.1	36.4	26.6	31.3	34.2	56.2	16.0	19.6	34.1
White men	16.3	21.4	21.2	57.6	42.3	40.6	22.4	25.9	38.3	11.8	15.1	20.9
White women	20.4	19.6	20.0	43.9	29.7	25.2	38.2	48.5	58.6	21.9	28.1	40.3
Black men	31.8	37.1	28.3	70.5	41.0	35.7	18.5	*24.0	40.9	5.0	*12.7	16.1
Black women	39.8	35.5	39.8	35.1	28.9	14.5	48.1	36.4	60.6	20.2	*22.3	38.3
	Standard error of percent											
All people 25–74 years[5]	0.83	1.26	0.68	1.66	1.70	1.53	1.62	2.21	1.99	1.65	1.49	2.02
White men	0.95	2.19	1.04	3.75	2.63	1.80	3.07	3.22	2.47	2.59	2.56	2.01
White women	1.07	1.14	0.66	2.77	2.08	1.97	2.24	3.61	2.40	2.24	2.93	2.99
Black men	3.37	5.94	1.86	7.07	10.38	4.27	5.53	10.79	4.52	2.18	6.69	3.72
Black women	3.73	3.60	1.96	3.72	7.42	2.73	3.87	8.30	3.22	3.21	7.93	4.35

[1]Elevated blood pressure (that is, a systolic measurement of at least 160 mm Hg or a diastolic measurement of at least 95 mm Hg) or taking antihypertensive medication.
[2]Reported never told by physician that he or she had high blood pressure or hypertension.
[3]Subset of "On medication" group; those taking antihypertensive medication whose blood pressure was not elevated at the time of the examination.
[4]Age adjusted by direct method to the population at midpoint of the 1976–80 National Health and Nutrition Examination Survey.
[5]Includes all other races not shown separately.

Technical notes

Sample design

The information presented in this report is based on data from the direct standardized physical examinations, tests, measurements, and questionnaires collected in the second National Health and Nutrition Examination Survey (NHANES II) during 1976–80. The target population of NHANES II was the civilian noninstitutionalized population of the United States, including Alaska and Hawaii, ages 6 months through 74 years.

NHANES II used a multistage probability design that involved selection of primary sampling units (PSU's); households; eligible persons; and, finally, sample persons. The sample design provided for oversampling among persons 6 months–5 years of age, persons 60–74 years of age, and persons living in poverty areas. Under contract to the National Center for Health Statistics and according to rigorous agreed specifications, the U.S. Bureau of the Census selected the NHANES II sample of 27,801 persons. Of this total sample, 20,322 (73.1 percent) were examined.

The data in this report are presented as population or subdomain estimates. Examination findings for each sample person have been inflated by the reciprocal of the probability of selecting a person, adjusted for persons who were not examined, and poststratified so that final population estimates closely approximate the independent U.S. Bureau of the Census estimates for the civilian noninstitutionalized population of the United States by race, sex, and age as of the midpoint of the study, March 1, 1978.

Sampling errors

The estimates presented in this report are based on a sample of the target population rather than on the entire population. Thus the estimated values may differ from the values that would be obtained from examining the entire target population. Assuming that an estimate is unbiased, the expected magnitude of the sampling error is measured by a statistic called the standard error. A variant of the pseudoreplication method was used to produce the estimates of standard errors for this report.[17]

Standardized values

Means and rates have been adjusted for age to the U.S. civilian noninstitutionalized population in 1976–80, where indicated, using the direct method of standardization.[18] Standardization removes the effect that differences in the age distributions may have on the comparison of subgroup rates.

Tests of significance

The procedure used in this report for testing the significance of the difference between two means consisted of dividing this difference by the standard error of the difference (Z-statistic). An approximation of the standard error of a difference $d = x - y$ between the two statistics x and y is given by the formula $S_d = (S_y^2 + S_x^2)^{1/2}$ where S_x and S_y are estimates, respectively, of the actual standard errors. When the two groups or measures are positively or negatively correlated, this equation yields an overestimate or underestimate, respectively, of the actual standard error of the difference.

If more than one comparison is implied, the Bonferroni test[19] was used to test for significance. In the Bonferroni test the Z-statistic is computed for each component in the multiple comparison, but each individual significance level is adjusted to account for the increased likelihood of a significant result from multiple tests.

The 5-percent probability level has been used for the determination of statistical significance in this report.

Order of measurements

The examinee's first blood pressure determination in the NHANES II of 1976–80 was made before the physical examination with the examinee sitting, the second at the end of the examination with the examinee supine, and the third immediately after the second with the examinee sitting on the edge of the examination table. This examination protocol was also used in the NHANES I of 1971–75. In the NHES of 1960–62, the order of the measurements in relation to the examination was similar to that in the present study, but all three were taken in a sitting position.

Initial blood pressure values for examinees on whom more than one reading was obtained in the National Health Examination Survey during the 1960's were generally higher than the subsequent ones. In contrast, blood pressure levels from all three measurements in the 1971–75 NHANES I were similar as are the three measurements in the 1976–80 NHANES II.

Note: A list of references follows the text.

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