Ischemic Heart Disease Mortality in Hispanics, American Indians, and non-Hispanic Whites in New Mexico, 1958–1982

Thomas M. Becker, MD, Charles Wiggins, MSPH, Charles R. Key, MD, and Jonathan M. Samet, MD

To describe trends in mortality from ischemic heart disease in New Mexico’s Hispanic, American Indian, and non-Hispanic white populations, we used vital records data collected from 1958 through 1982. We calculated age-adjusted and age-specific mortality rates for ischemic heart disease for each of the state’s principal ethnic groups. Death certificate data were used in combination with population estimates based on the censuses of 1960, 1970, and 1980. Age-adjusted mortality rates for ischemic heart disease among Hispanics, American Indians, and non-Hispanic white men were consistent with nationwide patterns of rising mortality rates during the 1960s followed by declining rates. Mortality rates from ischemic heart disease in all three ethnic groups in New Mexico were lower than national rates for whites. Rates for Hispanics in New Mexico were lower than for non-Hispanic whites; rates for American Indians were the lowest among the three groups. These data support previous observations that Hispanics and American Indians in the Southwest are at decreased risk for mortality from ischemic heart disease in comparison with U.S. whites. (Circulation 1988;78:302–309)

The rise and fall of ischemic heart disease mortality in the United States over the past 25 years has been well documented.1–5 It is not clear, however, if all racial and ethnic groups have shared in the national decrease in mortality from ischemic heart disease. Mortality from ischemic heart disease in Hispanics and American Indians—the principal minority groups in the southwest—has not been adequately examined. Although a low prevalence of coronary artery disease in Southwestern American Indians has been reported, most of the documentation has been from case reports, postmortem anatomical studies, and population surveys that were limited by short observation periods.6–21 Among Southwestern Hispanics, long-term trends in ischemic heart disease mortality have not been described.

Ethnic differences in disease incidence and mortality have been observed for several different diseases in New Mexico, including cancer, respiratory and other chronic diseases, and infectious processes.22–26 Ethnicity in this state has numerous correlates that may lead to differences in the epidemiology of many diseases: in addition to genetic variation among Hispanics, American Indians, and non-Hispanic whites, social and economic conditions as well as other aspects of life-style vary widely among members of New Mexico’s three principal ethnic groups. Over 40% of American Indians live below the poverty level, while 23% of Hispanics and 10% of non-Hispanic whites in New Mexico live in poverty.27 In addition, a lower proportion of American Indian and Hispanic adults have completed high school compared with New Mexico’s non-Hispanic white population.27 Furthermore, investigations conducted in New Mexico and other states show that the prevalence of risk factors for ischemic heart disease varies among Hispanics, American Indians, and non-Hispanic whites28–51 (Table 1).

To examine ethnic differences in ischemic heart disease mortality in New Mexico’s Hispanic, American Indian, and non-Hispanic white populations and to determine if trends in mortality in these populations followed recent nationwide decreases, we analyzed vital records data collected from 1958 through
TABLE 1. Risk Factor Profiles for Ischemic Heart Disease Among Southwestern Hispanics and American Indians in Comparison With Non-Hispanic Whites

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Hispanics</th>
<th>American Indians</th>
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<tbody>
<tr>
<td>Serum lipids</td>
<td>Cholesterol and triglyceride levels comparable with non-Hispanics45,51,67 Lipoprotein profiles similar to non-Hispanics51</td>
<td>Lower cholesterol levels compared with whites32,71 Higher HDL:LDL ratio compared with whites33</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Comparable proportions of men with hypertension; lower proportions of women with hypertension compared with non-Hispanics in Texas69</td>
<td>Higher prevalence of hypertension compared with whites7,31</td>
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<tr>
<td></td>
<td>Comparable proportions of Hispanic and non-Hispanic hypertensives in New Mexico.42 Lower prevalence of hypertension in Hispanic men compared with non-Hispanic whites in Belen, New Mexico; comparable prevalence of hypertension among Hispanic and non-Hispanic white women in Belen, New Mexico.68</td>
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<tr>
<td>Diabetes</td>
<td>Higher proportions with adult-onset diabetes compared with non-Hispanics45-47</td>
<td>Higher prevalence of adult-onset diabetes compared with whites22,28,29,36,72</td>
</tr>
<tr>
<td>Obesity</td>
<td>Higher proportions of obese persons compared with non-Hispanics45,49,51,68</td>
<td>Higher prevalence of obesity compared with whites22,28,29,30,70</td>
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<tr>
<td>Cigarette use</td>
<td>Cigarette use as common as in non-Hispanics but number of cigarettes smoked daily much less22,24,41,42,44</td>
<td>Little cigarette use compared with whites23,34,36</td>
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1982. These analyses provide information on the variation in ischemic heart disease mortality among the major ethnic groups represented in New Mexico.

Subjects and Methods

We obtained coded death certificate data for residents of New Mexico for the years 1958 through 1982 from the New Mexico Bureau of Vital Statistics. Cause of death was coded according to the seventh revision of the International Classification of Diseases (ICD) for the years 1958–1968,52 the eighth ICD revision for the years 1969–1978,53 and the ninth ICD revision for the years 1979–1982.54 For this report, deaths attributed to ischemic heart disease included ICD 420–420.9, 422.1, 440, 441, and 443 in the seventh revision, ICD 410–413 in the eighth revision, and ICD 410–414.9 in the ninth revision.

We adjusted all ischemic heart disease deaths recorded over the 25-year study period to the coding scheme of the eighth ICD revision. Changes in coding procedures for ischemic heart disease in 1969 resulted in the assignment of more deaths to this category than had been assigned to the most nearly comparable category ("arteriosclerotic heart disease, including coronary artery disease") in the seventh revision.3 The resulting comparability ratio of 1.146 expresses the differences in coding changes between the seventh and eighth ICD revisions.8 A comparability ratio of 0.998 results if ischemic heart disease (ICD 410–413, eighth revision) is compared with the following combined categories in ICD seventh revision: "arteriosclerotic heart disease, including coronary disease" (ICD 420), "other myocardial degeneration with arteriosclerosis" (ICD 422.1), and "other hypertensive heart disease" (ICD 440, 441, and 443).3 To control for artifactual elevation of ischemic heart disease mortality rates associated with coding changes, we included this combination of ischemic heart disease mortality codes from the seventh revision in our rate calculations for 1958–1968; this grouping more closely approximated the changed coding of cardiovascular mortality in the eighth ICD revision.

We also adjusted the mortality figures for 1979–1982, coded under the ninth ICD revision, to make them more comparable with data coded under the eighth revision for ischemic heart disease. We calculated age-specific and age-adjusted mortality rates for 1979–1982 by dividing the number of cases during these years by 0.8784, the comparability ratio for ischemic heart disease mortality between the ninth and the eighth ICD revisions. This ratio was used by Sorlie and Gold55 in a study of the impact of the change from the eighth to the ninth ICD coding scheme. Adjustment by this ratio reduces artifactual decreases in ischemic heart disease mortality that would result from incomparability of the ICD codes when the ninth ICD revision went into effect in 1979.55

Ethnicity of individuals was assigned by the New Mexico Bureau of Vital Statistics on the basis of information contained on the death certificates. Hispanic ethnicity was determined on the basis of the decedent’s surname, the surnames of the decedent’s parents, and specific statements on the death certificate. American Indians were identified solely on the basis of information cited on the death certificate. Non-Hispanic whites included those coded as "white" on the death certificate who did not have a Spanish surname or other information to indicate that they were Hispanic. Because of the small number of cases, we did not examine isch-
emic heart disease–related mortality among blacks or other ethnic-racial groups.

Because the validity of the assignment of ethnicity has not been formally evaluated by the Bureau of Vital Statistics, we compared ethnicity of lung cancer patients as stated in their responses to ethnic identification questions during interviews for a case-control study with death certificate information from recent Bureau of Vital Statistics records. We found 96.4% agreement between reported Hispanic ethnicity by the index subject or a surrogate in the case-control study and the coding of Hispanic ethnicity on 221 death certificates. Similarly, in a sample of 291 non-Hispanic whites, we found 98.3% agreement between identification as a non-Hispanic white in the case-control study and the coding of non-Hispanic white status on the death certificate.

Denominators for rate calculations were derived from the censuses of 1960, 1970, and 1980. Because different techniques were used in each census by the U.S. Census Bureau to identify Hispanic ethnicity, we have adjusted the estimates of the Hispanic white population from 1960 through 1980 to account for the different enumeration procedures. To clarify the comparability of the different techniques used to determine ethnicity, we conducted a cross-sectional survey of Hispanics and non-Hispanics in New Mexico in which each of the ethnic identifiers from the censuses of 1960, 1970, and 1980 was included in a single questionnaire. The responses obtained in this survey were used to measure the comparability of the Hispanic identifiers in the three censuses. Our survey showed a high level of agreement (approximately 95%) between the self-reported 1980 “Spanish Origin” question and the 1970 “Spanish Heritage” identifier; therefore, we chose the U.S. Census Bureau estimates of the “Spanish Heritage” population for 1970 and subtracted the number of American Indians with Spanish surnames from this figure to obtain our 1970 Hispanic denominators. We found lower concordance between the 1960 census bureau list of Spanish surnames and responses to the 1980 “Spanish Origin” question (sensitivity, 81% for men and 70% for women). To obtain Hispanic denominators for 1960, we upwardly adjusted estimates of New Mexico’s Spanish-surnamed white population from the 1960 census by dividing the number of Hispanic men and women by 0.81 and 0.70, respectively. Estimates of the American Indian population for 1960 were adjusted to account for systematic errors that occurred in data processing.


**Results**

Striking differences in ischemic heart disease mortality were evident among New Mexico’s three major ethnic populations during the 25-year study period (Table 2). Age-adjusted mortality rates from ischemic heart disease among Hispanics and among non-Hispanic white men showed comparable increases from the first to the third time periods followed by decreasing rates from 1973 through 1982 (Table 2). American Indian men also showed a peak in ischemic heart disease mortality in 1970, followed by a decline in rates, although the pattern of increasing mortality rates was not observed from 1958 through 1968. Among American Indian women, the decline in ischemic heart disease mortality occurred earlier, after the 1963–1967 time period (Table 2). Among non-Hispanic white women, comparable peaks in ischemic heart disease mortality rates were observed in 1958–1962 and 1968–1972; declining rates were observed from 1973 through 1982.

The age-adjusted ischemic heart disease mortality rates for Hispanics of both sexes were lower than for non-Hispanic whites, except for Hispanic women during the period 1963–1967 (Table 2). Differences in mortality rates between Hispanics and non-Hispanic whites were more pronounced for men than for women in each 5-year period from 1958 through 1982. Hispanic mortality rates for ischemic heart disease exceeded rates for American Indians in every time period. The age-adjusted ischemic heart disease mortality rates for American

<table>
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<th>Table 2. Mortality From Ischemic Heart Disease in New Mexico, 1958–1982 (Age-Adjusted Rates per 100,000)</th>
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<tr>
<td><strong>Time period</strong></td>
</tr>
<tr>
<td><strong>Men</strong></td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>American Indian</td>
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<tr>
<td>non-Hispanic white</td>
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<tr>
<td>US white</td>
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<td><strong>Women</strong></td>
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<td>non-Hispanic white</td>
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Indians were one fourth to one half of the rates for New Mexico’s non-Hispanic whites. The age-adjusted mortality rates from ischemic heart disease in non-Hispanic whites in New Mexico were lower than national rates for whites (Table 2).

When data were examined by 5-year birth cohorts spanning the period 1885–1920, the rise-and-fall pattern of age-specific mortality from ischemic heart disease was observed in most age groups among Hispanics, American Indians, and non-Hispanic whites (Figures 1–6). Among the three ethnic groups, the rise-and-fall patterns of age-specific mortality were most clearly observed in the oldest age groups of Hispanics and non-Hispanic whites.

**Discussion**

Our analysis of vital statistics data for New Mexico show that the state’s three major ethnic groups—Hispanics, non-Hispanic whites, and American Indians—followed the national trend of decreasing ischemic heart disease mortality. The results also indicate lower mortality rates from ischemic heart disease for New Mexico’s principal minority groups. Furthermore, our study reaffirms that mortality rates for ischemic heart disease in New Mexico’s non-Hispanic whites are lower than rates for whites nationwide.11

We found that Hispanics in New Mexico are at a lower risk for death from ischemic heart disease than are non-Hispanic whites. Other research has also shown that Southwestern Hispanics are at lower risk than non-Hispanics for ischemic heart disease mortality. In Bexar County, Texas, Hispanics (especially men) had lower mortality rates from ischemic heart disease than did non-Hispanics for 1970–1976.38 For Hispanic men statewide in Texas, lower ischemic heart disease mortality rates were observed compared with non-Hispanics in 1970 and 1980.65 In California, Hispanic men had lower mortality from all cardiovascular causes than did non-Hispanics, although rates in women were comparable between ethnic groups during the 1969–1971 study period.66 In Orange County, California, Hispanics showed reduced mortality in 1978 from all diseases of the heart when compared with non-Hispanic whites.66 In an earlier report from New Mexico for the period 1972–1974, ischemic heart disease mortality for Hispanic men ranged from 25% to 40% lower than for non-Hispanic white men.40

Comparable with observations in Texas,39,65 our study showed that differences in age-adjusted mortality rates between Hispanic and non-Hispanic whites were greater for men than for women over the entire 25-year study period (Table 2). However, the differences in ischemic heart disease mortality rates among Hispanic men, compared with non-Hispanic white men, were greater in New Mexico than in Texas.65 In 1970 and 1980, Hispanic men showed approximately 30% lower mortality in New Mexico but approximately 15% lower mortality in...
Texas. Also comparable with observations in Texas, our data showed declining ischemic heart disease mortality in Hispanics in recent years.\textsuperscript{38,65} In New Mexico’s Hispanic men, however, the decline in ischemic heart disease mortality from the peak period (1968–1972) to the most recent period (1978–1982) paralleled the decline observed among non-Hispanic white men (27–29%; Table 2). In Texas, ischemic heart disease mortality in Hispanic men declined at approximately one half the rate as in non-Hispanic men over the same period.\textsuperscript{65} For Hispanic women in New Mexico, a steeper rate of decline was observed from the peak period to the most recent period (34%) compared with non-Hispanic white women over the same period (23%) (Table 2). These data contrast with the ischemic heart disease mortality experience in Texas, which indicated comparable declines for Hispanic and non-Hispanic white women from 1970 through 1980.\textsuperscript{65}

Available data on risk factors do not adequately explain the lower rates of ischemic heart disease mortality among Hispanics. Serum cholesterol levels appear to be comparable between Hispanics and non-Hispanic whites\textsuperscript{43,51,67} as do serum triglycerides.\textsuperscript{43,51,67} The San Antonio Heart Study showed few ethnic differences between Hispanics and non-Hispanics with regard to lipoprotein profiles, although Hispanic women of lower socioeconomic status had a lower level of high-density lipoproteins.\textsuperscript{51} In population surveys, Hispanics in Texas and New Mexico included a higher proportion of obese individuals than did non-Hispanics in Texas and New Mexico.\textsuperscript{42,45,48,49,51,68} Hispanics in Texas also demonstrated higher frequencies of type 2 diabetes than did non-Hispanics.\textsuperscript{45–47} and a higher prevalence of hypertension was detected among Hispanic men compared with non-Hispanic white men, although Hispanic women showed lower proportions with hypertension compared with non-Hispanic white women.\textsuperscript{50} However, more recent research among Hispanics in Texas revealed that among men, the prevalence of hypertension was similar to non-Hispanic white men, and that among Hispanic women, the prevalence of hypertension was lower than for non-Hispanic white women.\textsuperscript{69}

The Behavioral Risk Factor Survey in New Mexico demonstrated comparable proportions of hypertensive Hispanics and non-Hispanic whites.\textsuperscript{42} A recent survey of an Hispanic community near Albuquerque, New Mexico, also revealed no excess of hypertensive adults.\textsuperscript{68} In addition, cigarette smoking in Hispanic men is as common as in non-Hispanic whites,\textsuperscript{22,24,41,42,44} although the numbers of cigarettes smoked per day tends to be less among Hispanics. Dietary factors, patterns of alcohol use, physical activity, and stress have not been adequately evaluated as cardiovascular disease risk factors in New Mexico’s Hispanics.

We also observed low rates of ischemic heart disease mortality in American Indians in New Mexico. Other reports have previously documented low rates of ischemic heart disease–related mortality in Southwestern American Indians. Mortality data compiled by the Indian Health Service\textsuperscript{70} indicate that within certain health service areas in New Mexico, heart disease mortality in American Indians remains the second leading cause of death, although rates are comparatively low and have been decreasing from 1972 through 1982. The Albuquerque Area Indian Health Service facilities serve about 40% of New Mexico’s American Indians; in this service area, the mortality rates from ischemic heart disease from 1980 through 1982 were less than one third the national rate. In the Navajo area, mortality rates for the same period were one fifth the national rate. The low mortality from ischemic heart disease among New Mexico’s American Indians is not characteristic of all American Indian tribes, however, as several Northwestern, Midwestern, and Eastern tribes have ischemic heart disease mortality rates that exceed national rates.\textsuperscript{70}

Risk factors for ischemic heart disease in most of the American Indian tribes have not been described, although some observations on risk factors provide several potential explanations for the low rates of mortality from ischemic heart disease among New Mexico’s American Indians. Members of Southwestern tribes have lower plasma cholesterol levels than age- and weight-matched whites; furthermore, the
levels rise very little with advancing age.32,71 Southwestern Indians also have a higher ratio of high-density lipoproteins to low-density lipoproteins compared with non-Indian controls.33 In addition, Southwestern Indians rarely smoke cigarettes, and very few individuals smoke heavily.23,34,36 However, the prevalence of diabetes and obesity among Southwestern American Indians is very high compared with U.S. whites,2,28-30.72 and rates of hypertension are also high in comparison with U.S. whites.7,31 Among the Navajo, the major risk factors for acute myocardial infarction include hypertension, diabetes, and obesity.37 Although it has been suggested that low levels of interpersonal competitiveness and stress in Southwestern Indians are a factor in low rates of ischemic heart disease,6 the data are not convincing, and stress as a cardiovascular risk factor in Indians needs to be addressed more thoroughly. Dietary factors, patterns of alcohol use, and physical activity also warrant evaluation as cardiac disease risk factors in Southwestern Indians.

In addition to published information on ischemic heart disease mortality in American Indians, available data on morbidity from ischemia also indicate low rates in Southwestern tribes. Acute myocardial infarction occurs at much lower rates in Southwestern American Indians compared with nationwide rates.37.71 Sievers and Fisher71 observed an increasing frequency of acute myocardial infarction in Southwestern Indian tribes from 1957 through 1978, but acute myocardial infarction occurred at only one fifth the national rate. Among the Navajo, rates for acute myocardial infarction were one fourth to one fifth the national rate.37 Targeted investigations of acute myocardial infarction among the Pueblo and Apache tribes—groups that comprise a large proportion of New Mexico's Indian population—have not been reported.

We observed lower rates of mortality from ischemic heart disease among New Mexico's non-Hispanic whites compared with rates for U.S. whites. Previous studies have also shown lower mortality rates from ischemic heart disease for non-Hispanic whites in New Mexico compared with rates for whites nationwide.1,40 Other western states with populations composed mostly of non-Hispanic whites also show lower mortality rates for ischemic heart disease than are observed nationwide.1 Major risk factors for ischemic heart disease among New Mexico's non-Hispanic white population parallel U.S. profiles for whites22-42; thus, we cannot adequately explain lower ischemic heart disease mortality rates for non-Hispanic whites in this state compared with that for whites nationwide.

Our study has several limitations that must be addressed. The limited validity of death certificate cause-of-death statements has been well described for numerous diseases55,73-75 and for cardiovascular disease in particular.55 In New Mexico, additional bias in death certificate–based studies may be related to ethnic group. A larger proportion of death certificates was coded under the category "symptoms and ill-defined conditions" for American Indians than for the other ethnic groups23; thus, misclassification of cardiac-related deaths may be greater among American Indians than among non-Indians. Our rate calculations based on ethnic identification are also subject to bias. For the numerators of the mortality rates, ethnicity was assigned by the New Mexico Bureau of Vital Statistics with procedures that were constant over the study period (Tony Ortiz, personal communication). The designation of American Indian on the basis of stated race on death certificate information should closely parallel the self-identification of race used by the Census Bureau, on which our denominators are based. For Hispanics, the Bureau of Vital Statistics considered surname and parents' surnames as well as statements on the death certificates. Our validation of the Bureau of Vital Statistics' coding procedure indicates a high degree of concordance between the bureau's assignment of Hispanic or non-Hispanic white ethnicity and reported ethnicity at interview in a recent lung cancer case-control study. Thus, we do not expect that misclassification of Hispanic or non-Hispanic white ethnicity was a frequent occurrence in the present study. Although we have not carried out any comparable validation studies involving American Indians in this state, ethnic identification of American Indians in New Mexico is less problematic than the determination of Hispanic ethnicity. In addition, misclassification of ethnicity would result in bias that would underestimate ethnic differences in ischemic heart disease mortality rather than overestimating those differences.

Additional bias may enter this study from the changes in the ICD codes for ischemic heart disease.3,55 However, the adjustments in the classification of ischemic heart disease mortality were designed to reduce artifactual changes in mortality rates caused by inconsistencies in the coding schemes spanning the seventh, eighth, and ninth ICD revisions. Sorlie and Gold55 observed that, at least for chronic ischemic heart disease in New Mexico, little change in mortality was apparent between the eighth and ninth revision coding schemes. The adjustment from the ninth to the eighth revision may bias our results toward the null (i.e., no recent decline in ischemic heart disease mortality in New Mexico). Nevertheless, our potentially overadjusted mortality rates still revealed a decline in ischemic heart disease mortality during the most recent time period in this study for all ethnic groups.

References

KEY WORDS: cardiac diseases, ethnic groups, cross-cultural comparison.
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