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# Commentary: Spatial clustering of HIV infection: providing clues for effective HIV prevention

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'Know your epidemic' is the Joint United Nations Programme on HIV/AIDS (UNAIDS) mantra for HIV prevention.[1] Knowledge of the nature of the local HIV epidemic is critical for HIV prevention programmes to be effective. Overall HIV prevalence rates hide the true complex mosaic of the HIV epidemic. HIV infection, like most other infectious diseases, is known to cluster in relation to risk factors, especially substantial risk factors like migration and mobility. Tanser and colleagues[2] identified clusters of high HIV prevalence close to the national roads in rural KwaZulu-Natal, South Africa, reiterating the spatial observation made >15 years earlier in this area along the same national road.[3]

This observation is significant because community-based HIV outreach programmes in hard-to-reach rural areas, which are distant from the main roads, are expensive and labour intensive. These findings provide grounds for targeting HIV prevention efforts in the identified high HIV prevalence geographical regions close to the national road. Knowing where to target interventions is a useful first step. The next step is to establish why HIV is clustering along this national road. There are at least four potential explanations that deserve further investigation.

The first consideration is age. Remote rural areas tend to have higher proportions of toddlers and the elderly. Hence, it is important to establish whether those living close to the national road were generally

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younger and in the age range at greater risk of HIV infection. One of the most notable features of the HIV epidemic in South Africa is the stark differences in age and sex distribution of HIV infection.[3] HIV prevalence is highest in teenage girls whereas it is low in teenage boys; with prevalence rates rising in men ~5–7 years later than in women. In South Africa, >20% of pregnant women aged 15–24 years attending prenatal clinics in this region are infected with HIV,[4] and overall, ~76% of HIV infected young people aged 15–24 years are women. Young women in this age group are 1.3 to 12 times more likely to be infected than their male counterparts.[5,6] Age-adjusted comparisons across geographical clusters could provide information on the extent to which age, and possibly gender, differences explain the variation in HIV prevalence across clusters and differences between clusters close to and distant from the national road.

Another factor to consider is mobility associated with migrant labour. In sub-Saharan Africa, migration has been shown to be a risk factor for the spread of infectious diseases, and has contributed to the extraordinarily rapid spread of HIV in South Africa. A number of studies in South Africa have shown that migrants are at greater risk of infection with HIV and other sexually transmitted infections.[7–9] The apartheid-inspired migrant labour system created a situation where multiple partnerships, especially concurrent multiple partnerships, became the norm. Under the apartheid laws, only the black men were allowed temporarily into the cities to work. This led to many of the workers visiting sex workers in the cities and mines or having both a 'town' wife and a rural 'farm' wife. As migrant workers are most likely to live close to the national road, this may be one of the reasons that the areas close to this road have the highest HIV prevalence.

The third consideration is the extent to which sex work is prevalent in those living close to the national road. The national road is the main truck route and there are many establishments along this route where sex can be purchased. HIV prevalence among sex workers is known to be very high. A study in the late-1990s found an HIV prevalence of 51.3% (95% confidence interval: 46.7–55.8) in Truck Stop sex workers. The HIV incidence rate in those women who were followed for 3 years was 18.2 per 100 person-years.[10]

The vulnerability associated with poverty is a further consideration. Communities close to the national road are often shanty towns with the poor who do not have enough land for food security and survival. In these poverty-stricken informal settlements, a range of risk factors for HIV infection are commonplace, including the practice of transactional sex for survival.

While spatial clustering provides useful data on where to intervene, they provide an entrée for studies to better understand the HIV epidemic and thereby to identify the most effective possible interventions for implementation. Knowing what to do and where to do it will provide the key ingredients for effective action against HIV in communities severely affected by this epidemic.

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