High Blood Pressure in Older Americans
The First National Health and Nutrition Examination Survey

WILLIAM R. HARLAN, ALAN L. HULL, ROBERT L. SCHMOUDER, J. RICHARD LANDIS, FRANCIS A. LARKIN, AND FRANCES E. THOMPSON

SUMMARY Data from a representative sample of the U.S. adult population obtained during 1971-1975 were analyzed to provide a profile of blood pressure (BP) levels and related nutritional and sociodemographic factors. Older adults (aged 55-74 years) had a twofold greater prevalence of high BP than younger adults (25-54 years), and older black persons had the highest rates. Isolated systolic elevation was uncommon under 54 years of age, but occurred in 5% to 10% of adults over 55 years and was less common than systolic-diastolic elevation. In older adults, body mass (weight/height^2) had the strongest relationship to BP of all the nutritional variables. Alcohol consumption and dietary calcium and phosphorus were associated with high BP, but dietary sodium and salt use were not. The serum calcium/phosphorus ratio and serum urate were significantly higher in older adults with high BP. In general, the variables associated with elevated BP in older adults were similar to those in younger adults, although the strengths of the associations differed. Associations of factors useful for nonpharmacologic prevention and management of high BP in older persons were suggested from this survey. (Hypertension 6: 802-809, 1984)

KEY WORDS • calcium • body mass index • sodium • alcohol

HIGH blood pressure (BP) is a common and important problem in older Americans, but relatively few data are available regarding its prevalence and related demographic and nutritional factors. High BP in older persons carries an increased risk of mortality and morbidity from cerebrovascular, cardiovascular, and renal involvement. In clinical trials, successful lowering of BP in older persons has been accompanied by a favorable change in mortality. A recent symposium highlighted the important role of nutrition in BP regulation and indicated its potential use in preventing and managing high BP. Despite these important health implications, there is relatively little information in older persons about factors correlating with BP that could lead to rational development of life-style interventions. Yet, nutritional interventions are particularly important in older individuals because drug therapy is associated with greater untoward effects than in younger persons. Studies of BP relationships in adolescents and young adults have provided a scientific basis for nonpharmacologic intervention, and comparable population-based studies are needed for older individuals.

The National Health and Nutrition Examination Survey I (NHANES-I) examined a probability sample of the United States population aged 1 to 74 years. Results provided a rich data source that characterized BP levels in a representative sample of North Americans. Because a broad range of nutritional, clinical, and biochemical variables were measured, it has been possible to explore their joint relationships to BP. Univariate and covariate adjusted associations between BP and nutritional variables have been presented in a detailed report for adults aged 18 to 74 years. Our focus here is on a comparison between older adults and younger adults. To take into account the complex interactions among nutritional variables, we used multivariable analyses to adjust for the effects of important nonnutritional variables.

Population and Methods

NHANES I was conducted from 1971 through 1975 on a representative sample of the noninstitutionalized U.S. population with respect to sex, race, age, socioeconomic status, geographic region, and urban-rural residence. Because of special interest in the health and nutrition of selected subgroups, there was deliberate
oversampling of lower socioeconomic groups, older citizens, black persons, and pregnant women. The general survey examined 20,749 persons aged 1-74 years, who represented an overall response rate of 74% of those selected for the sample. Prevalence data on BP and dietary intake utilize data from this survey. In addition to this general survey, a representative subsample of adults aged 25 to 74 years received special questionnaires and examinations of the cardiovascular, pulmonary, and musculoskeletal systems, as well as additional clinical biochemistry determinations. This subsample of 3854 persons is referred to as the detailed sample and is used to examine BP correlates and to develop predictive models of BP because of the availability of biochemical measurements.

The survey was conducted in mobile examination units at locations of the sampled populations. Examinations were performed by specially trained teams of physicians, nurses, and technicians who used a standard manual of operations. Dietary intake was determined through 24-hour dietary recall and 3-month food frequency records. A computer program was used to determine nutrient values of food consumed. Participants aged 12 to 74 years completed a medical history questionnaire, which requested information on health habits, general medical status, and known disease conditions and medical treatments.

The BP was recorded in the sitting position near the beginning of the examination, according to recommendations of the American Heart Association. A cuff was selected that was at least 20% wider than the diameter of the arm, and adult (13 cm) and pediatric (9.5 cm) cuffs were available to examiners. The cuff was deflated at a rate to 2 mm Hg per heartbeat, and readings were made to the nearest 2 mm interval on the scale. Diastolic pressure was taken on cessation of Korotkoff sounds (Phase V) unless there was no loss of sounds, in which case, the point of muffling (fourth phase) was used as diastolic pressure. If the latter situation obtained, this was recorded. Three determinations of BP were made on subjects in the detailed sample, but for this analysis we have reported only the first sitting BP measurements. Although we have not investigated the variation among multiple BP readings separately for the older age group, we have reported an extensive comparison of single and paired BP readings for the detailed and augmented survey groups across all ages. These analyses indicated that the initial and subsequent BP measurements yielded essentially the same means and marginal distributions of categorized pressures. Body measurements, including height, weight, and skinfold thickness, were made by specially trained examiners who used equipment designed for the study that was checked weekly and before each examination series.

All respondents underwent laboratory assessments that included hematologic examinations and nutrition-al biochemistries on serum and urine specimens. On the detailed sample only, the following serum biochemistries were performed: total bilirubin, aspartate aminotransferase (formerly serum glutamic oxaloace-

tic transaminase or SGOT), alkaline phosphatase, calcium, phosphorus, and uric acid.

All analyses were performed by statistical procedures that incorporated the sample weights and the complex design effects. Consequently, the results reported here can be extrapolated to the target U.S. population. Because dietary and drug treatments for elevated BP might alter the prevalence estimates or interrelationships among BP and other variables, individuals reporting therapy were considered separately in the analysis. For prevalence estimates, treated individuals were classified as having hypertension regardless of the pressure recorded in the survey. In univariate and multivariate analyses, treated persons were included or excluded from analysis.

There were no major changes in the relationships when treated individuals were included, and the analyses in this report include treated individuals.

Several analytical approaches were used to investigate the relationships between BP and other variables. First, BP's were used as continuous dependent variables in multiple regression models. Then, three clinical categories of BP were made: 1) systolic-diastolic high BP (greater than 160 and/or greater than 90 mm Hg); 2) isolated systolic high BP (greater than 160 and less than 90 mm Hg); and 3) normal BP (remainder). The weighted mean values for key variables were among these three subgroups investigated by analysis of variance (ANOVA) tests. Older adults (aged 55-74 years) were contrasted to younger adults (aged 25-54 years) by use of multivariable models and clinical categorization of BP. Statistical significance was determined for all these methods with use of the sample weights and the design effects. Both biological and statistical considerations led us to separate the groups at 55 years of age. After this age, the mean diastolic BP for men plateaus, rather than increases, and the prevalence of isolated systolic high BP becomes important. Of lesser importance was the restricted sample sizes available for analysis, particularly when race-sex separations were made for each decade. Sample sizes for each decade and contingency tables for the variables analyzed have been provided in a detailed report.

**Results**

The prevalence of systolic-diastolic BP elevation and isolated systolic BP elevation are presented in Figure 1 for male and female and white and black subjects. The prevalence rate increased with age for systolic-diastolic high BP, and 30% or more of the older adults had elevated pressures. At all ages after 25 years, black persons had the higher rates. Systolic-diastolic BP elevation was more common in young males than females during younger adult years, but at 65 to 74 years of age, females had a higher prevalence of high BP. All differences were statistically significant, although the large sample sizes vitiated conventional use of statistical comparisons, because even smaller, and potentially unimportant, differences may have been significant.
Isolated systolic BP was uncommon in subjects under 55 years of age, but was present with increasing frequency after this age. The prevalence was highest in women, and there were no major differences between black and white groups. In subjects over 55 years, the prevalence of systolic-diastolic BP elevation was about 2.5 times greater than isolated systolic BP elevation.

Multiple regression models were used to investigate the joint relationship between variables found to be statistically significant singly with either systolic or diastolic BP in order to assess the relative importance of these independent relationships. Prediction models were developed for men (Table 1) and women (Table 2). Older persons (55-74 years) were contrasted with younger persons (25-54 years). With this analytical procedure we selected first the independent variable having the strongest association with the dependent variable and thereafter selected the independent variables only if they provided increments significant to the explanation of the residual variance in the dependent variable. Variable selection was terminated when no additional variable had a significance level less than 0.05. The variables are listed in the forward stepping order in which they were selected for the final model. Standardized beta weights are given so that the relative contribution made by each independent variable in the model can be observed.

Although the population was grouped by age, the first variable selected was generally age, except for diastolic BP in older men and women. The decreased association between age and diastolic pressure reflects the trends found in older persons. In men, it has been found that the diastolic BP plateaus or declines after 55 years and it increases only gradually in women after this age. We selected body mass index (weight/height$^2$) as the first or second independent variable for all groups except systolic BP in older women. We found that skinfold thickness, which is a measure of subcutaneous fat thickness, added little to the prediction of high BP except in young males. Pulse rate was directly related to systolic BP at all ages, but was less strongly related to diastolic BP in young adults. Socioeconomic status (SES) was inversely related to diastolic BP in older and younger men, but not in women, who were not greatly represented in the work force at the time of the survey (1971-1975).

Reported dietary intake and serum biochemistries made significant, but often inconsistent, contributions to the explanation of BP variance. Alcohol intake had a curvilinear relationship with BP; heavy alcohol consumers had the highest pressures, while moderate consumers had the lowest pressures, and abstainers, slightly higher pressures. SGOT was selected as a predictor of BP in the younger groups and may be a surrogate for heavy alcohol intake. Dietary salt intake

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TABLE 1. Multiple Regression Models for Systolic and Diastolic Blood Pressures in Older (55-74 Years) and Younger (25-54 Years) Men

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
<th>Diastolic blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men 55-74 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple $r = 0.45$; $r^2 = 0.20$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.280</td>
<td></td>
</tr>
<tr>
<td>Body mass index</td>
<td>0.224</td>
<td></td>
</tr>
<tr>
<td>Pulse rate</td>
<td>0.135</td>
<td></td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>0.124</td>
<td>Hemoglobin</td>
</tr>
<tr>
<td>Uric acid</td>
<td>0.124</td>
<td>Serum aspartate</td>
</tr>
<tr>
<td>aminotransferase</td>
<td></td>
<td>aminotransferase</td>
</tr>
</tbody>
</table>

Variables were selected until $p < 0.05$ was exceeded.

TABLE 2. Multiple Regression Models for Systolic and Diastolic Blood Pressures in Older (55-74 Years) and Younger (25-54 Years) Women

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
<th>Diastolic blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Women 55-74 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple $r = 0.28$; $r^2 = 0.08$</td>
<td></td>
<td></td>
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<tr>
<td>Age</td>
<td>0.154</td>
<td>BMI</td>
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<tr>
<td>Skinfold thickness</td>
<td>0.184</td>
<td>Pulse rate</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>0.125</td>
<td>Serum Cholesterol</td>
</tr>
<tr>
<td>Dietary calcium</td>
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<td>-0.086</td>
</tr>
<tr>
<td>Serum cholesterol</td>
<td>-0.086</td>
<td></td>
</tr>
</tbody>
</table>

Variables were selected until $p < 0.05$ was exceeded.

TABLE 3. Multiple Regression Models for Systolic and Diastolic Blood Pressures in Older (55-74 Years) and Younger (25-54 Years)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
<th>Diastolic blood pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women 25-54 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple $r = 0.47$; $r^2 = 0.22$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.204</td>
<td>Age</td>
</tr>
<tr>
<td>BMI</td>
<td>0.323</td>
<td>BMI</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>0.069</td>
<td>Serum phosphate</td>
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<td>Serum phosphate</td>
<td>-0.102</td>
<td>Uric acid</td>
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<tr>
<td>Serum calcium</td>
<td>0.110</td>
<td>Hemoglobin</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>0.121</td>
<td>Serum aspartate</td>
</tr>
<tr>
<td>aminotransferase</td>
<td></td>
<td>aminotransferase</td>
</tr>
</tbody>
</table>

Variables were selected until $p < 0.05$ was exceeded.

This permitted older adults with normal BP to be compared to younger adults with normal BP, and likewise for systolic-diastolic high BP. Within older and younger adult groups, significant differences between normal and high BP were found for all listed variables, except dietary phosphorous in young adults and serum cholesterol in older adults.

When older and younger adults with normal BP were compared (Table 3), there were statistically significant differences in most of the nutritional variables, although the differences in mean values were small. These differences reflected changing nutritional status and dietary intake in older persons or possibly a cohort.
The survey includes noninstitutionalized older people aged 55 to 74 years, a population group that often visits physicians and hospitals for symptomatic problems but infrequently is the subject of population studies. The nutritional relationships in older and younger persons. Americans and, specifically, permits comparison of profile of the BP of a representative sample of older and younger adults. Calcium/phosphorous and SGOT were not significantly different. For serum phosphate and urate, there were age group differences in the normal BP group, but not in the high BP group.

Older adults with isolated systolic high BP had characteristics similar to older adults with systolic-diastolic high BP except for ethanol ingestion, SGOT, serum phosphate, and serum calcium/phosphate. The means of these variables for the isolated systolic high BP group were not significantly different from those in the group with normal BP.

**Discussion**

This national survey provides a useful and unique profile of the BP of a representative sample of older Americans and, specifically, permits comparison of nutritional relationships in older and younger persons. The survey includes noninstitutionalized older people aged 55 to 74 years, a population group that often visits physicians and hospitals for symptomatic problems but infrequently is the subject of population studies. The sampling and analytical approaches make the observations representative of the adult United States population with respect to demographic variables, such as age, sex, race, socioeconomic status, urban/rural residence, and geographic region. Therefore, the prevalence rates for high BP and the correlates for systolic and diastolic BP can be assumed to represent contemporary characteristics of the United States population.

The age limit for NHANES was 74 years, and, therefore, the oldest segment of the population and those institutionalized were not surveyed.

High BP is common in older adults; the prevalence of systolic-diastolic BP elevation is higher at successively older ages through 74 years of age (Figure 1). The only exceptions are a slight decline in men and in black persons aged 65 to 74 years. The racial differences in the rates of high BP are most striking in older adults, although present in younger adults. Interestingly, these racial differences are not found in similar surveys of adolescents. The prevalence of high BP is approximately the same in black and white persons from childhood through 25 years of age, but thereafter, the prevalence of systolic-diastolic high BP increases rapidly in black persons. The rate for blacks over age 55 years is 1/2 to 2 times the rate in whites. This impressive racial difference cannot be explained by differences in measured nutritional or physiologic characteristics, but may relate either to other unmeasured environmental features or to genetic differences, or to an interaction between them.
Isolated systolic high BP (greater than 160 mm Hg systolic, less than 90 mm Hg diastolic) is infrequent until 55 years of age; then the prevalence reaches 10% to 20% in those 65 to 75 years of age. This finding is more common in women than men, but there are no important black-white differences. Although there is considerable interest in this entity, the national prevalence data indicate that this situation is found considerably less frequently than systolic-diastolic BP elevation through age 74 years. Systolic BP determines the risk for subsequent mortality and morbidity as well or better than diastolic BP, but the benefits of treating isolated systolic hypertension have not been defined in a clinical trial as they have for diastolic hypertension. The variables associated with isolated systolic high BP are similar to those related to systolic-diastolic high BP (Table 3) except for the lesser alcohol consumption, lower serum calcium-phosphorous ratio, and higher serum cholesterol. These observations provide some help in delineating isolated systolic BP elevation as an epidemiologically distinct entity, but further information on differential prognosis and responses to therapy would be helpful in this regard.

These prevalence rates should be interpreted with an appreciation for the variability of BP levels and the potential misclassification if a BP measurement from a single examination is used for diagnosis. Because hypertension is defined as a persistent elevation of BP recorded on several occasions over a period of weeks to months, we have chosen to use the term "High BP" rather than "hypertension" when categorizing the survey data. When we selected the cutoff levels for high BP we considered the differential variability of systolic and diastolic BP. Systolic BP is generally more variable than diastolic, and the cutoff point was set at 160 mm Hg. The cutoff point for diastolic was set at 90 mm Hg, because of the lesser variability of this pressure and the demonstrated benefits of treating pressures above this level. The prevalence rates for "high BP" are affected by the cutpoints selected and by regression toward the mean. In this latter case, initially high BP levels tend to be lower on repeat measurement. Modest overestimates of the prevalence of high BP may result, therefore, from surveys. These overestimates may be greater in older persons who have greater day-to-day variability in BP, especially systolic BP.

However, the relationships between high BP and other variables were not altered in these analyses by changing the cutoff level. When systolic and diastolic BPs were analyzed as continuous variables in the multiple regression models (Tables 1 and 2), the associations were the same as when the BP categories were used (Table 3). The multiple regression model tested for correlations throughout the entire range of BP values and was not influenced by the cutoff levels. Moreover, in these multiple regression models, variables were selected only if they made independent contributions to the prediction of BP not made by previously selected variables. Categorical analyses were used to complement the regression model by placing the observations in a clinical context and by indicating the magnitude of difference in the variables associated with selected BP categories.

In general, factors selected in the regression models were also significantly related to high BP levels, and the two approaches to the analyses were concordant. The variables related to systolic and diastolic BP levels in older adults (55-74 years of age) were similar to those in younger adults (25-54 years of age). However, the explanation of BP variance was less for older adults; the variance explained (r^2) ranged from 0.08 to 0.20 for the older group and 0.22 to 0.24 for the younger group. Age and body mass were the most important determinants of BP levels. Even within the two broad age groups developed for this analysis, age remained an important correlate for systolic BP but not for diastolic BP in older men or women. This reflected the trend of systolic BP to increase throughout adult life and diastolic BP to plateau or decline.

Another important correlate of BP was adiposity or body mass, and several lines of evidence have suggested that age and body mass have independent, thought potentially confounding, effects on BP. Body mass index (weight/height^2) was directly related to BP and was the strongest nutritional correlate selected in all comparisons except for systolic BP in older men. This variable provides a crude assessment of weight for volume and, in older adults, increased body mass primarily reflects accumulation of adipose tissue. With aging, the major changes in body mass are increases in adipose tissue and losses in muscle mass and bone density. In the United States, adiposity increases through mid-adulthood and then plateaus for men while continuing to increase in women. Although this is a cross-sectional survey, a similar association between body mass changes and BP have been found in a longitudinal study of adult men. This association has obvious implications for prevention through weight reduction and maintenance of leanness. Because the relationship is similar in older and younger adults, the benefits of having lean body weight in maintaining normal BP should be as great in older adults as in younger adults.

Relatively few dietary constituents have consistent relationships to BP, and we have presented only those with significant relationships. A complete assessment is available. These dietary relationships differ somewhat in older persons. The sodium-potassium ratio of reported food intake was an important predictor in younger men but not in older men or women (Table 1). This perhaps reflects, in part, the lower mean sodium intake of older persons in the United States when compared with the intake in late adolescence and early adulthood. In fact, if salt use and BP are correlated across the entire adult age range, the relationship is inverse because older individuals have lower reported salt intake and higher BP. This survey is cross-sectional and reflects only current measures of nutritional and health status and does not disclose prior dietary intake that may have been different or may have acted as an initiating but not maintaining agent in the genesis.
of high BP. Moreover, there are problems in reliably quantifying even current intake, and population surveys cannot delineate a "salt-sensitive" segment of the population. Nevertheless, this survey indicates that, within the range of sodium intake of the older contemporary U.S. population, there is no significant correlation between sodium or sodium-potassium intake and BP. Such a relationship can be demonstrated in cross-cultural comparisons of populations with marked divergence in salt intake, but rarely within populations with relatively homogeneous salt use.

A significant, direct relationship is present between alcohol consumption and high BP in both older and younger adults, although the reported alcohol consumption of older persons regardless of BP status is less than that for younger persons. The differential in alcohol intake between normal and high BP groups is significantly greater in younger adults, but the relationship remains significant in older persons. The effect of alcohol on BP is modified by age, but the heaviest consumers have high BP regardless of age. Serum aspartate aminotransferase levels are consistently related to systolic and diastolic BP and to BP categories. This relationship may reflect excessive alcohol consumption and its toxic effect on the liver and perhaps a pharmacologic effect on BP.

Serum urate is significantly higher in those with high BP, and the difference is present in older and younger adults. This association is independent of body mass (or adiposity), although both BP and urate levels relate to body mass. A previous study has suggested that the elevation of urate found in high BP was related to vascular changes in the kidneys. However, the similar findings in older and younger men argue against this explanation, since higher urate levels would be expected in older persons who have more extensive vascular disease.

Provocative relationships are present between BP and serum levels of calcium and phosphorous. Serum calcium was directly related and serum phosphorous inversely related to systolic and diastolic BP. The most predictive variable was the serum calcium/phosphorous ratio, which combined the independent relationships of each. No significant differences were found between older and younger groups in comparable hypertensive categories. These findings agree with those of other epidemiologic studies of non-U.S. populations. In Belgian military personnel (mean age, 39 ± 11.5 years), Kesteloot and Geboers found serum and urinary calcium levels to be significantly and independently related to BP. Other studies have confirmed the direct relationships to serum calcium. Moreover, serum phosphorous has been found to be inversely related to BP in a survey of Swedish men aged 49 to 50 years, although no relationship was found for serum calcium. Thus, studies of other populations support the relationships found in the U.S. survey, but these findings are counter to studies in animals and selected patient groups. In the spontaneously hypertensive rat, low serum calcium is associated with higher pressures, and calcium feeding lowers pressure. McCarron and colleagues have found lower serum calcium and a decrease in the ionized fraction in hypertensive patients. Reasons for these discordant findings are not apparent, but they may relate to dietary preparation and patient selection. Prior therapy with thiazide diuretics is apparently not responsible.

In contrast to the conflicting human and animal data on serum calcium, there is general agreement that calcium intake is lower in those with elevated BP. This NHANES-I analysis, a survey of Puerto Ricans, and the findings of McCarron et al. indicate a significantly lower dietary calcium intake in persons with high BP. It is not clear why the directional effects of dietary intake and serum levels are contrary to each other, and how survey findings may relate to physiologic regulation of BP by calcium and phosphorous. Several explanations are possible. First, there may be a direct effect of calcium and phosphorous on vascular tone, and such a direct action has been demonstrated in physiologic studies. Cellular calcium flux is linked to membrane stability and vascular tone, and it has been suggested that calcium can increase vascular resistance by modulating the interaction between calcium and sodium fluxes. The relatively small differences in dietary and serum calcium and their contrary effects would argue against a direct relationship to cellular fluxes in BP.

A second possibility is that a hormonal response could explain the countervailing relationships of dietary and serum levels and secondarily influence BP. A third possibility is that the measured calcium levels in diet and blood reflect the action or interaction with other divalent cations. Lead and magnesium are possible candidates. Magnesium was measured in this survey and had no consistent relationship to BP. Lead has a direct effect on BP in toxic amounts and the appropriate interactions with dietary and serum calcium, but blood lead was not measured in NHANES-I. The mechanism of serum calcium effect on BP cannot be resolved by a survey approach. Nevertheless, the clinical implications of the calcium/phosphorous relationship and BP are of particular interest because of the lowering effect of nifedipine on BP, which is a calcium-entry-blocking agent. This affords further epidemiologic support for the relationship between calcium and hypertension, but does not afford further leads about the mechanism underlying this relationship.

These analyses have focused on contrasts between older and younger adults with respect to sociodemographic and nutritional variables related to BP. The pathogenesis of BP may differ considerably between older and younger groups, and many of the aspects on which they differ were not measured in this survey, which had a primary focus on nutritional and clinical features. For example, the relative importance of renovascular hypertension in older individuals was not assessed in NHANES-I nor was the contribution of arterial rigidity to elevation of systolic BP in older persons. Therefore, while the analyses indicate similarities between older and younger adults in the nutri-
tional correlates to systolic and diastolic BP, there may be differences in physiologic and biochemical parameters that were not (and cannot be) assessed in a large national survey.

This survey establishes a useful perspective on potential approaches to the prevention and management of high BP in older individuals. Nutritional factors are important and, in general, are similar to those in younger adults. Excessive weight has as prominent an influence on BP in older adults as in younger adults or adolescents. Because of the parallel age trends in adiposity and BP, much of the increasing incidence of hypertension at older ages, particularly in women, might be ascribed to weight gain after 40 years of age. The data from this survey and similar studies of nutritionally homogeneous populations do not support a robust relationship between sodium intake and BP within the usual range of intake in this country. This does not infer that restricted sodium intake (below 75-100 mEq/day) will not lower BP, but it does suggest that modest changes in salt use may have little effect. Finally, the potentially important effect of dietary calcium and phosphorous on BP and the reverse relationships of serum levels deserve considerable attention, especially in older persons who have a lower dietary calcium intake and who may benefit from calcium supplementation as a prophylaxis for osteoporosis.

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