Mortality differentials and causes of death among self-settled refugees and host population in Agincourt: Insights from demographic and health surveillance system data 1994-2018

Introduction

Mortality differentials reflect significant variations in health outcomes across populations and are essential for understanding public health dynamics. These differences are influenced by various socio-demographic factors such as age, sex, ethnicity, socio-economic status among others. However, scholarly literature argues that circumstances under which people move or migrate significantly predicts their mortality outcomes. For example, Castaneda, Holes, Madrigal, De Trinidad, Beyeler and Quesada (2015) affirmed that the process of migration is an important social determinant of health and can affect health directly or indirectly, through changes to other social circumstances such as housing and living conditions. In other words, moving out from one's place of origin as a forced migrant (refugee or internally displaced person) or a voluntary migrant has a dire consequence on health outcomes including mortality, immediately and over time.

In past and recent refugee crises, refugees remain among the most vulnerable members of society faced often with xenophobia; discrimination; poor living, housing, and working conditions; and inadequate access to health services, despite frequently occurring physical and mental health problems (Gleeson et al., 2020). In fact, previous studies have documented inequality in mortality for refugees and host population with conflicting results. Some studies have reported higher risk of morbidity and mortality for refugees compared to non-refugee immigrants even after controlling for some demographic and socio-economic variables (Hollander et al., 2012; Norredam et al., 2012; Toole & Waldman, 1998). However, other studies have reported lower risk of death and morbidity for refugees (Swerdlow, 1991; Khawaja & Tewtel-Salem, 2004; Hynes, Sakani, Spiegel and Cornier, 2012; Heudtlass, Speybroeck & Guha-Sapir, 2016). In the Agincourt context where there are Mozambican self-settled refugees, a few studies have been done on mortality patterns (Kabudula et al., 2014; Houle et al., 2014; Houle et al., 2024) and specifically on infant mortality (Sartorius et al., 2010) and child mortality (Houle et al., 2013; Tlou et al., 2018; Houle et al., 2021). It is important to note that these studies focused mainly on two groups/sub-population (Mozambican and South African). However, the Mozambican population consist of individuals who are refugees and migrants (see methods section). To the best of our knowledge, there is only one study that focused on the refugees and compared their child mortality outcome to the host population. The study found that children from former Mozambican refugee households had higher mortality rates than those from host South African households, particularly in the first four years of life (Hargreaves, Collinson, Kahn, Clark & Tollman, 2004).

Nonetheless, there are few longitudinal studies that follow refugees over a long period of time (Hollander et al., 2012). Also, there is limited empirical literature on mortality pattern and how that has changed over time for refugees and lastly, the use of similar data that allows for comparison of results among different groups. Overall, our study aimed to contribute to existing literature on forced migration by examining the mortality differential and cause of deaths among Mozambican self-settled refugees and host population in Agincourt. Specifically, we used longitudinal data for 25 years (1994-2018) to report on the mortality pattern of self-settled refugees compared to other sub-groups and how these differentials have changed over time (i.e., reduced or equal to that of the host population). We also examined differentials in cause-specific mortality for these groups and how that has changed over time (the epidemiological transition). Lastly, motivated by the "Key methods for assessing migrants' health" (Agyemang, 2019), we compared the mortality differentials among Mozambican self-settled refugees, Mozambican migrants, the host population and Mozambican non-migrants living in Manica, Mozambique.

Methods

Study area and population

The Manica Health Research Centre, established in 1996, is situated in a rural area of southern Mozambique. It currently follows around 92,000 individuals living in approximately 20,000 enumerated and geo-positioned households. Initially, the Manica HDSS started producing baseline socio-demographic observational studies describing the patterns and trends of fertility, migration, and mortality in the area, together with basic descriptive studies on the epidemiology and burden of the most prevalent infectious diseases. For the analysis, estimates on mortality across all ages consist of individuals who are currently settled at the site between 1999 and 2018.

The Agincourt or Matsavana is a town in Bushbuckridge Local Municipality in the Mpumalanga province of South Africa. The size of the site is 420 square kilometres. The area may be considered a cross-border zone of rural southern Africa since it is just 40 km west of the Mozambican border; in fact, nearly a third of the population of Agincourt is former refugee or descended from former Mozambicans refugees who arrived in the area in the early to mid-1980s and their descendants following the Mozambican civil war (Kabudula et al., 2017; Kahn et al., 2012). Agincourt lies 100 km north of the border with Eswatini and 90 km east of the border with Mozambique. MRC/Wits-Rural Public Health and Health Transitions Unit (Agincourt) is a health and socio-demographic surveillance system (HDSS) that was established in 1992, in rural northeast South Africa, close to the national border with Mozambique. The Agincourt HDSS study area is comprised of 31 villages and about 120 000 people with 21,000 households (Kabudula et al., 2017). For the analysis, estimates on mortality across all ages consist of individuals who were either born or migrated into the site between 1994 and 2018.

Data preparation and variables

We used the Agincourt Demographic and Health Surveillance System (ADHSS) data (1994-2018) from Agincourt in South Africa and the Manica Demographic and Health Surveillance System (MDHSS) data (1998-2018) from Manica in Mozambique. The dependent variables are death status (dead, alive) and cause of death (HIV/AIDS and TB, other communicable and infectious diseases, non-communicable diseases, injuries). The main independent variable is status (South African [SA], Mozambican migrant, Mozambican self-settled refugee, Mozambican non-migrant). South Africans are the host population/community in Agincourt. Mozambican migrants are all Mozambicans who migrated voluntarily to Agincourt whereas Mozambican self-settled refugees are those who moved to Agincourt as a result of the Mozambican civil war. This includes both the original refugees and their descendants. Mozambican non-migrants are conceptualised in this study as those currently settled in Manica, Mozambique. Other independent variables we used include age (0-4, 5-14, 15-49, 50-64, 65+); sex (female, male); time-period (1994-1998, 1999-2003, 2004-2008, 2009-2013, 2014-2018); and socio-economic status (poorest, poorer, average, richer, richest).

Cause of death

We used InsilicoVA to determine the most likely cause of death for each death that was documented during the period 1994-2018 (Flaxman et al., 2018). This approach allows for consistent evaluation of changes in causes of death over time and allows for a standardised, automated attribution of cause of death that is much faster and more consistent than physician review (Houle et al., 2024). Verbal autopsy (VA) interviews were done with caretakers of persons who died between yearly surveillance update rounds, using a locally validated VA instrument until 2011, then WHO VA instruments from 2012 forward (Kabudula et al., 2021). The most likely causes of death were divided into four major categories based on the World Health Organisation's burden of disease classification system (Byass et al., 2012): HIV/AIDS and TB, other communicable diseases and maternal, perinatal, and nutritional causes (excluding HIV/AIDS and TB); non-communicable diseases (NCDS); and external causes/injuries. HIV is an underlying cause of many TB fatalities, and the VA approach has difficulty differentiating

between TB deaths due to HIV and those that are not. For these reasons, we included HIV/AIDS and TB together (see Houle et al., 2024).

Socio-economic status

Data collection on socio-economic status (SES) started in 2001 and was measured biannually. To account for missing values from 2001-2018, we used partial mean matching with five imputations. We used Gelman and Hill's (2007) recommendations to create a household-year level data set for imputation (Houle et al., 2016). This includes aggregated individual-level measurements such as counts of males, females, self-settled refugees, migrants and South Africans, ages under 20, 20-59, and 60+, and 1–2-year lags of household SES to account for patterns in SES over time

Statistical analysis

We used discrete time event history analysis to estimate the probability of dying between self-settled refugees and other groups (SA, Mozambican Migrants and Mozambican non-migrants) and assessed how this mortality differential varied over time. Based on methods used by previous studies (Houle et al., 2014; Houle et al., 2015; Houle et al., 2016; Kabudula et al., 2017), we arranged data on each person into a person-year file, which included a record for each complete year of life. Only records for fully observed person-years and the year of the person's death, regardless of whether the person-year was complete, were included. First, we estimated the probability of all-cause mortality for all groups in Agincourt and non-migrants in Manica across time-period as well as age-specific all-cause mortality. Due to limited data availability on SES and cause of death from the MDHSS, we estimated the risk of dying from cause-specific mortality for the sub-populations in Agincourt only. We then estimated how SES influenced all-cause and cause specific mortality from 2001-2018. We did all analyses with Stata version 18.1.

Preliminary results

All-cause mortality

From Figure 1, our result shows from the beginning (1994-1998), self-settled refugees had lower probability of dying compared to the host population but, higher than that of the migrants. However, from 1999 to 2018, Mozambican self-settled refugees had higher probability of dying than their counterparts – Mozambican migrants and South Africans in Agincourt with the highest probability recorded during 2004-2008 (HIV peak period in Agincourt). It is important to also note that probability of dying from 2014-2018 increased for self-settled refugees while it declined for migrants and the host population. We also compared the probability of dying for Mozambican self-settled refugees to non-migrants in Mozambique and found that probability of dying for non-migrants has been declining over time but, higher than that of self-settled refugees, migrants and South Africans in Agincourt. This same trend can be observed for both sexes with males recording higher probability than females (see Figure 1).

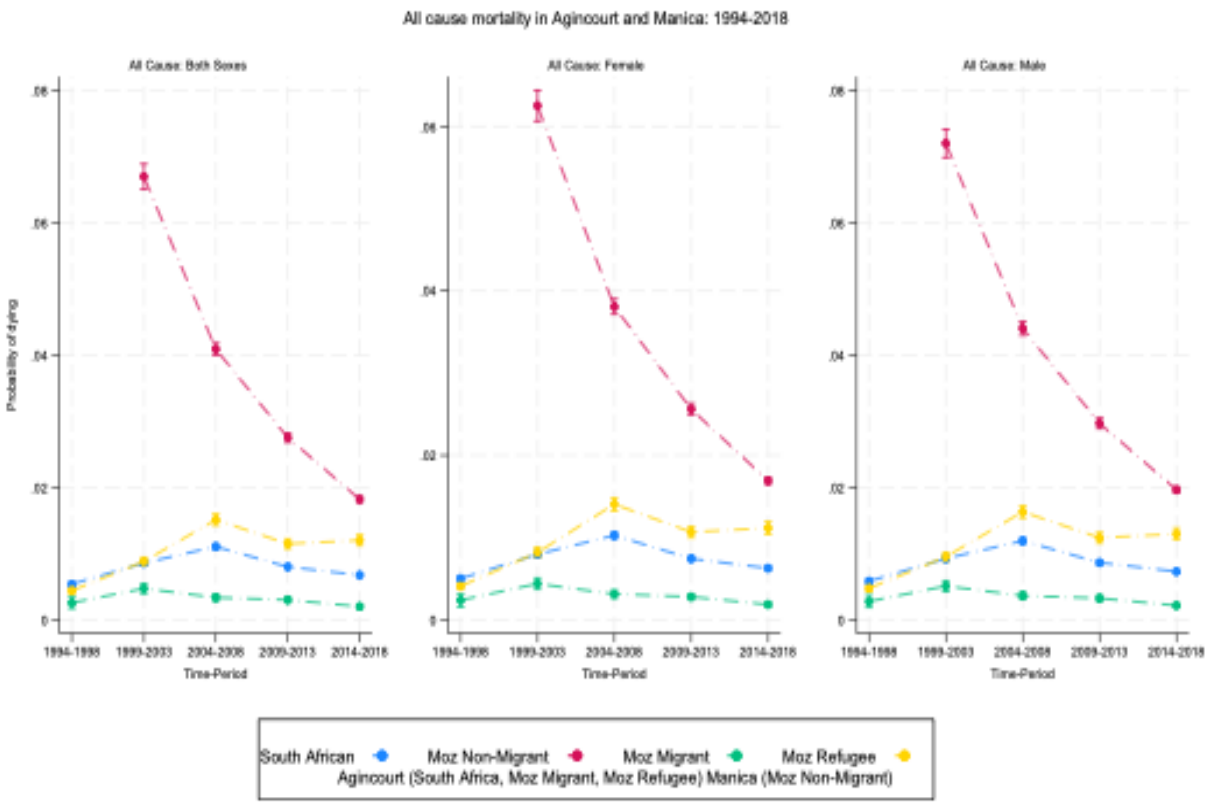

Figure 1: Patterns of all-cause mortality from 1994-2018

Cause-specific mortality

Figure 2 shows the cause-specific mortality risk in Agincourt. The risk of dying from HIV/AIDS and Tuberculosis (TB) steadily increased for self-settled refuges from 1994-2008, then declined afterwards. The same pattern can be observed for South Africans. However, the risk of dying from HIV/AIDS and TB remains highest among refugees compared to migrants and South Africans in the latest time periods. Similar trends can be seen for other infectious and communicable diseases. Although the risk of dying has decreased over time, refugees still bear the highest burden. Nonetheless, the risk of dying from non-communicable disease for refugees has increased over time. The same pattern can be seen for South Africans however, stalled from 2014-2018. For injuries/eternal causes, although the pattern has been fluctuating, there is a steady increase for refugees from 2004-2018 compared to the host population and migrants. Overall, self-settled refugees had the highest risk of dying from every major cause of death group (see Figure 3).

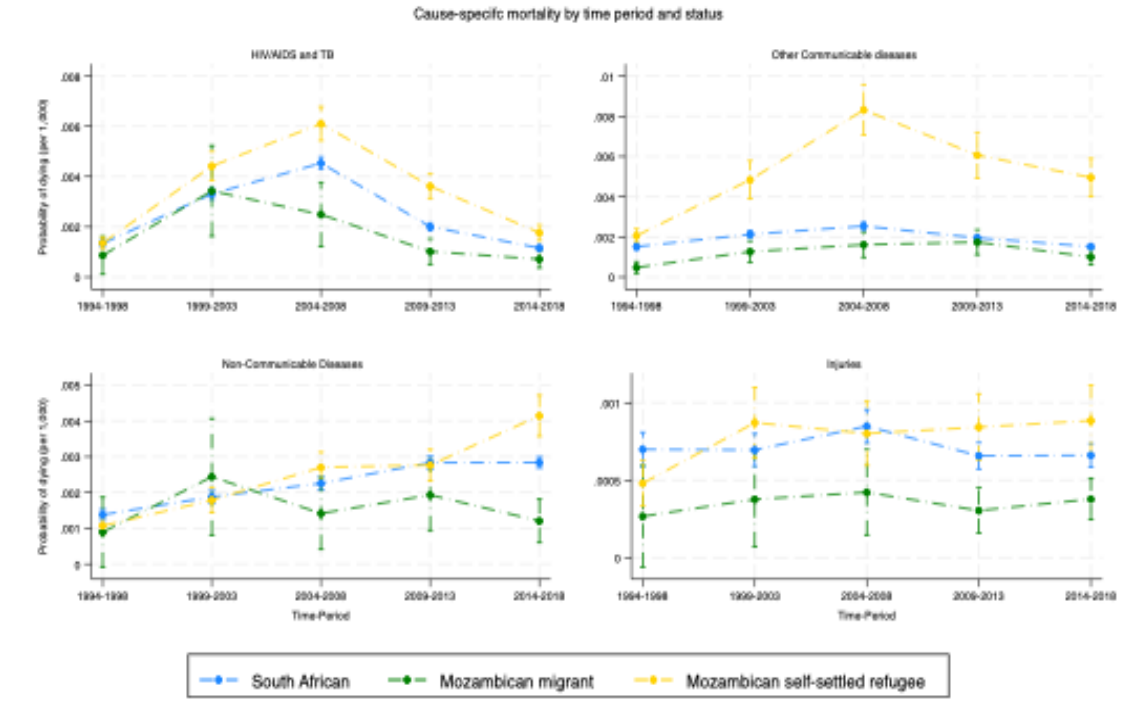

Figure 2: Cause-specific mortality risk in Agincourt by time-period

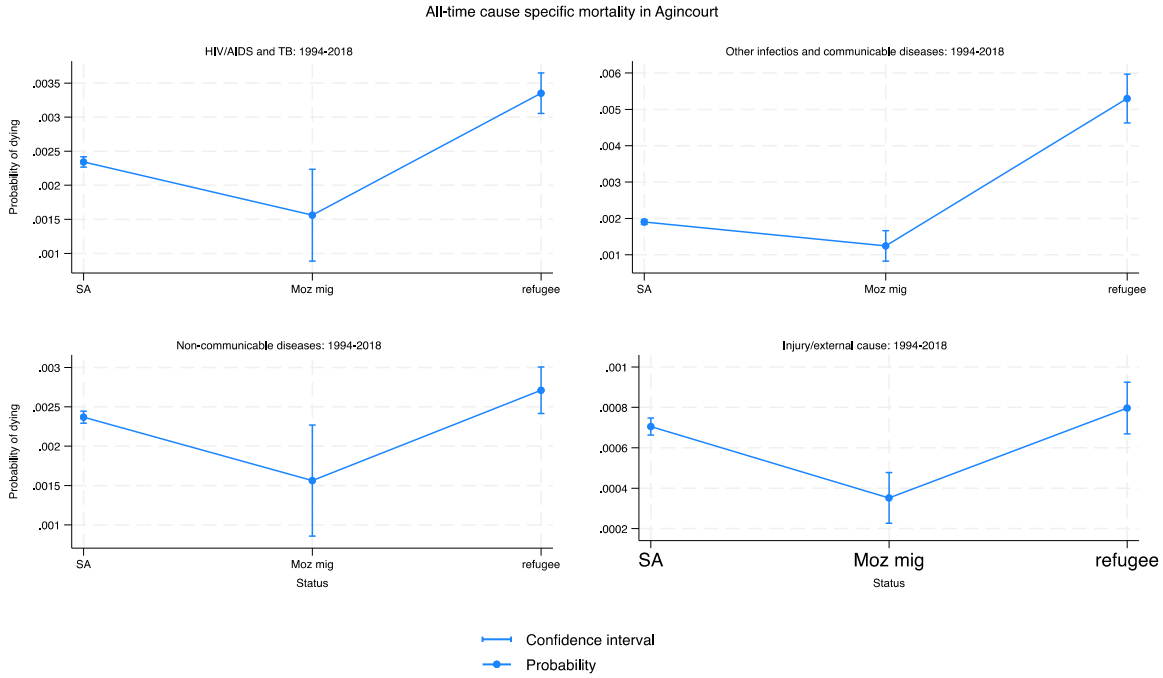

Figure 3: Overall cause-specific mortality risk from 1994-2018

Way forward

This is a work in progress as part of the first author's PhD thesis and we will continue to advance this analysis prior to the conference.

1. Examining age-specific mortality over time
2. Examine the impact of socio-economic status (SES) on all-cause of death as well as cause-specific mortality over time.