Altitude & CBVD Death Rates Show Apparent Relationship

To the Editor:

The Nationwide Cerebrovascular Disease Mortality Study has provided evidence that regional differences in reported death rates due to cerebrovascular diseases are real, and not artifacts resulting from regional differences in diagnostic or reporting practices. We undertook to test a hypothesis suggested by that study: "Generally, the rates are . . . lowest in the Midwest and Rocky Mountain areas." Since chronic acclimatization to altitude results in numerous physiologic and biochemical changes, and appears to induce an increase in resistance to the deleterious effects of acute hypoxia, it seemed reasonable to us to consider the possibility that residence at higher altitudes might somehow affect the risk of death due to cerebrovascular diseases.

For each of the 229 Standard Metropolitan Statistical Areas (SMSA's) defined by the 1970 Census of the United States, we found the altitude in feet above mean sea level for the principal city, from available published information. Through the courtesy of Mr. Michael J. Zugzda, Chief, Statistical Resources Branch, Division of Vital Statistics, we obtained unpublished data of the National Center for Health Statistics which tabulated cerebrovascular disease deaths and death rates for each SMSA by age, sex, and race for the period 1969–1971. Cerebrovascular diseases included categories 430 through 438 of the International Classification of Diseases, 8th revision. Because the actual racial composition of the non-white group might vary markedly from region to region, we omitted these data from the computations which followed.

For each SMSA we computed a standardized mortality ratio (SMR), using data for whites of both sexes in the age groups 55–64 and 65–74 years. This was done by dividing the total observed number of deaths by the number that would have been expected if the overall death rates for the 229 SMSA's, pooled, had applied to the individual SMSA. We then performed simple correlation and least-squares linear regression analyses to test the hypothesis that altitude and SMR were related.

The correlation coefficient between SMR and altitude proved to be −0.14, which, with 229 data points, corresponds to a statistical significance level p < 0.05. The point estimate of the regression coefficient was −0.025 per thousand feet, with 95% confidence limits of −0.002 and −0.048.

It would be presumptuous to speculate on a mechanism by which altitude of residence might affect cerebrovascular disease death rates, as the possibilities are so numerous and so complex, and our information is so limited. Even by using the SMR, we cannot claim to have eliminated completely possible effects of differences in composition of the population at different altitudes. Rather, it would seem useful to urge that this hypothesis be tested again in other locations and at other times. Countries where part of the population resides at altitudes higher than those found in the United States might provide particularly valuable information. We offer these findings in the hope that they will stimulate the interest of other investigators.

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