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Nutrition Noteworthy

Title

On the Use of Migration Studies in the Explanation of Diseases of Multifactorial Causality:
The Risk of Non-Insulin-Dependent Diabetes in Japanese-Americans

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Journal

Nutrition Noteworthy, 1(1)

Author

Furst, Ben

Publication Date

1998

Peer reviewed

Introduction.

In diseases of multifactorial causality, genetic and environmental factors contribute to the disease process whereby a disease can be considered the result of "phenotypic development occurring within an environmental context" (1). In many instances, the genetic effect does not lend itself to the disease process directly; rather, the phenotype expressed is a normal state, which, under certain environmental conditions, increases the likelihood of onset of a particular pathological state. Following the line of reasoning presented by Leonetti *et al.*, "the direct phenotypic expression of the genotype is likely to occur early in life, although not as any recognizable pathology" (1). However, in cases where individuals exhibiting genetic propensities toward disease are immersed in an environment containing factors that contribute to the pathological state, the risk of disease onset increases. Such is the case in observing certain instances of acculturation of ethnic groups to a westernizing influence.

Studies of migrant populations have been favored inquiries of epidemiologists, offering insight into "the relative importance of environment and genetic make-up in disease etiology" through the comparison of disease risk in populations of a shared genetic background who live in differing physical and social environments (2). In investigations of this type, specific environmental circumstances of individual early lives are examined with reference to their late-life health experiences. Some of the best-documented examples of health effects attributed to migration are studies of the acculturation of people of Japanese descent to the westernized way of life in the United States. The difference in late-life health outcomes can be observed in the differences between people of Japanese ancestry who have acculturated to a westernized lifestyle in America and those who maintain a traditional lifestyle in their country of origin.

Arriving at this answer, however, is not as simple as it has been presented. Migration studies, while they are valuable as a method to examine changes in disease risk as a result of the translocation of groups of particular genetic dispositions into different environments, are fraught with complications. It is the purpose of this paper to address and discuss the complications that arise in using migration studies. The body of work pertaining to Japanese-American acculturation will be the focus through which this examination is conducted—particularly with respect to risk for Non-insulin-dependent diabetes mellitus (NIDDM).

A history of studies on the effects of acculturation on Japanese-Americans.

Much of the research that has been conducted with respect to the effects of acculturation on Japanese-Americans originated from the data generated from the NI-HON-SAN Study, a research endeavor comprised of three coordinated cohort studies of men living in Hiroshima and Nagasaki, in Honolulu, and in California. Among the specific goals of the study was the desire to arrive at "a more precise estimate of the prevalence, incidence, and mortality of coronary heart disease and cerebrovascular disease" through the elucidation and comparison of risk factors with respect to differences in disease experience (3). From the information compiled in the baseline study between 1965 and 1970 on Issei (Japanese-born) and Nisei (born of Issei parents in the United States) male subjects of similar age, a database of basic demographic and socioeconomic information, estimates of general health status and usual physical activity, and histories of smoking and dietary habits were generated. The data from the baseline study, further studies

from the NI-HON-SAN population sample, as well as studies patterned after results established by the NI-HON-SAN Study have been used in other areas of research.

The significance of the information collected for the NI-HON-SAN Study is as a body of descriptive data of ethnically similar cohorts, demonstrating similarities or very slight differences in characteristics "wholly or largely genetically determined" (e.g., blood type, stature, and skeletal size), while distinct differences were noted in characteristics considered to be largely determined by environmental factors (e.g., weight, blood pressure, glucose tolerance, and serum lipid and uric acid levels) (3). Yet, these differences in data comparing environmental factors, relative to a rather similar genetic background, are significant: these data capture the effects of Westernization experience on Japanese-Americans coming of age during the period from 1910 up to World War II. For the Nisei, being born to parents of Japanese descent in the United States was met with the following effects of Westernization: the urbanization of a formerly agrarian people, the education and new occupational roles of the immigrant parents, the shifting profile of body weight and physical activity, the emphasis on pursuit of educational goals, shifting family size, and shifting cultural roles of sons by birth order. Moreover, these effects also represented socioeconomic factors with theoretically important implications on health (e.g., data on parents' occupation and education, subjects' education level, family size, and birth order), which is the area researchers have focused in on in order to ask if migration increases the health risks of Japanese-Americans for certain maladies (1).

In the case of NIDDM, careful consideration of the data from studies on Nisei males has indicated an increased prevalence of NIDDM in the more westernized Nisei (1,4,5). The measures of acculturation and determination of study samples was critical in the data analysis. However, the basis for the claim has been the finding of obesity resulting from excessive caloric intake, the location of the deposits of excess fat, a high percentage of calories from fat and animal protein, increased risk directly proportional to aging, and a sedentary westernized lifestyle leading to decreased physical activity (4,5). Migrant subjects who maintained a less acculturated lifestyle, including a more traditional diet of lower fat, animal protein, and overall caloric intake placed themselves at a lower risk for NIDDM (1,4,5).

Problems with migration studies.

Studies of migrant populations are only helpful when a significant difference exists in disease risk between the country of origin and the host country. Problems arise when there is confounding or bias that interferes with sample selection and evaluation. These problems have been broken down by Parkin *et al.* (2). Of the issues raised, some of the most critical are problems with the confounding factors of poor data quality and selection bias. Concerns over data quality arise when there are variations in the quality of data from different sources, such as different countries. For example, there is often a considerable difference between countries in the accuracy of coding for causes of death. Causes of death may be attributable to differences in access to health care facilities in different areas, the manner in which death certificates are filed, or the actual coding procedure for the underlying cause of death (2). The result is the introduction inaccurate differences in mortality rates. However, in a study where there is a concerted effort to employ a uniform set of methods in different regions, as in the NI-HON-SAN Study, problems with data quality can be minimized.

Selection bias often occurs in migration studies because migrant populations are non-random, self-selected populations that frequently come from a limited geographical locus. A migratory pattern of a group from a specific locality is frequently comprised of individuals of a particular social or religious affiliation that can tend to exhibit distinctive patterns of disease. Therefore, when these individuals are compared to cohorts in their country of origin, the common genetic background—an integral part of conducting a migration study—is skewed. Another complication of selection bias in migration studies is the healthy/unhealthy migrant effect (2). Depending on the circumstances surrounding migration, a migrant population may be more or less healthy than their country's population. In instances when migrants are healthier than the average population, the reasoning is that the "fact of seeking a new life overseas implies a population that is resourceful and energetic (at least not chronically ill)" (2). Historically, there have been instances when the sick and disabled were denied entrance into their destination by immigration authorities. However, the converse has been true as well, in the case of Jews migrating from the Soviet block to Israel where the permission to immigrate was more easily obtained for the ill (2).

The effect of selection bias can be reduced only when comparisons can be made between similar groups. In the case of studies conducted for NIDDM risks in Nisei populations, certain studies fare better than others in accounting for selection bias by examining urban vs. rural populations (1) or by employing demographic and sociocultural assessments (4) among other variables, whereas other studies were adjusted for age while lacking a comprehensive consideration of environmental factors (5).

Conclusion.

Theoretically, the study of multifactorial disease is aided by studies of migrant groups in that migrant groups allow investigators to focus their efforts on environmental factors that precipitate disease for a particular genetic predisposition. However, the nature of a multifactorial disease is complicated; the determination of the environmental factors that trigger the pathological state are not always readily apparent—especially in the face of many confounding factors. The body of work on the effects of acculturation of Japanese-Americans, while it contains a vast amount of data canvassing myriad variables, is only useful if it is evaluated in such a manner that as many possible confounding elements are dealt with as possible. As discussed above in the case of studies dealing with the risk of NIDDM in acculturated peoples of Japanese descent, it is often the case that certain considerations are not taken into account, such as socioeconomic status or demographics. These sorts of oversights or lack of available data act to detract from the validity of observations that certain dietary and lifestyle aspects increase one's risk for NIDDM. It is extremely promising, however, that as investigators continue honing their skills of carrying out and evaluating migration studies, that increasingly complex studies will be able to provide even more useful information as to the environmental factors responsible for the onset of multifactorial disease.

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