Commentary: What can we make of an association between human immunodeficiency virus prevalence and population mobility?

Richard G White

It is a truism that population mobility facilitates the spread of infectious disease. Infected individuals will carry the infection with them when they move and, if infectious, may infect others, spreading the infection from one area to another. The spread of Sudden Acute Respiratory Syndrome (SARS) is the most recent high profile example, and the development of the human immunodeficiency virus (HIV) pandemic has been no exception.

We also expect a priori that as an epidemic spreads spatially through a population, mobility between areas of higher and lower prevalence will be found to be a risk factor for infection. On average, individuals who move from higher HIV prevalence areas to lower prevalence areas will be more likely to be infected with HIV than those in lower prevalence areas. This risk will reduce as the epidemics matures and prevalence equalizes in the two areas.

However, this has few practical implications for HIV control given the worldwide dissemination, long latency, and low infectivity of HIV. Unlike the strategies used to control the SARS epidemic, isolation of HIV infected individuals is impractical and unethical.

Of more interest to HIV prevention policy makers is that mobility may also be causally associated with more proximate risk behaviours for HIV infection; and there are many plausible hypotheses that may explain any association. In the context of rural–urban mobility in sub-Saharan Africa, mobility may raise the risk of HIV infection by increasing partner-change rates, increasing contact with higher risk sex partners, such as commercial sex workers or clients, or increasing rates of concurrency.

Conversely, mobility may tend to reduce the risk of HIV infection by increasing exposure to behaviour change messages or by improving access to sexually transmitted disease (STD) treatment services. In addition, the direction of causality may be reversed, with HIV infection leading to mobility. For example, mobility may be caused by AIDS morbidity (to ‘go home to die’ or to seek treatment) or union dissolution due to the death of a partner from AIDS.

The specific hypotheses through which mobility and HIV infection are linked may have very different implications for the impact of mobility on the scale of the HIV epidemic. For example, if mobility purely links populations with differing HIV prevalence, mobility will increase the rate at which HIV spreads through the population, but may not have much impact on the endemic prevalence, which will be primarily determined by the mix of endogenous risk factors. However, if mobility causes increased risk behaviours, then increased mobility rates will increase the endemic HIV prevalence. This finding would be important for HIV prevention policy making.

To be able to distinguish between the plausible hypotheses linking HIV infection and mobility we require prospective studies collecting HIV risk behaviours and STD/HIV status data in individuals and their partners before, after, and during the mobility event. Such studies are very complex and resource intensive, and are probably only justified in populations in which mobility is believed to be a major cause of HIV infection, such as in Southern Africa.

The results of one such prospective study in a rural South African population are reaching publication. Analysis of the baseline HIV prevalence data from mobile and non-mobile males and their resident female partners has already challenged the commonly held assumption that the transmission of HIV infection is unidirectional, from infected mobile to uninfected resident. In the context of the mature South African HIV epidemic, this study reported that in nearly one-third of discordant partnerships it is the resident female partner who is HIV infected, not the mobile male. This suggests that for resident rural women, sexual contacts outside of the primary steady partnership are a significant source of HIV infection.

More frequently, those interested in the links between HIV infection and mobility must interpret data from cross-sectional studies restricted to a population at one end of the mobility flow. For example, in an interesting paper in this issue of the International Journal of Epidemiology, Lagarde et al. report that in rural Caio, West Africa, higher HIV prevalence was found to be associated with casual sex in a city (necessitating mobility) among women and increased short term mobility among men. This finding is consistent with those from many studies in rural populations in Eastern and Southern Africa in which various indicators of mobility have been found to be associated with HIV prevalence or incidence at the individual or community level.

Given the importance the authors gave to these findings, I believe it would have been justified to further explore the associations between mobility and HIV prevalence, bearing in mind their relationship to plausible intermediate determinants. For example, it would have been interesting to see how much of the fully adjusted association between male short-term mobility and HIV prevalence could be explained by the available indicators of riskier sexual behaviour. This could have been achieved by reporting the association between short-term mobility and HIV prevalence adjusted for socio-demographic confounders, and comparing this with

Department of Epidemiology and Population Health, London School Of Hygiene and Tropical Medicine, 49 Bedford Square, London WC1B 3DP, UK. E-mail: richard.white@lshtm.ac.uk
the association further adjusted for intermediate determinants of risk behaviour, such as the number of partners in the last 12 months.

I hope further analysis and perhaps follow-up studies will explore in more detail why HIV prevalence and mobility were found to be associated in these populations. For example, were males in Ciao just ‘unlucky’? Was the association between higher HIV prevalence and higher short-term mobility primarily due to contact with partners who were more likely to be infected with HIV just because they happened to live in higher prevalence areas? Or was the association due to differing behaviour while away, such as contact with commercial sex workers? The answer will partly explain the eventual magnitude of the spread of HIV into these rural areas and may be useful in selecting the most suitable mix of HIV prevention activities.

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References