Multiple Sclerosis, Schizophrenia, Temperature and Latitude

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Abstract

Greater geographical latitude was found to be positively associated with multiple sclerosis rates in the United States and Italy. Latitude was found to be positively correlated with schizophrenia rates in Italy. Temperature was negatively correlated with multiple sclerosis in the United States. The exploratory variable of amount of sunlight was inversely related to multiple sclerosis in the United States and inversely related to schizophrenia in Italy. Other exploratory findings were schizophrenia correlating positively with precipitation and negatively with elevation in the United States; schizophrenia rates positively correlating with esophageal cancer rates in Italy and in the United States; and multiple sclerosis rates correlating negatively with influenza rates in the United States.

The present research examined the inter-relationship of schizophrenia rates, multiple sclerosis rates, temperature and geographical latitude. This research had two principal purposes, one pertaining to multiple sclerosis and the other more central to the interests of the present authors and pertaining to both multiple sclerosis and schizophrenia.

It has long been very well established that multiple sclerosis rates are higher in locations with greater latitude, both in the northern and southern hemispheres (McAlpine et al, 1972). Although the authors of these studies have stressed latitude rather than temperature, there seems to be little rationale provided for the position that latitude is more important than temperature. The present study included both latitude and temperature.

The second purpose was to relate both schizophrenia and multiple sclerosis to temperature and latitude in order to permit greater comprehension of the geographical positive association of these two disorders in three previous studies (Templer, Cappalletty & Kauffman, 1988, 1989; Templer, Regier & Corgiat, 1985). These studies found a very high relationship with the districts of Italy, a modest relationship with the states of the U.S.A., no relationships in the counties of Ireland and very high correlations with the six continents.

The present study employed the same schizophrenia and multiple sclerosis rates for Italy and the United States used in the above three studies. January mean low temperature, July mean high temperature, and latitude were determined from encyclopedic sources. January low and July high temperatures were chosen because these two months ordinarily are the coldest and warmest months of the year.

In addition to the above-stated variables, elevation, annual precipitation, influenza rate, esophageal cancer rate and amount of annual sunshine were used as exploratory variables. Elevation was used because multiple sclerosis and goiter are more common in areas where soils are low in iodine (Campbell, Crow & Lang, 1960; Foster, 1987, 1988a, 1989). Influenza was used because of the evidence that infection could have an etiological role in schizophrenia and multiple sclerosis, and influenza was the most common infection recorded in Italy and the United States. Precipitation was chosen as an exploratory variable both because infectious disorders are more common in seasons and locations with more precipitation and because Foster (1988b) reported a negative correlation between sunlight and multiple sclerosis.

Esophageal cancer rate was also used as an exploratory variable because of the suggestion of

Foster (personal communication, 1988) that both esophageal cancer and schizophrenia seem to be related to selenium and calcium deficiencies, while esophageal cancer and multiple sclerosis seem to be related to selenium deficiency (Foster, 1988a, 1988b). The esophageal cancer rates of Italy were obtained from a figure provided by Cislaghi, De Carli, Morosini and Putoni (1978). The esophageal rates for the United States were obtained Vital Statistics of the United States, 1967, Vol. II - Mortality, Part A. For each of the 16 Italian districts Compania and Lucaria were combined for all variables because they were combined for the rates given by Arieti (1974). The subdistricts provided by Cislaghi et al were averaged. When all subdistrict esophageal cancer rates were not given, those provided were averaged.

It was the intention of the present authors to use the variables for all three countries for which multiple sclerosis-schizophrenia correlations had been calculated in previous research, Ireland, Italy and the United States; however, most of the variables could not be located for Ireland.

Results and Discussion

Table 1 (p. 128) displays the product-moment correlation coefficients between the independent variables and the multiple sclerosis and schizophrenia rates for both Italy and the United States. It is to be noted that both significance levels and trends ($p < .10$) were based on the more conservative two-tailed assumption.

The variables that most strongly predict multiple sclerosis are the principal variables of this investigation, latitude and temperature, with greater risk of multiple sclerosis being associated with greater distance from the equator, lower January temperature, and lower July temperature. The association of multiple sclerosis with greater latitude is certainly not a new discovery. However, the predicted inverse correlations with temperature are apparently the first to be reported in the scientific literature. The determination of whether temperature or latitude is more related to multiple sclerosis was an objective of the present research. It appears that the latter is of greater importance.

The inverse correlations between sunlight and multiple sclerosis are congruent with the relationship between these two variables reported by Foster (1988b). However, the negative correlations between multiple sclerosis and influenza are the opposite of those hypothesized by the present authors. Any explanations for this finding should be regarded as within the realm of speculation. Nevertheless, an inverse relationship between multiple sclerosis and influenza should not be viewed as incredible. Poskanzer, Schapira and Muller (1963) made an analogy between multiple sclerosis and polio in terms of the latter disorder being very seldom followed by paralysis and neurological illness in infancy. Such are more apt to occur a decade or two later. This appears to explain the fact that persons in undeveloped countries tend not to be stricken by polio since they apparently develop immunity from the relatively asymptomatic infection very early in life. Poskanzer et al pointed out that multiple sclerosis also is uncommon in the tropics and other undeveloped regions where sanitation standards tend to be low.

In general, schizophrenia correlated less highly with the geographical variables than did multiple sclerosis. However, greater precipitation, less elevation, greater distance from the equator and less sunlight seem to be associated with greater risk of schizophrenia. This is apparently the first investigation that specifically addressed and found correlations of some of these variables and schizophrenia. The positive correlations between esophageal cancer and schizophrenia were the only significant schizophrenia-disease correlations and support the research of Foster (1988a, 1988b). It should be noted that esophageal cancer was the only variable that correlated significantly with schizophrenia in both Italy and the United States.

It should be borne in mind that the rationale for this research rested to a large extent upon the correlation of .81 between multiple sclerosis and schizophrenia in Italy in the Templer, Cappalletty and Kauffman (1988) study. The fact that none of the Italian correlations in the present study were of this magnitude tends to legislate against the

possibility that the correlation of .81 is merely an artifact of some more obvious and fundamental variable such as temperature. The possibility of multiple sclerosis and schizophrenia having more of an intimate etiological connection (e.g., both caused by a related infectious or nutritional variable) cannot be ruled out at this time.

Perhaps the most omnibus generalization permitted by the present findings is that schizophrenia and multiple sclerosis both seem to be associated with geographical variables that at least folklore has traditionally regarded as unhealthy. The "unhealthy" variables associated with high multiple sclerosis rates and/or schizphrenia rates include colder temperature, closer to the hemispheric poles, more precipitation, low elevation and less sunlight. Infection and nutrition are two of the possible etiological variables that could account for this pattern.

Although it is here acknowledged that a cause and effect relationship cannot be inferred on the basis of this research, it is very apparent that our findings are consistent with the impressive array of information that shows schizophrenia is definitely a disorder with an interesting but complex epidemiology.

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Table 1

Correlations of Multiple Sclerosis and Schizophrenia with Geographical and Disease Variables

Independent Variables	Multiple Sclerosis Rates U.S.A.				Schizophrenia Rates U.S.A.		
	Italy	A	B	C	Italy	D	E
January low temperature	-.25	-.65[4]	-.56"	-.60[4]	-.36	.05	.02
July high temperature	.16	-.65[4]	-.64[4]	-.69[4]	.27	-.19	-.17
Precipitation	.43[1]	-.18	-.24[1]	-.20	.38	-.10	.44[3]
Elevation	-.20	.13	.17	.13	.31	-.372	-.362
Latitude	.43[1]	.77[4]	.81[4]	.84[4]	.54[2]	.20	.03
Influenza	-.16	-.32[2]	-.42[2]	-.442	-.06	-.18	.12
Sunlight	-.33	-.49[1]	-.452	-.432	-.62[2]	-.02	-.25
Esophageal cancer	.38	.19	.02	.08	.50[2]	.33	.53*

1. p < .10, 2. p < .05, 3. p < .01, 4. p < .001
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