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Blood Pressure in Minorities Screened for the Multiple Risk Factor Intervention Trial (MRFIT)

SYNOPSIS

THE AUTHORS PRESENT DATA FROM 361,662 MEN ages 35 to 57, screened from 1973 to 1976 for possible participation in the Multiple Risk Factor Intervention Trial (MRFIT). Volunteers identified themselves as "white," "black," "Oriental," "Spanish American," "American Indian," or "other." They also noted if they were taking medication for diabetes. A trained technician measured blood pressure after participants had rested for 5 minutes, using the fifth Korotkoff sound to define diastolic pressure and averaging the second and third of three readings. Differences among the groups included the following: blacks had consistently higher systolic and diastolic blood pressure (SBP and DBP) than other groups; Orientals had slightly lower pressure than other nonblack groups; American Indians had somewhat higher pressure than other nonblack groups at ages 35 to 44 but lower at ages 45 to 54; Hispanics in Miami and Davis, California, had significantly higher SBP and DBP than whites in the same area; Orientals in California had significantly higher DBP (but not SBP) than whites in California.

The Multiple Risk Factor Intervention Trial (MRFIT) screened 361,662 men ages 35 to 57 living in the 48 contiguous U.S. states. The screening took place from 1973 through 1975, in 22 clinical centers, to identify men at increased risk of coronary heart disease on the basis of diastolic blood pressure (DBP), serum cholesterol, and reported current cigarette smoking. The purpose of the first visit was to identify men eligible for the trial, not to collect scientifically useful data (although the data have in fact provided the base for a large and valuable cohort study of predictors of coronary heart disease and cancer *(1,2)*). Thus, no attempt was made to obtain either a representative sample of any defined population or information that would have increased the scientific value of the data, such as height, weight, and treatment status for high blood pressure. Nonetheless, the data have unique attributes for use in the study of blood pressure levels in U.S. minority populations.

Table 1. Mean systolic (SBP) and diastolic (DBP) blood pressure and prevalence of diabetes among MRFIT screenees by race or ethnic group and age

		Ages 35 to 44			Ages 45 to 54		
Race or Ethnic Group	n	SBP mmHg ±s	DBP mmHg ±s	Current Medication for Diabetes	SBP mmHg ±s	DBP mmHg ±s	Current Medication for Diabetes
"White"	290,350	127.0 ±13.7	82.5 ±10.2	0.7	131.2 ±16.3	84.6 ±10.6	1.8
"Black"	21,410	130.8 ±16.2	85.6 ±12.3	1.9	136.0 ±19.1	88.4 ±12.6	4.2
"Hispanic"	6152	125.5 ±13.1	83.1 ±10.7	1.0	130.7 ±15.1	85.6 ±11.1	2.8
"Oriental"	4100	124.0 ±13.6	82.9 ±10.4	0.8	128.9 ±16.3	85.4 ±11.1	2.7
"American Indian"	314	127.8 ±12.6	83.7 ±9.4	1.1	129.4 ±14.9	83.4 ±10.5	3.0

Methods

The study protocol has already been described *(3)*. Age-eligible men were invited to attend the first screening visit at their place of employment, but some volunteers were solicited through the media, men's clubs, unions, and other organizations. Since the screening was not advertised as a means of entering the clinical trial, it probably did not attract many volunteers with known risk factors, such as elevated blood pressure, that would have made them eligible for the trial.

Volunteers described themselves as "white," "black," "Oriental," "Spanish American," "American Indian," and "other." Although these designations for race or ethnic group do not reflect current usage, they remain in this paper because they reflect the usage current at the time of the study. Volunteers also answered the question—"Are you presently taking medicine prescribed by a doctor for diabetes?"—with either "yes" or "no, uncertain." In this analysis, the mean income for volunteers' zip code stood as a surrogate for individual income.

A trained technician, using a standard mercury manometer on the right arm of participants, took the first of three blood pressure readings after seated participants had rested at least 5 minutes. (Participants were not required to remain silent; however, they had to remain seated.) Second and third readings followed at 2-minute intervals. The fifth Korotkoff phase was used to define DBP, and the mean of the second and third readings defined eligibility for the trial. Venipuncture took place after the three readings.

Analysis included age-specific tabulations of systolic blood pressure (SBP) and DBP by race and ethnicity and multiple linear regression to adjust for age, clinical center, and income. The full age range of 35 to 57 was used for the multiple regressions, but only the two decades up to 54 were used in the tabulations to render the data comparable to those of other studies presented at the NHLBI-sponsored workshop (see Havas and Sherwin summary article in the section that follows). Because eligibility depended on DBP (Tables 1 and 2), the absence of SBP was not a criterion for exclusion. About 3% of the participants did not have an interpretable record of SBP.

Results

Table 1 shows the mean SBP and DBP classified by race or ethnic group and age. As expected, blacks had substantially higher SBP and DBP than whites. Orientals had substantially lower SBP than whites, but similar DBP. Younger American Indians had slightly higher DBP and SBP than whites but substantially lower pressures in the older age group because both older and younger American Indians had virtually identical blood pressure. As expected, the prevalence of reported diabetes rose with age; it was higher in blacks than in whites in both age groups, and higher in each nonblack minority than in whites in the older age group.

Table 2. Comparison of mean systolic (SBP) and diastolic (DBP) blood pressure of Hispanics and Asian Americans with Caucasians by clinical center adjusted for age and income

Race or Ethnic Group	Clinical Center	n	SBP	DBP
"Hispanic"	Miami, FL	2150	+1.1**	+2.6**
	New York, NY	360	−0.3	+0.9
	San Francisco, CA	623	−1.2*	−0.1
	Davis, CA	798	+2.2**	+0.9*
	Los Angeles, CA	998	−0.2	+0.9*
"Oriental"	San Francisco, CA	1658	+0.4	+2.2**
	Davis, CA	857	+0.4	+2.4**
	Los Angeles, CA	713	−1.5**	+1.5**

*P <0.05
**P <0.01

Table 2 shows the results of separate multiple linear regressions for each of several clinical centers with substantial numbers of participants from a minority group; we used whites as the reference population and race, age, and income as covariables. Hispanics in Miami had a mean SBP of 1.1 mmHg higher than whites after adjusting for differences in age and income. Similarly, Hispanics in Davis had mean SBP and DBP higher than whites after the same adjustments. SBP and DBP of Hispanics in New York City and Los Angeles were similar to whites, whereas Hispanics in San Francisco had SBP slightly but significantly lower than whites, but similar DBP. Orientals in California had significantly higher DBP than whites, but similar or lower SBP.

Discussion

These data have both strengths and weaknesses. They allow comparison of relatively large numbers of Hispanics and Orientals with very large numbers of whites in different parts of the United States with respect to blood pressure taken under fairly uniform conditions. In particular, they allow comparison of groups of Hispanics in New York City where they are mainly of Puerto Rican origin, in Miami where they are mainly of Cuban origin, and in California where they are mainly of Mexican origin. The principal weakness is absence of information about the status of treatment for high blood pressure at the time of measurement, which probably differs among racial and ethnic groups and subgroups, and may be responsible for some or all of the observed differences in blood pressure.

It is unclear who the population samples represent, since the participants were almost all employed and probably of higher socioeconomic status than the group from which they were drawn. Surely, there are major differences in socioeconomic status among the several racial and ethnic groups represented, which are only partially adjusted for by including estimated income in the regressions.

It is not possible to adjust for body mass index, since data on height and weight are lacking. Differences in adiposity might explain some differences in blood pressure, as well as differences in the reported prevalence of diabetes (which is generally lower than abnormal glucose tolerance).

While the opportunity to compare Hispanics of different geographic and cultural backgrounds is interesting, it appears from the heterogeneity of the results for Mexican Americans in California that other factors exert a major influence on blood pressure. One such factor may well be the different prevalence of treatment for high blood pressure among Hispanics in different parts of California, as well as other areas of the United States.

References

1. Sherwin, R., and others: Serum cholesterol levels and cancer mortality in 361,662 men screened for the Multiple Risk Factor Intervention Trial. JAMA 257: 943–948 (1987).
2. Stamler, J., Stamler, R., and Neaton, J.: Blood pressure, systolic and diastolic, and cardiovascular risk: U.S. population data. Archives of Internal Medicine 153: 598–615 (1993).
3. Sherwin, R., and others: The Multiple Risk Factors Intervention Trial (MRFIT) II: the development of the protocol. Prev Med 10: 402–425 (1981).