Impact of migration on prevalence and incidence estimates of HIV among adults in a longitudinal population-based cohort in rural Uganda

Introduction

Quantifying the size of the burden of HIV is important since this draws attention to the scale of the problem, thereby helping to mobilize resources for HIV prevention, care and mitigation. Also, changes in indicators of the size of the burden indicate the extent of progress in HIV prevention. The burden is often measured in terms of HIV prevalence and incidence. Prevalence may be estimated using sentinel surveillance, and prevalence and incidence can be measured directly in longitudinal population-based cohorts. Population-based cohort studies of HIV prevalence and incidence are also important for understanding the population dynamics of the infection.

Despite the enormous extent and impact of the HIV epidemic, population-based research on HIV epidemiology in Africa has been very limited. A longitudinal population-based cohort has been run in rural southwest Uganda since 1989 by the Medical Research Council (UK) through its Research Unit integrated within the Uganda Virus Research Institute (UVRI). This MRC/UVRI project is one of only a handful of population-based cohorts in sub-Saharan Africa, the region most badly affected by HIV/AIDS. Most of these cohorts form the ALPHA network).[1]

In measuring the prevalence and incidence of HIV in a longitudinal population-based cohort, the numerator depends on the number of new and existing cases of HIV infection detected, and the denominator depends on the number of residents comprising the cohort. Migration can influence the measured HIV burden by affecting the numerator and the denominator. Regarding HIV prevalence, people with HIV infection can move into the study area and become residents, thereby contributing to the numerator, and residents with HIV infection can move out of the study area, thereby subtracting from the numerator. Regarding prevalence and incidence, the denominator depends on the original number of residents in the study area and any subsequent changes due to births, deaths and in- and out-migration.

The purpose of this paper is to examine the impact of migration on the calculated burden of HIV among adults in a longitudinal population-based cohort in rural Uganda.

Objectives

The main objective of this paper is to assess the influence of migration on HIV prevalence and incidence calculations. Specifically this will be achieved through examining two subsidiary objectives.

1. To assess how migration affects the numerator in HIV prevalence calculations, we describe a) the proportions of HIV infections arising as incident and prevalent cases among residents and contributed by in-migration of people with HIV infection, and b) the proportion of residents with HIV infection who out-migrate.
2. To assess how migration affects the denominator in HIV prevalence and incidence calculations, we describe the proportions of residents, in-migrants and out-migrants in the study population.

Setting

Uganda has been recovering since 1986 from previous civil, political and economic turmoil. The vast majority of the 30 million population is engaged in subsistence agriculture. Annual Gross National Income is $300 per capita and mean life expectancy at birth is 50 years.[2] Uganda is one of the countries in Africa where the HIV epidemic was first reported and that was initially most badly affected by HIV/AIDS. National HIV seroprevalence reached a peak of 18% in 1992, with a subsequent 70% decline through the 1990s until reaching a plateau of about 6% at the end of that decade.[3 4] Recent indications are that HIV prevalence and incidence are again on the rise.[4]

The study site (not far from the shore of Lake Victoria) was chosen as a typical rural setting in Africa. The Trans-African Highway passes nearby bringing commercial sex and transmission of HIV and other sexually transmitted infections in its wake. As in many other rural settings in Uganda, most people are subsistence farmers, levels of literacy (especially female) are comparatively low, there are no tarmac roads and access may be difficult in the rains, and local radio is the main mass communication medium.

The study community in rural southwest Uganda is stable and homogeneous. Most people are from the Baganda tribe, and the 15% of Rwandese origin are well assimilated in the community. Religious affiliation is mostly Christian, with a significant Muslim minority (28%). 50% of the population under 15 years of age. The main income-earning activities are agricultural (growing bananas, coffee and beans) and trading fish. The main change in health status over the past 20 years has been due to the impact of HIV.

Methods

The annual General Population Cohort (GPC) survey has been fully described elsewhere.[5] In brief, the annual household survey (initially among the residents of 15 villages, later increased to 25 villages) currently has 18,000 participants. All adults and children (with parental consent) are eligible for inclusion. Each annual survey round is preceded by community sensitization activities, including briefing the local council and a meeting and video show for the whole village. All households are visited by, in turn, the mapping, census and survey teams (all routinely accompanied by a village councilor). Consenting community members are interviewed at home by survey field workers and provide a blood sample for HIV testing. Average annual survey participation is about 70%, although a much higher percentage has been seen, and bled, in at least one survey round.

HIV incidence and prevalence

In each survey round, the HIV serostatus of all consenting adult participants (aged 15 years and above) was determined. A participant who in the first round tested HIV-positive, or who in a subsequent round tested HIV-positive and had also previously tested HIV-positive, was recorded as a case of prevalent HIV infection. A participant who tested HIV-positive having previously tested HIV-negative was recorded as a case of incident HIV infection. Each HIV seropositive participant falls into one of three

categories: prevalent case, incident case, or migrated into the study area with HIV infection.

Residence status
In each annual survey round since 1989, information collected in the census has included the residence status of each participant, i.e. whether the individual has remained in the study area since the previous survey round, or has moved out of or in to the study area.

Influence of migration on HIV prevalence and incidence calculations
To assess the influence of migration on the numerator in prevalence calculations, we measured the proportions of HIV infections arising as incident and prevalent cases among adult participants who had remained residents, the proportion of residents with HIV infection who out-migrate, and the contribution to prevalent cases made by participants who in-migrated with HIV infection.

To assess the influence of migration on the denominator, we measured the proportions of adult participants who had remained residents, and who were in-migrants and out-migrants in the study population.

Finally we examined the overall impact of migration on HIV prevalence and incidence calculations.

Results

HIV incidence and prevalence
Figure 1 shows HIV prevalence by round, with a fall during the 1990s from 9.5% to 5% and in the 2000s prevalence varying between 5%-7%. Figure 2 shows the contribution to HIV prevalence in each round of the three categories of HIV infection (prevalent cases, new incident cases in that round, and cases in in-migrants joining the study population in that round). Figure 3 shows the contributions of these three categories of HIV infection to the total number of HIV seropositive participants in each round. Figure 4 shows the status of seropositive participants at the subsequent round, in terms of whether they are still resident, have left the study area or have died.

Residence status
Figure 5 shows the proportion of survey participants at each round in each of the three residence categories (remained resident since the previous round, migrated out, and migrated in). Figure 6 shows the proportion of survey participants in each of these three residence categories by age. Figure 7 shows the proportion of survey participants in each residence category by age for rounds 1-10, and figure 8 for rounds 11-19. The proportion of survey participants in each residence category by age is shown for females in figure 9 and for males in figure 10.

Figure 1. HIV prevalence by round (participants aged 15 years and above)

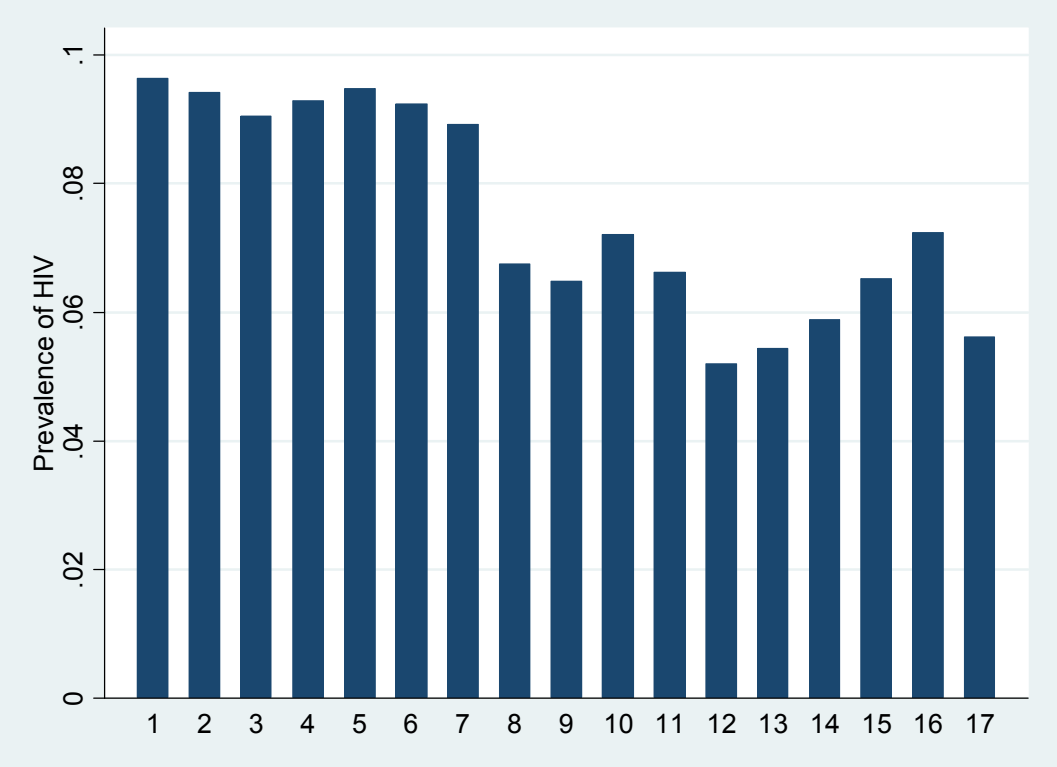


Figure 2. HIV prevalence by round, according to category of infection

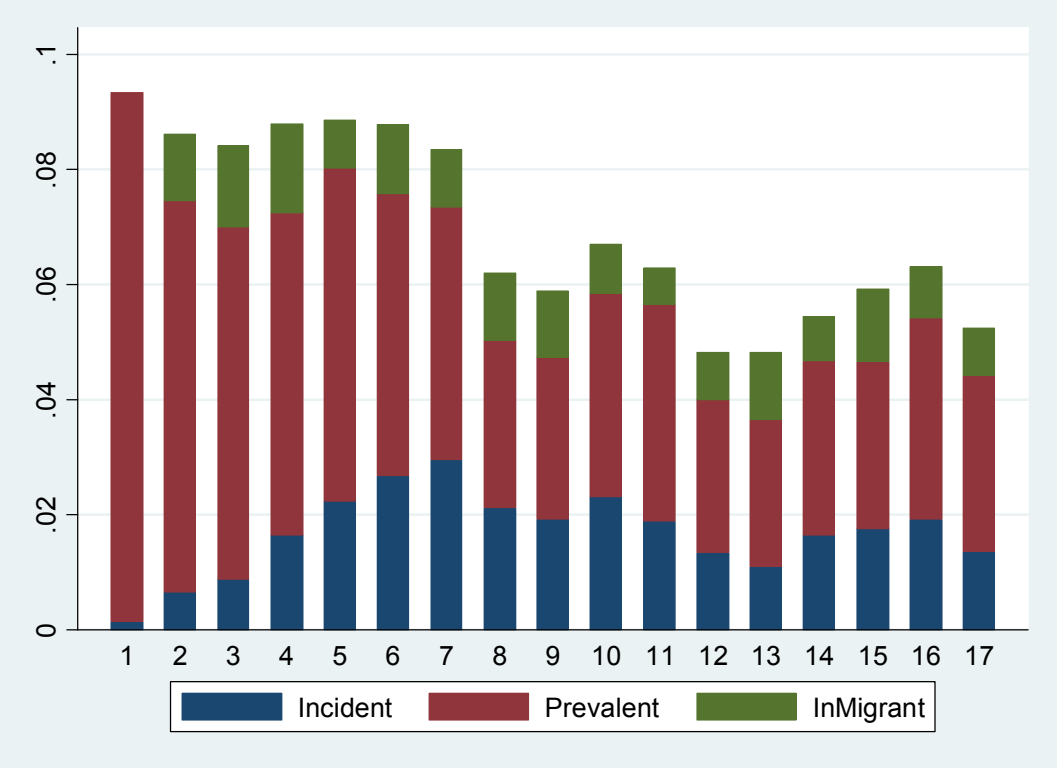


Figure 3. Among adult HIV seropositive participants at each round, percentage in each category of infection.

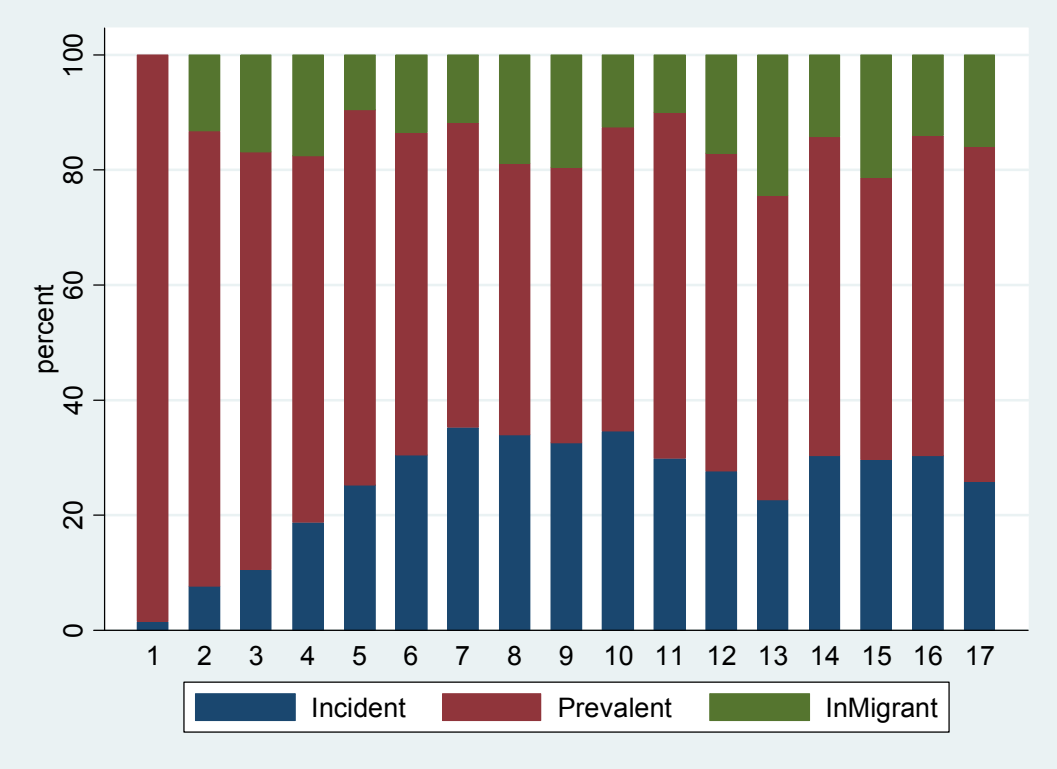


Figure 4. The status of adult seropositive participants at the subsequent round (still resident, have left the study area or have died).

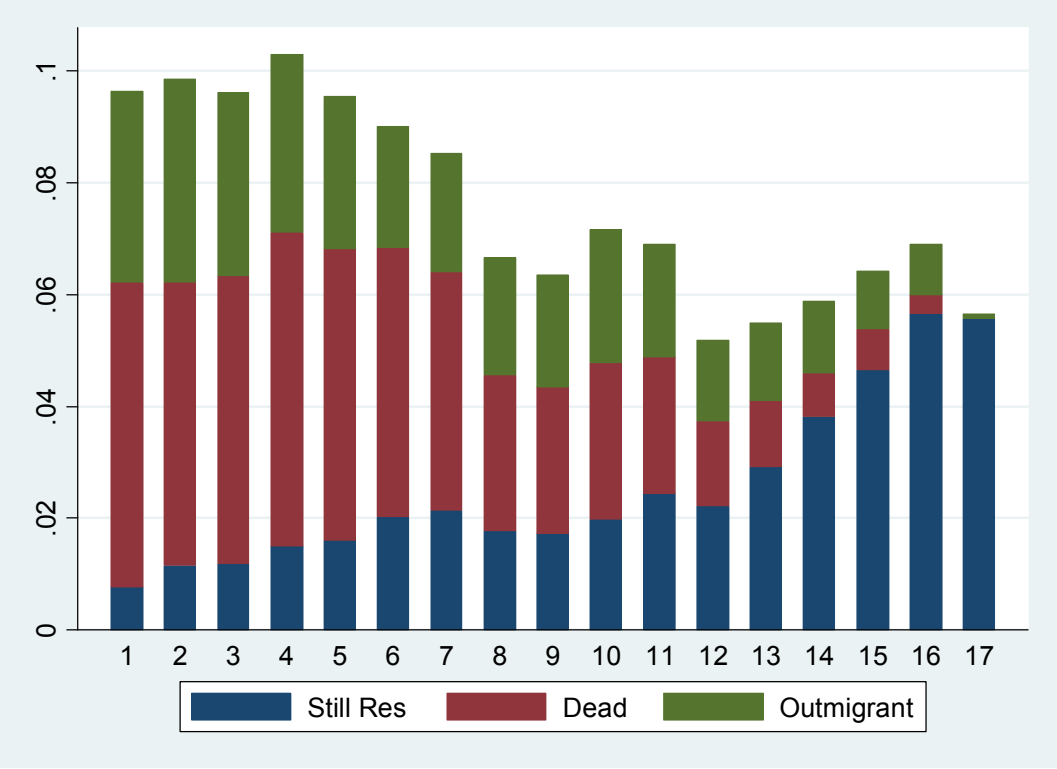


Figure 5. Proportion of survey participants at each round in each residence category

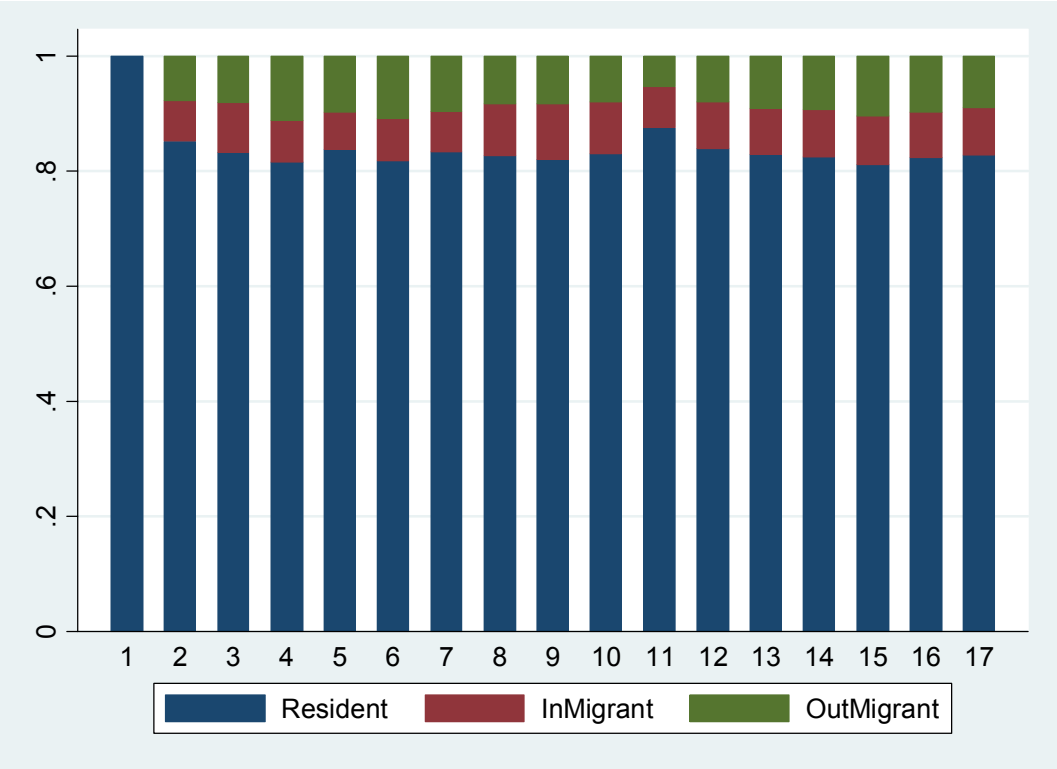


Figure 6. Proportion of survey participants in each residence category by age

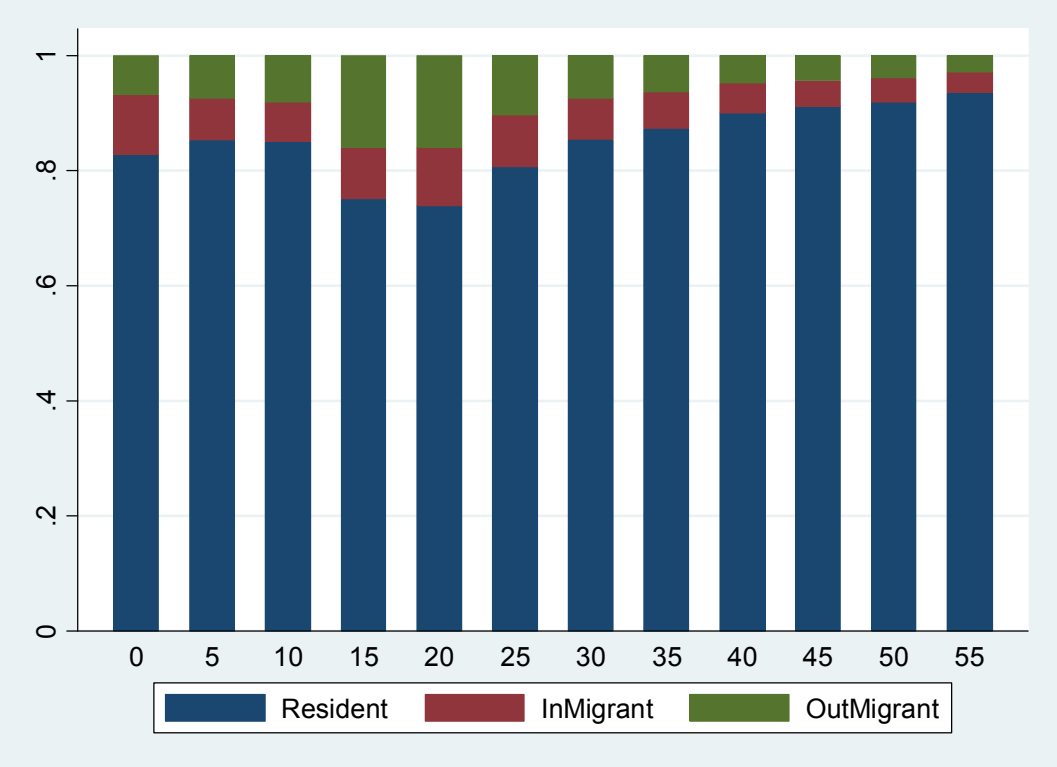


Figure 7. Proportion of survey participants in each residence category by age for rounds 1-10

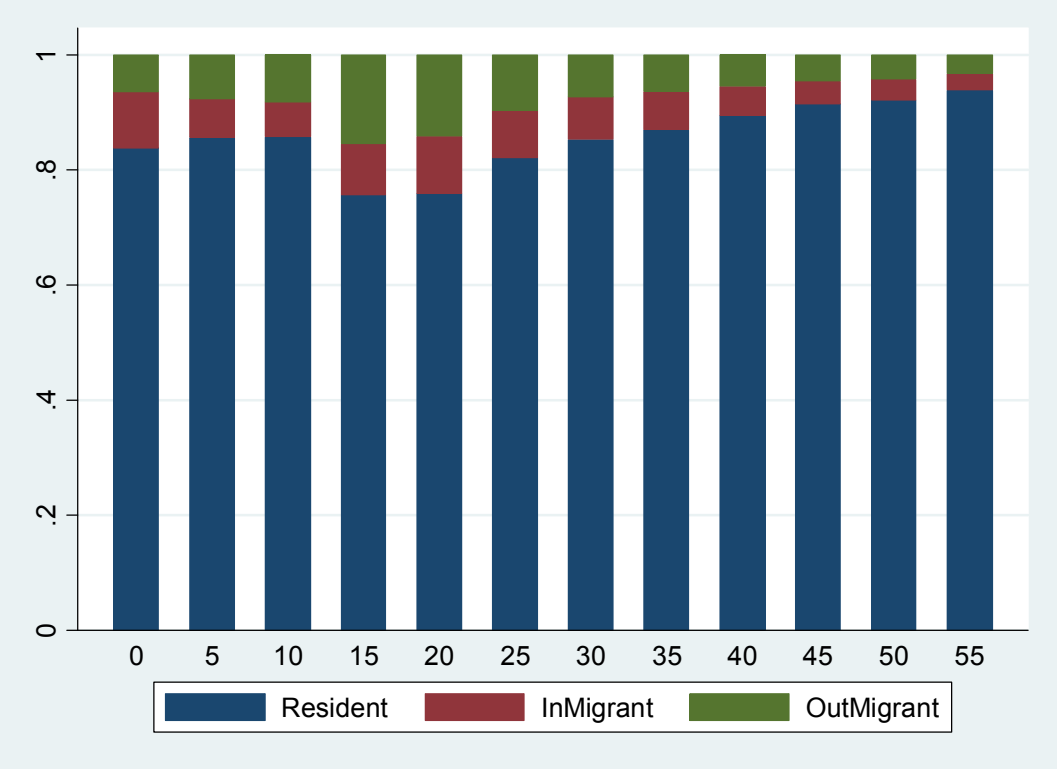


Figure 8. Proportion of survey participants in each residence category by age for rounds 11-17

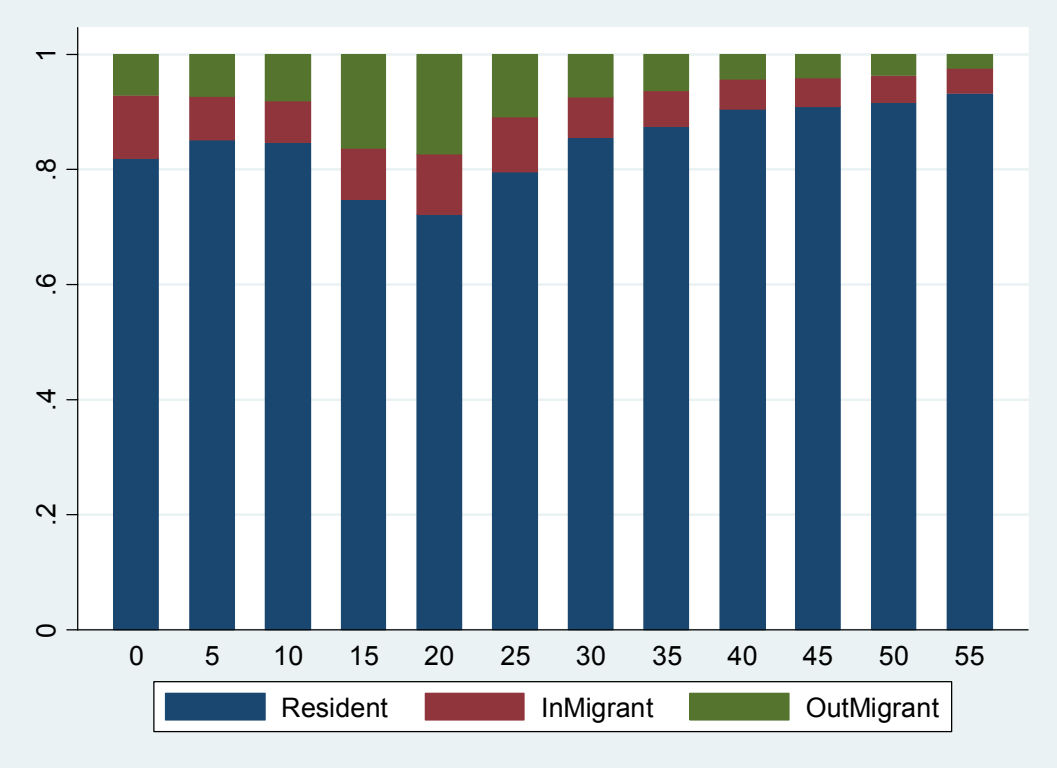


Figure 9. Proportion of female survey participants in each residence category by age

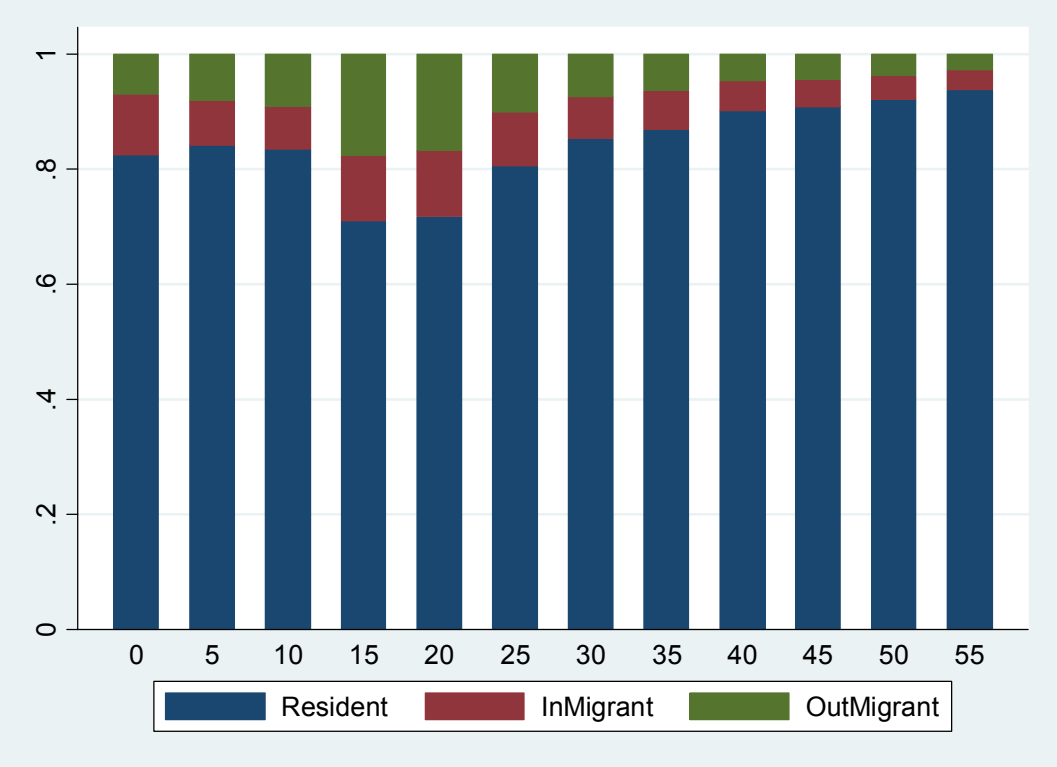
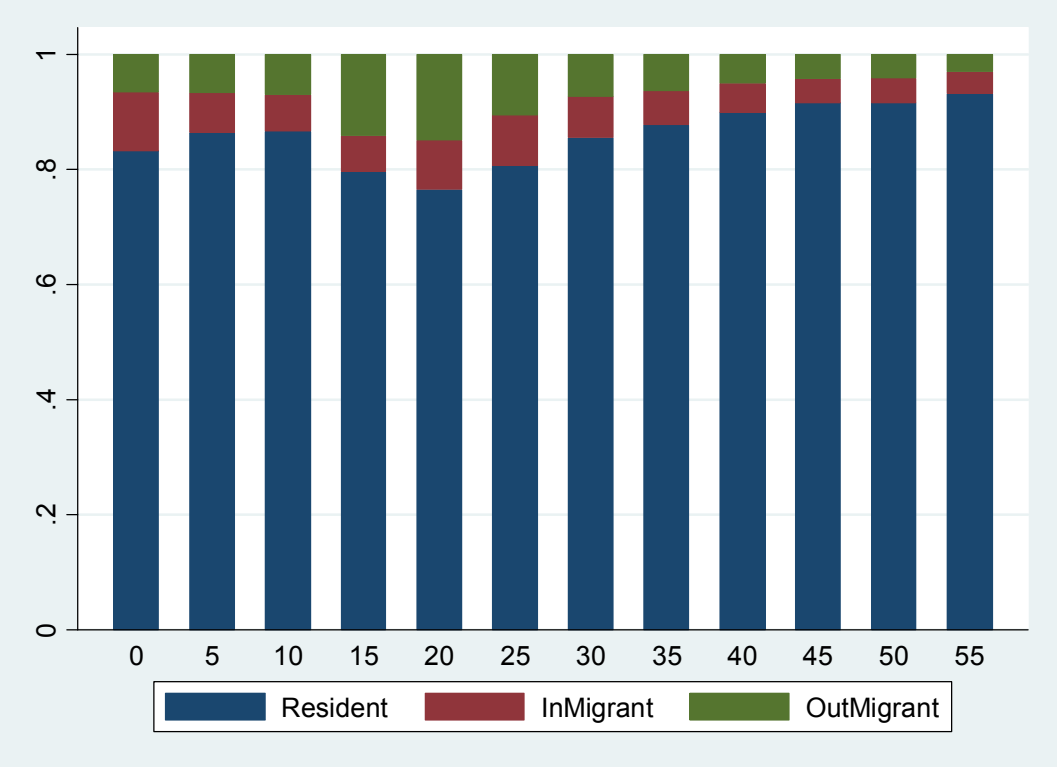


Figure 10. Proportion of male survey participants in each residence category by age



Discussion

Seropositive in-migrants have represented a proportion of the recorded HIV seropositive cases varying over the time of the survey between slightly less than 10% and slightly more than 20%. They therefore make a substantial contribution to HIV prevalence and may be considered a group suitable for targeting for prevention of HIV transmission and for HIV treatment.

Mobility (in-migration and out-migration) is greatest among people in the 15-30 years age group. In this age group out-migration exceeds in-migration, and is more common among females than males. There is little difference in the pattern of mobility by age between the earlier rounds (1-10) and later rounds (11-19). Since risk of HIV infection is highest among people in the 15-30 years age group, and particularly in females, out-migration may tend to decrease HIV prevalence in the study population. The results of regression modelling will show any association between migration and HIV infection.

References

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