# Migration, Circulation, and Socioeconomic Change in South Africa

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In this paper we analyze migration, specifically temporary migration, and its crucial but complex role in the well-being of rural households. We take advantage of long-duration panel data for a rural-district of South Africa: the Agincourt Heath and Demographic Surveillance System. We analyze both the determinants and consequences of temporary migration. In one prong of our analysis, we predict temporary (aka circular) migration as a function of individual and household traits, including *a priori* household economic status. In the other, we predict decadal change in household economic standing as a function of the extent of temporary migration experience. Such analyses allow us to shed light on competing contemporary theories about the role of temporary migration in sending communities. Our results indicate that households that are somewhat better offer are, adjusting for other features of their composition, more likely to send a temporary migrant. Our analyses also point to strong differentiation in the probability of migration by position in the household structure. Our results indicate that simply being a temporary migrant always not confer a benefit to the origin household (and in fact might initially come at a cost) that benefits accrue over time with repeated migration events and differ by gender. Temporary migration confers modest socioeconomic benefits to the origin household in the case of male migrants, as each year of temporary migration modestly raises predicted asset status a decade later. However, for women each year of temporary migration experience comes at a cost for decadal household asset status. All told, our results point to the extensive prevalence of temporary and circular migration and to its mixed net benefit for the origin household.

## Introduction

Demographic Surveillance has particular advantages for understanding the dynamics of population change, especially with respect to temporary and circular migration. Health and Demographic Surveillance Systems (HDSS) provide presumptively key insights into the health and well-being of populations, and in their change over time. Temporally detailed data, such as that collected by HDSS, can help us open a window on the complex interplay of social and demographic events. In this paper we analyze migration in one well-known long-running surveillance program, the Agincourt HDSS in South Africa (Kahn et al, 2007). Migration is a key demographic event for populations monitored with surveillance systems. Because of the observational structure of the HDSS data we use, we are uniquely positioned to learn about the determinants and consequences of temporary and circular migration.

Although often in health studies and in HDSS settings, migration is treated as a nuisance variable or more formally as a source of (uninformative) loss-to-follow-up (LTFU), such platforms offer the opportunity to considerably enrich our understanding of how migration related to change in the origin household and community (White, 2009). (It is noteworthy that in their original implementation most HDSS were not designed to take detailed account of migration.) In our approach, migration may itself be related to the underlying social and health processes within the HDSS population, say through contributing remittances from work in another region or being a source of disease risk or new knowledge as migrants circulate among communities.

This study examines the dynamics of household socio-economic status (SES), migration and other household characteristics in a rural population living in the Agincourt sub-district of Mpumalanga province, South Africa. We examine, in particular the interval 2001-2011, during which time household asset information has been collected, augmenting annual demographic surveillance of the population, which picks up information in household structure, composition, and the migration of household members, both temporary and permanent. Through a module that inventories different types of assets, namely, 'modern' assets (possessions), livestock, other household and community infrastructure, we can analyze the effects of temporary labor migration on changes in absolute household socio-economic status. At the same time we can test whether differential asset wealth early in the period predicts greater or lesser propensity for migration, thereby shedding light on migration-development paradox in a particularly informative setting.

The decision of a person to migrate (or of a family strategy to send a migrant to another locale) is likely to have a significant impact on the livelihood of the original family. There may be a loss of agricultural production or child supervision, or conversely, there may be a new flow of remittances. If we consider migration from this vantage point, as a critical event in and of itself, the ability to track migration presents an unheralded opportunity to exploit some of the unique advantages of HDSS. Given that HDSS are prospective, temporally dense, and comprehensive demographic observation platforms, they possess some distinct advantages over other means by which social and health scientists learn of and integrate population movement into substantive analyses.

Throughout the developing world rural households that are unable to sustain themselves using local resources utilize migration as a compensatory livelihood strategy (Oberai and Singh 1980; Cross 2003; World Bank 2003). Migration enables individuals to maximize their return to human

capital and allows substantial numbers of rural dwellers to participate in the dynamic urban economy while retaining a rural base (Guest 2006), as urbanization confers considerable benefits for development (NRC 2003). South Africa offers a special case, but one in which such rural-urban dynamics may be highlighted. In the apartheid era in South Africa labor migration was strictly controlled using restrictions on destination and duration of stay, giving rise to patterns of temporary circular labor migration (Posel 2006). Various laws facilitated the provision of cheap labor for the emerging economy of South Africa while simultaneously prohibiting Africans (Black South Africans) from accruing, owning or renting land of their own (Aliber 2003). In this way the migrant labor system simultaneously developed wealth and structural poverty in South Africa (Wilson 2001). With the end of the pass laws and then the end of apartheid itself (Reed, 2013), constraints on geographic mobility were removed. Nevertheless, patterns of rural-urban circulation were long established, and so much temporary migration continued well beyond the dismantling of apartheid and into the 2000s. Despite the unique history, then, the South African case—and in particular our rural origin surveillance site—can offer invaluable insights into the role of temporary and circular migration, largely to these urban areas, in sustaining rural communities.

Migration is undoubtedly implicated in the socio-economic and poverty dynamics of rural South African communities. To be sure, migration is a diverse phenomenon; our population engages in both permanent and temporary moves, each with its own gender dynamics, underlying motivations and potentially different outcomes. Temporary, circular migration is predominantly undertaken for continued employment, but also for reasons of job-seeking and education. A study of temporary migration in the Agincourt sub-district of north eastern South Africa showed that of all temporary migrations 46% were to the main metropolis (Johannesburg/Pretoria) and 41% to secondary urban centers (Collinson, 2010). Gauteng Province is clearly a magnet. Out tabulations of permanent migration on a nationwide basis, using the 2007 South African Community Survey (mini-census), indicate that 43% of South African internal migrants go to Gauteng Province.

# Data and Methods

### Agincourt Health and Demographic Surveillance System

The Agincourt Health and Socio-Demographic Surveillance System (HDSS) is a particularly valuable resource through which to carry out this project. Figure 1 describes the geographic setting. The Agincourt HDSS is a one of several health and demographic surveillance sites operating in low-income, often rural, settings. The HDSS in Agincourt routinely updates a population register for such a population of now almost 110,000. An annual field visit to every household in a sub-district is carried out by trained and supervised fieldworkers. This update records each birth, death or migration since the baseline in 1992, thereby producing a dynamic list of all people who have lived within the area (Collinson, M.A., S. M. Tollman, and K. Kahn. 2007; Tollman et al., 2008). Core demographic attributes are recorded at first observation (baseline, in-migration or birth). Modules have been added at times for specialized topics. Beginning in 2001 for part of the study area and expanded later to all of the area, modules were introduced in selected years to ask about household possessions and other topics. We use information from these modules to construct an 11-item asset index much in keeping with practice for low-income African settings (White, et al, 2008). GIS-based maps are employed to ensure that every household is covered. For each death, a trained lay fieldworker conducts a verbal autopsy in the vernacular language. The HDSS provides a prospective, longitudinal database of demographic events for the entire sub-district population that has been established and regularly updated for twenty years.

*Migration.* The study site has long experienced both temporary (circular) and permanent labor migration. Historically this was attributable to labor recruitment (often in the mines of Gauteng region) in the apartheid era. The apartheid regime prohibited permanent resettlement to the urban centers, and thus circularity was established. Even in the post-apartheid era temporary migration has persisted, with temporary migration prevalence reaching 60% of males and 20% of females in their 30s. Permanent migration occurs at slightly younger ages, with up to about 15% of males and 8% of females in their 20s classified as permanent migrants (Collinson et al, 2009). HIV-linked illness and AIDS deaths are high in the Agincourt district, although recent year have seen improvement with a decline in new incidence of cases and lower mortality.

We classify an individual as a temporary migrant if they are still considered a member of the household (retuning periodically) and are away for at least 6 months at the time of household survey visit. (A large fraction of individual classified as temporary migrants are away for almost all 12 months of the year, returning for annual leave, holidays, and the like.) We make such a determination for each wave of the surveillance system. Thus, we possess a panel data set with annual indicators (1,0) of whether each adult in the household is a temporary migrant or not. In the Agincourt observation protocol a "temporary migrant" is an individual who remains attached to a household although physically absent for periods of time. Permanent migrants, by contrast are individuals who have severed membership ties with the origin household; most often this is due to marriage, divorce, or setting off to establish a new household

Despite the central position of migration as one of the three key components of population change (fertility, mortality, migration), it is a conceptually and analytically more difficult phenomenon to capture. The migration "event" is repeatable, even in short intervals of time, and is not constrained by a biological process. One of the great strengths of the Agincourt HDSS is its effort to record migration of household members. Under the present system, administrative records distinguish temporary and permanent migrants, with the former still seen as linked to the household. We use the HDSS infrastructure to shed light on the LTFU issue, and thus point the way to improved analytical purchase on the challenge posed by migration. Our approach can capture temporal details of migration cyclicality.

To understand temporary migration, a year-by-year repeatable event, we estimate models that identify a person (HDSS member) as a temporary migrant (or not) in each year of observation. We rely on contemporary multivariate statistical techniques for limited dependent variables; for the binary outcome *tempmig* [0,1] we estimate a logit model. We adjust for clustering of multiple observations at the level of the individual. Stated in other words, we use the HDSS database to predict, in a repeated measures framework, annual classification of an individual as a temporary migrant or not.

We examine the years 2003-11 inclusive, because the *tempmig* classification was well-established by 2003 and we are confident of classification of status as of 2001, since this requires a subsequent visit. We also include only those person-years of exposure that occurs within that age range of 15 to 70 years, arguing that this is the key age range in which migration is prevalent and likely to be independent.

*Covariates.* We use a range of fixed and predetermined (measured *a priori*) traits of the individuals and households as predictive covariates. Included among the predictors are basic demographic and social characteristics of the individual: age (and its square), sex, educational attainment, refugee status (Mozambican). We also include an array of dummy variables that indicate membership position/status within the household: Head (female), Spouse (female), Spouse (male), Son, Daughter, Other. (Male Head is the reference category.). These are time-varying measures than can change annually. We include the asset index measure, lagged to capture information from closest prior year for which asset information was collected. It is also a time-varying covariate. (It is entered in present models for the closest previous year of observation/risk, i.e. closest prior year for which asset information was collected, so usually lagged by a year or two--such information is collected at specific intervals with the asset module collected every other year.)

*Socio-economic change.* For the second prong of our analysis, we predict change in household economic standing over a decade as a function of the extent of temporary migration experience. Specifically, we use OLS regression to predict the household socio-economic status (using the same 11-item asset index) at the end of the observation period (2011). Given we have information available prospectively throughout this period, we control for initial household SES as well as all of the covariates described above. Currently, we include only individuals who are present at the site during 2001 and at that time were aged 15 and above, thus at risk of experiencing temporary migration. Then we follow all individuals who remain under surveillance (with the possibility of circulating through the site through temporary migration) and analyze their household's asset index in a decade's time.

## Results

Temporary migrants are predominantly young and male. Figure 2 portrays the distribution of duration out of the origin (HDSS area) for these temporary migrants, by sex. We see a long tail for both men and women (some individuals in *tempmig* status for several years), and we also see that males are generally absent for longer durations.

### Determinants of Temporary Migration

In Table 1 we predict *tempmig* classification [0,1]—considered a household member but absent for 6+ months at the time of the annual HDSS census]—from our covariates. We can estimate our model with considerable precision (almost all covariates are found to be statistically significant), since we observe 74,260 individuals who accumulate 378,672 person-years of exposure during the 2003-2011 period. An alternative estimation model, which limited analysis to *tempmig* status in calendar year 2011, gives similar results to those presented here.

Our demographic and socioeconomic covariates have, for the most part, expected influences on temporary migration. We find strong evidence of the standard curvilinear relationship of migratory behavior to age. The probability of becoming a temporary migrant, is expected to rise with age to a maximum at about age 41, and then decline somewhat after that. As is well known in the community and from historical experience, males are far more likely to be temporary migrants than females. In our model, we capture the effect of gender jointly with the position of the individual within the household. Compared to male heads of household, female heads are quite unlikely to be temporary migrants, and female spouses (of the male head) are even less likely to move. Among children we observe a dramatic difference between sons and daughters. Sons are 1.8 times as likely

to be undertaking temporary migration as daughters. Other household members and those whose membership was not classified at the time of census and data reconciliation were also less likely to move.

Agincourt residents who are Mozambicans with refugee status (dating from the late-20th century civil war in that neighboring country and its aftermath) not more or less likely to be temporary migrants (one of the few variables that does not appear to be significant). Other Mozambicans however are much less likely to be migrants (more than half as likely as the general population). Since we are controlling for other traits, this appears to be a significant difference within the Mozambican-origin population itself. One possible explanation is that those with formal refugee status may enjoy less constrained (less worry about being detained, etc.) geographical mobility within South Africa and cycling back to Mozambique.

Another individual characteristic that is an important predictor of temporary migration experience is educational attainment. Higher levels of education (time-varying but contemporaneous) are associated with greater likelihood of temporary migration behavior for individuals in any given year. However, the highest level of educational attainment (university-level) does not increase likelihood of temporary migration than the next highest one (matriculation); in fact the highest attainment possible is associated with two-thirds less likelihood of migration as the latter. Both are associated with an increase (1.5 to 2 times) in the likelihood of temporary migration, compared to the reference group (no or little formal schooling). Lower levels of education show a negative association with circulatory migration behavior. Individuals with only primary education are in fact less likely to move temporarily than the reference group, by about 10 percent.

Our final variable examines the predictive impact of household origin resources. Here we make use of the measure of initial household economic status, as indicated by *assetindex*. An individual whose origins are in a household with more assets (consumer goods, livestock, etc.) is more likely to migrate. More concretely an increase of the index by one standard deviation (about 1.6 units on a mean of 2.8) is predicted to raise the odds of *tempmig* status by about 9%. When entered under an alternative specification (not presented) as a categorical variable, higher values of the asset index are associated positively with temporary migration, while lower levels are associated negatively or not at all. This provides some initial micro-level support for the long-proffered but rarely rigorously tested (within the "migration-development-paradox rubric) notion that extreme deprivation in resources can actually be an impediment to migration.

**Socioeconomic Improvement, Gender and Temporary Migration**

Table 2 shows the analysis for a sub-sample of the Agincourt data presented here, for whom residence status (which is used to derive information on temporary migration experience in a given year) were available for both 2001 and 2011. The analysis should be broadly comparable with the data presented until now, since the asset index is constructed in the same manner as earlier, except it focuses on a specific subset of individuals (N= 19,127 from 8,171 households) examined due to data restrictions (mainly asset information and temporary migration experience).

Level of well-being (asset index) in 2001 is strongly predictive of well-being a decade later, as one would expect. Still the coefficient of 0.36 is indicative of only an imperfect correlation, pointing to the influence of other variables and other aspects of asset index growth at the household level. We find that asset index growth, i.e. 2001 predicted value net of 2001 value and other covariates, is less for older individuals (in their households), while it is also lower for males and Mozambican

households. Educational attainment (fixed covariate at the end of the analysis window) is strongly predictive of asset growth, consistent with expectation. We find that persons with secondary and university-level education are predicted to have higher level of socioeconomic standing in the 2011 round. Those with university education are predicted to reside in household with value of about 0.6 units higher on the index.

Of central interest for this analysis is temporary migration experience, included as both any migration experience during those 10 years and the number of years of spent in temporary migration status. The first accounts for any experience of circular migration in the period, while the second reflects the impact of cumulative experience as a temporary migrant. Thus, individuals with larger values on this variable are likely to be circulating to other employment sites and activities, all while remaining connected to the origin household. Surprisingly, the base impacts of migration experience (at null duration) yields a statistically significant and modestly negative effect on the outcome, i.e. 2011 household SES as measured by the asset index. Next, each year of temporary migration experience only raises the predicted 2011 asset level by 0.0072 units, a modest substantive effect. Someone who was a migrant for 5 years—not rare among males depicted in Figure 2, and about half the width of our observation window—would be expected to raise household predicted asset level by about 0.015 standard deviation.

The effects of migration experience on household well-being differ in direction and strength, when we stratify by gender. Among both males and females, the substantive effect of any migration experience on 2011 asset index is still negative, although still modest (the coefficient is much smaller for men than women, which might mean the pooled result was mostly driven by experiences among males). However, each year of migration experience yields different outcomes for household SES. Among men only, the effect is positive, i.e. each year of temporary migration experience raises the predicted 2011 asset level by 0.026 units, whereas among women a year leads to a decrease by 0.028 units.

**Conclusions**

Health and Demographic surveillance systems (HDSS) have much to offer the study of migration and its links to socioeconomic well-being and other outcomes. Our study was undertaken with this in mind, and our empirical results indicate "how migration matters" and how the study of rural-urban migration, particularly short-term, temporary, and circular migration, can be improved by taking advantage of the ready-made data in ongoing HDSS.

Our key findings include:

- Migrant selectivity by a variety of demographic and social traits is appreciable, as evidenced by large-scale analysis of several years of surveillance data from the Agincourt HDSS.
- Temporary migrants from Agincourt (rural, Northeast South Africa) are more likely to be male HH heads or male children. The pattern of temporary migration behavior shown a strong curvilinear age pattern.
- An individual linked to a household with more assets is more likely to migrate; migration propensity rises with prior (lagged specification, t-1 or greater) asset level of the origin household.
- Temporary migration has a complex association with increased asset growth. Any migration experience is tied to a negative impact on the final asset outcomes. Every year of migration experience is seen to have only a modest impact on decadal asset growth. When stratified by gender, the compensatory effect of each year of migration experience

is positive for men but negative for women. Overall, though the substantive impact of migratory experience seems to be modest. We also observe continuity from 2001 to 2011 in relative well-being, as indicated by household assets, and controlling for several sociodemographic characteristics.

Migration studies may be improved by exploiting HDSS data that more consistently record migration, and better-positioned to capture temporary migration. Such data collection and associated statistical approach are position to understand the role migration plays in livelihoods and health. HDSS sites, with their comprehensive coverage and detailed temporal information are well-suited to such extensions, especially as they link the history of individuals from origin communities to their subsequent geographic mobility and life outcomes. Preliminary results for companion analysis of permanent migration also points to (unsurprising) selectivity by a variety of demographic and social traits. Here a curvilinear pattern also shows, but women are overall more likely to be permanent migrants, most likely due to marriage (severing of residential ties with the origin household) and re-settlement in the husband's community outside of the Agincourt district.

Overall our empirical results led support to the notion, often found in the migration-development paradox literature, that severe socioeconomic deprivation (here indicate by low levels of assets in a relatively low-income rural community) is an impediment to migration. Conversely migration—temporary and circular migration to and from a more economically dynamic region (Guateng), as investigated here—can confer significant benefits on the origin household, and by extension, the surrounding and community.

Demographic surveillance is well-positioned to carry out longitudinal studies of the determinants and consequences of migration for the migrants themselves and for their sending communities. Many health and social issues are relevant to HDSS populations and are linked to the migration of local residents. Migration is, deeply implicated in socioeconomic change—for the migrants, for the receiving communities, and as we show here, for the origin households and communities. Our continuing work is designed to better understand these implications.

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**Table 1. Logit Model Predicting temporary [*tempmig*] migration status: Agincourt Health and Demographic Surveillance System, 2003-2011**

| VARIABLES | (1)<br>Temporary Migrant *tempmig*<br>(=1 in PY) |
|---|---|
| Age | 0.34*** |
| | (0.0040) |
| $Age^2$ | -0.0041*** |
| | (0.000052) |
| Moz. Refugee | 0.035 |
| | (0.019) |
| Moz. Other | -0.92*** |
| | (0.072) |
| Education level | |
| Primary | -0.14*** |
| | (0.016) |
| Secondary | 0.77*** |
| | (0.018) |
| University | 0.41*** |
| | (0.054) |
| Household membership | |
| Female Head | -1.36*** |
| | (0.038) |
| Male Spouse | 0.097 |
| | (0.18) |
| Female Spouse | -2.36*** |
| | (0.040) |
| Son of Head | 0.068* |
| | (0.031) |
| Daughter of head | -0.53*** |
| | (0.033) |
| Other member | -0.50*** |
| | (0.031) |
| Not classified | -0.14 |
| | (0.090) |
| Lagged Asset index | -0.00072 |
| | (0.010) |
| Lagged Asset index squared | 0.0018* |
| | (0.00087) |
| Constant | -6.48*** |
| | (0.081) |
| Observations *(person years)* | 378,672 |
| Clusters *(persons)* | 74,261 |

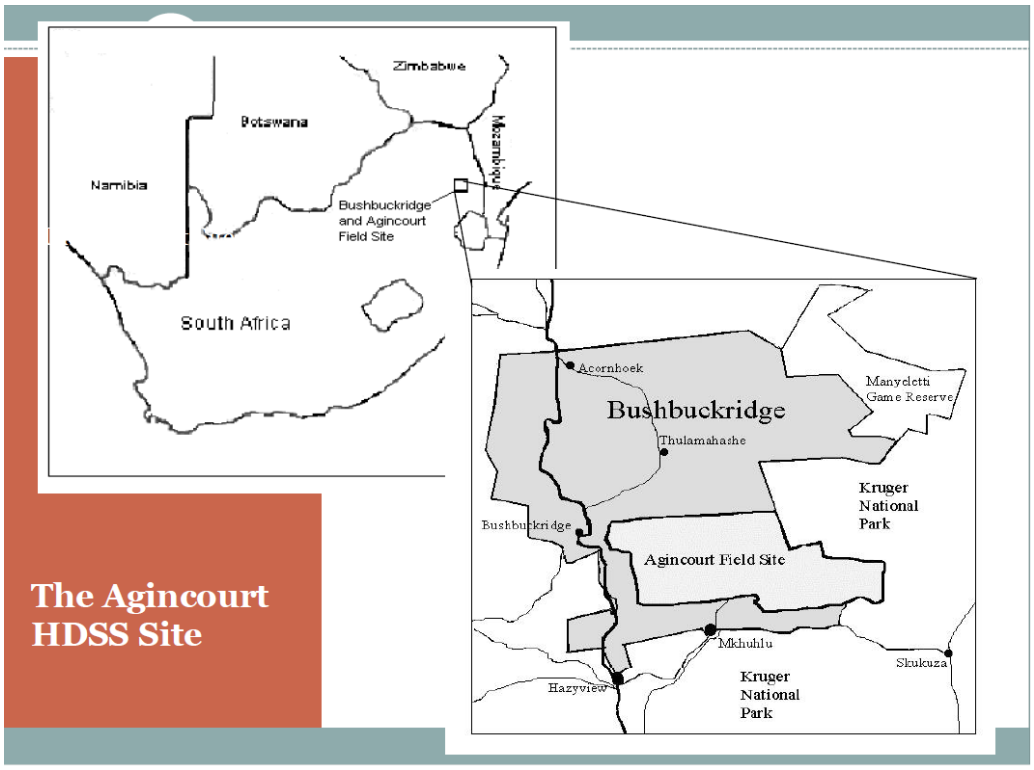
Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05 denote significance levels

**Table 2. OLS Model Predicting 2011 asset index: Agincourt Health and Demographic Surveillance System, 2001-2011**

| VARIABLES | (1) *Pooled* | (2) *Female only* | (3) *Male only* |
|---|---|---|---|
| Asset index in 2001 | 0.36*** | 0.34*** | 0.37*** |
| | (0.0056) | (0.0078) | (0.0080) |
| Age | -0.020* | -0.0060 | -0.045*** |
| | (0.0085) | (0.011) | (0.013) |
| Age-Squared | 0.00020* | 0.000020 | 0.00050*** |
| | (0.000093) | (0.00012) | (0.00014) |
| Male | -0.073* | N.A. | N.A. |
| | (0.029) | N.A. | N.A. |
| Moz. Refugee | -0.45*** | -0.58*** | -0.38*** |
| | (0.032) | (0.046) | (0.045) |
| Moz. Other | -0.37 | -0.32 | -0.41 |
| | (0.45) | (0.61) | (0.65) |
| EDUC=Primary | -0.078* | 0.046 | -0.22*** |
| | (0.032) | (0.043) | (0.048) |
| EDUC=Secondary | 0.26*** | 0.21*** | 0.26*** |
| | (0.035) | (0.053) | (0.047) |
| EDUC=University | 0.60*** | 0.43*** | 0.73*** |
| | (0.064) | (0.094) | (0.088) |
| Ever *tempmig* | -0.13** | -0.028 | -0.13 |
| | (0.043) | (0.056) | (0.068) |
| Years classified as *tempmig* | 0.0072 | -0.028*** | 0.026*** |
| | (0.0048) | (0.0075) | (0.0065) |
| Constant | 7.08*** | 6.99*** | 7.32*** |
| | (0.19) | (0.26) | (0.27) |
| Observations | 19,127 | 9,196 | 9,931 |
| R-squared | 0.253 | 0.252 | 0.261 |

Standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05) denote significance levels

**Figure 1. Study Site**



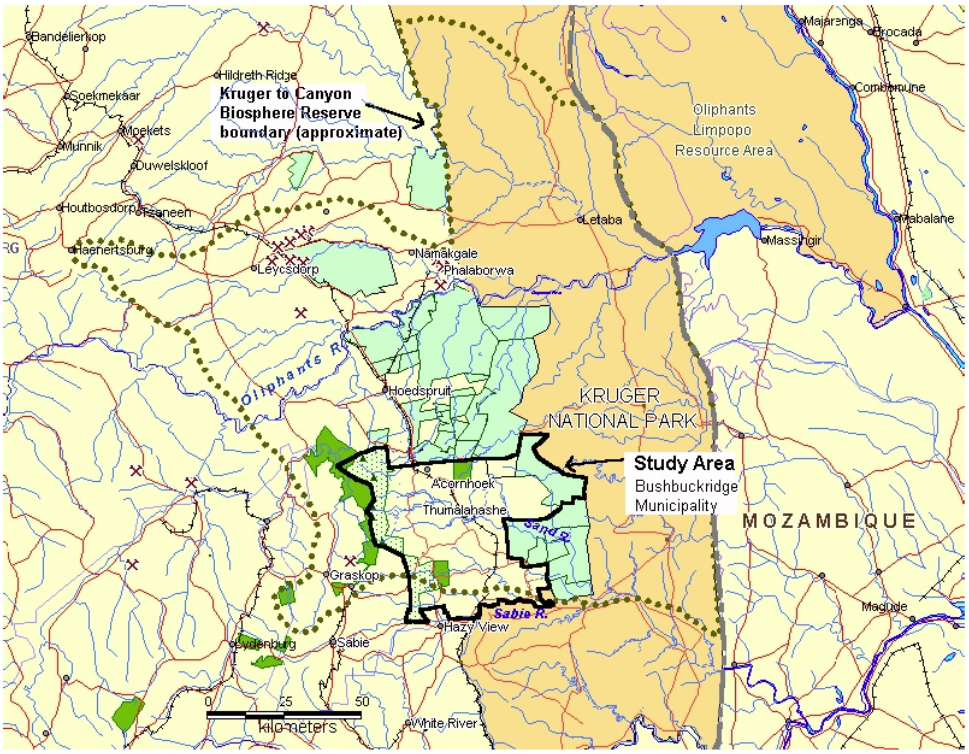



**Figure 2 Distribution of Temporary Migration Duration, by Sex (Male=1) AHDSS 2001-2011**