Commentary: Can conventional migration studies really identify critical age-period effects?

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Schooling et al. examine the association between migration to a more advantaged environment and the subsequent risk of cardiovascular disease. Their data show that, compared with those who migrated later in life, those who migrated in the first two decades were at a greater risk of diabetes, hypertension, hyperlipidaemia, and ischaemic heart disease. From this the authors infer that there may be specific vulnerabilities to environmental change during childhood. They further suggest that the increased risk may be mediated...
through altered trajectories of childhood growth and puberty. Their study makes an important contribution to the limited body of knowledge that exists on the determinants of the health effects of migration.\textsuperscript{2,3} Substantial economic migration (from mainland China to Hong Kong) over a short period of time, and the relative ethnic similarity between the migrant and non-migrant populations, offer a valuable opportunity to isolate the contribution of environmental exposures with minimal confounding by genetic differences. The study's findings are limited to some extent by poor characterization of the primary exposure, that is, migration. Migration status was assigned according to the place of birth and the age at migration estimated from current age and the length of stay in Hong Kong. Age at migration was used as a broad proxy measure for environmental exposures before and following migration. Such a binary classification of environment ignores the marked heterogeneity that exists among places at various stages of development.\textsuperscript{4} It also ignores the possibility of multiple migrations. However, the most uncertain aspect of this research—as indeed of many other such studies of migration—is the appropriate interpretation of the significance of age at migration.

In this study, the authors conclude that their data showing higher risk of cardiovascular disease in those who migrated young are supportive of a critical period effect at that age.\textsuperscript{1} However, the same data could be regarded as evidence of an effect of the total duration of stay in the new environment, as those who migrated young also spent the longest time in the new environment. This is clearly supported by the data presented in the article and could indeed be predicted by the way in which age at migration was calculated. There are three time-related exposures relevant to this study—the age of the individual, the age at migration to Hong Kong, and the total duration of stay in Hong Kong. Knowledge of any two allows one to calculate the third. The lack of independence between these measures makes it impossible to isolate the independent contributions of age at migration and total duration of new exposure, as for any given age of the individual the other two are automatically correlated.

Other studies of migration with such data have variously attributed the results to either of the two correlated exposures, that is, the age at migration or the total duration of exposure to the new environment, without adequate justification.\textsuperscript{5–8} The best evidence for studying changes over time is provided by longitudinal studies, and several such studies have been conducted for the outcome of blood pressure.\textsuperscript{9} A two-year follow-up of Luo tribe migrants to Nairobi and their rural controls showed that blood pressure increased with duration of urban residence in men.\textsuperscript{1} Studies conducted among Tokelau islanders migrating to New Zealand and Yi farmers migrating to urban areas of China have reported a more rapid age-related increase in blood pressure among the migrants compared with the non-migrants.\textsuperscript{6,7} A cross-sectional survey of Israeli factory workers, comparing Jewish migrants with native-born Israelis, found a significant positive association between prevalence of hypertension and age at migration, but the researchers did not control for the total duration of stay.\textsuperscript{8} None of these studies tried to assess the independent contributions of age at migration and of duration of stay at the new residence.

Environmental differences among places at different stages of development are known to influence the lifestyle of individuals living in them, with important implications for the risk of cardiovascular and other chronic diseases.\textsuperscript{2,3,9} Migration to an advanced environment can reasonably be expected to increase an individual's risk of cardiovascular disease through adoption, after varying lengths of time, of the new lifestyle.\textsuperscript{10} Little is known about the time-related aspects of this risk acquisition, and the situation is unlikely to change with further conventional studies of migration. Although far from ideal, one solution might be to conduct studies in settings with bidirectional movements of migrants, possibly involving multiple migrations and large sample sizes. The availability of multiple comparison groups with different relative weightings of each of the correlated variables may allow some estimation of their independent contribution to disease risk. The application of other novel techniques such as multilevel modelling needs to be explored.

In summary, this study provides useful estimation of the risk of cardiovascular disease associated with migration to a more advanced environment in childhood. Whether this represents a longer duration of adult life exposure to the new environment or some critical period in childhood remains to be established.

References