IJE vol.33 no.6 © International Epidemiological Association 2004; all rights reserved.
Advance Access publication 19 August 2004

*International Journal of Epidemiology* 2004;**33**:1271–1278
doi:10.1093/ije/dyh257

# Childhood mortality among former Mozambican refugees and their hosts in rural South Africa

James R Hargreaves,[1,2] Mark A Collinson,[3] Kathleen Kahn,[3] Samuel J Clark[3–5] and Stephen M Tollman[3]

Accepted 13 May 2004

**Background** It is important to monitor health differentials between population groups to understand how they are generated. Internationally displaced people represent one potentially disadvantaged group. We investigated differentials in mortality between children from former Mozambican refugee and host South African households in a rural sub-district in the north-east of South Africa.

**Methods** Open prospective cohort of 30 276 children (80 462 person years of follow-up) followed from 1 January 1992 to 31 October 2000 in Limpopo Province, South Africa. Exposure and outcomes data came from the Agincourt Health and Demographic Surveillance System (DSS).

**Results** There was no difference in infant mortality between children from former Mozambican refugee households and those from South African homes (adjusted rate ratio [RR] = 1.02, 95% CI: 0.79, 1.32), but mortality levels were higher among former Mozambican refugee children during the next 4 years (adjusted RR = 1.91, 95% CI: 1.50, 2.42). Increased mortality levels were also seen among children from larger households and whose mother died, while children born to mothers aged >40 years or with higher education were at lower risk. Measured maternal, household, and health service utilization characteristics could not explain the difference in mortality between children from former Mozambican refugee and South African households. Former Mozambican refugee children residing in refugee settlements had higher mortality rates than those residing in more established villages.

**Conclusions** This study demonstrates higher childhood, but not infant, mortality rates among children from former Mozambican refugee households compared with those from host South African households in rural South Africa. The lack of legal status and lower wealth of many former Mozambican refugees may partly explain this disparity.

**Keywords** Child mortality, infant mortality, health equity, displaced people, South Africa, Mozambique

[1] Rural AIDS and Development Action Research Programme, School of Public Health, University of the Witwatersrand, South Africa.

[2] Clinical Research Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London, UK.

[3] Agincourt Health and Population Unit, School of Public Health, University of the Witwatersrand, South Africa and MRC/Wits Unit in Rural Public Health and Health Transitions Research.

[4] Graduate Group in Demography, University of Pennsylvania, USA.

[5] Institute of Behavioral Science, University of Colorado at Boulder, USA.

Correspondence: James Hargreaves, Clinical Research Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK. E-mail: james.hargreaves@lshtm.ac.uk

Addressing inequities in health between advantaged and disadvantaged populations constitutes one of the great challenges of the new century.[1] Research that describes such inequities and the mechanisms by which they are generated is necessary to inform policies that aim to close health gaps. Internationally displaced people may represent one such disadvantaged group. Refugees may be temporarily settled in camps and a number of studies have described the health status of camp refugees.[2,3] However, many of the world's largest refugee populations have been living in host countries for more than 10 years, with significant numbers of 'self-settled'

refugees* often staying beyond conflict resolution.[4] Local integration culminating in refugees once again acquiring the protection of a state is promoted as a durable solution in such cases but is often slow.[5]

South Africa's Limpopo Province was a key destination for refugees fleeing the civil war in Mozambique from 1983 onwards. A formal peace agreement was signed in October 1992, yet despite a variety of voluntary repatriation programmes, by 2000 it was estimated that over 220 000 former Mozambican refugees were still resident in the province.[6] Our aim in this study was to compare mortality rates during 1992–2000 among children from former Mozambican refugee and host South African households. Secondly, we aimed to examine whether differences in levels of more proximate household, maternal, and health utilization characteristics could explain any differences in mortality levels found.[7] Finally, we wished to examine whether there was a difference in the mortality rate between children from former Mozambican refugee households resident in locally recognized refugee settlements and children from former Mozambican refugee households residing in more established host villages.

## Methods

### Study setting

South Africa's rural Limpopo province is among the poorest regions of the country.[8] The Agincourt sub-district, near to the country's eastern border with Mozambique, comprises 21 villages with a population of approximately 70 000. The area is densely populated with low rainfall, and 40% of the population are <15 years old. Over 60% of men and 14% of women aged 30–49 years migrate from the area for at least 6 months of every year to seek or take up work elsewhere, resulting in a high proportion of de-facto single-parent households.[9]

From 1983, Mozambicans fled into South Africa to escape the civil war. They dispersed within local settlements or settled on land allocated to them by local authorities. In 1993, group refugee status was granted to Mozambicans who had fled the conflict, yet access to water, sanitation, and legal rights remained poor for most.[10] Following this, a Southern African Development Community (SADC) amnesty during 1996 encouraged Mozambican refugees to apply for permanent South African residency. While many took advantage of this, outreach to rural areas was limited and standards of living remained low in many areas. In 2000, more than a quarter of the population (29%) of the Agincourt sub-district were of Mozambican origin. We have used the term former Mozambican refugee to describe those whose nationality of origin was Mozambican. This term describes the current socio-legal status of the population group who arrived in South Africa from Mozambique before the end of the civil war and settled. However, it should be noted that it does not accurately describe the status of individual household heads during the entire study period.

### Data collection and analysis

The Agincourt Demographic and Health Surveillance System (DSS) monitors demographic events and socio-economic variables in the sub-district. Since 1992 there have been eight census rounds in 10 years with each of the approximately 11 500 households visited at each census. The main variables measured annually include births, deaths, in- and out-migrations, household relationships, pattern of residency, nationality, educational attainment, and antenatal and perinatal health-seeking practices.[9,11,12] The data model for household membership takes account of high levels of population mobility by including on the household roster non-resident members who retain significant links with the rural home.

During each census a trained fieldworker checks existing individual information for every household member. Births, deaths, and migrations that have occurred since the previous census are recorded. Revisits are undertaken when appropriate respondents are not available. Duplicate visits are made to a random sample of 2% of households and a number of validation checks are built into the fieldwork and data-entry programme.

For this study an open cohort of all children in the first 5 years of life was constructed using data from the DSS. The cohort was followed from 1 January 1992 to 31 October 2000. All individuals who spent time resident in the sub-district during the first 5 years of life were captured by the DSS and were eligible for inclusion in the study. Entry into the cohort could occur at any time during the study period and was captured by entry to the DSS through birth, in-migration, or presence in the baseline census. Exit from the cohort was determined either by exit from the DSS before 5 years of age (through death or out-migration), turning 5 years during the follow-up period, or reaching the end of the follow-up period before the fifth birthday.

The major exposure under investigation was the nationality of origin of the head of the household in which the child resided. Further risk factors for childhood mortality investigated included household factors (sex of household head, number of female adults or children in the household and maternal presence in the home after delivery), maternal socio-demographic factors (age at birth of child and level of education), and health service utilization factors (mother receiving antenatal care and birth in a health facility). Risk factor data was limited to measures that could be calculated from data routinely collected through the DSS and complete data was not available for all children. In our analysis we constructed three groups on the basis of available data. Group 1 children have data available for all household factors. Group 2 children have data available on both household and maternal factors, with missing data primarily a result of inconsistencies in the DSS database that prevented linking a child to the mother. Group 3 children have data available on household and health service utilization factors. Data on health service utilization was only available for children born into the cohort.

Firstly, mortality rates were calculated as the number of deaths per 1000 person years of follow-up (PY). Following this, Poisson regression was used to estimate incidence rate ratios (RR) for mortality over the first year of life and over the next 4 years of life separately since the mortality rates during these two age bands was significantly different.

To identify factors that might explain differences in mortality between children from host and former Mozambican refugee households, the second part of the analysis was conducted with reference to a hierarchical causal framework (Figure 1). The

* Self-settlement occurs when refugees settle amongst the local community without direct official assistance

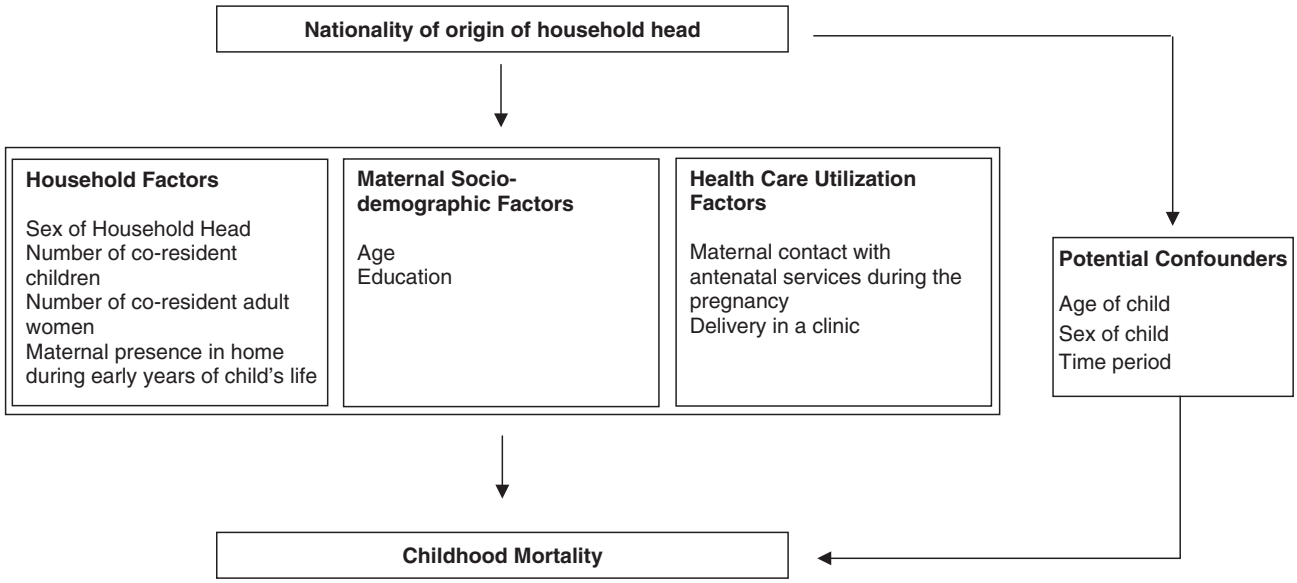


**Figure 1** Hierarchical causal framework for analysing the mediating effect of household, maternal, and health care utilization factors on childhood mortality differentials between households headed by South Africans and former Mozambican refugees

'mediating' impact of variables lower in the hierarchy was assessed by including the variable 'nationality of origin of the household head' in the regression model first, and then adding potential risk factors that are lower in the framework to the model. Changes in the incidence RR associated with nationality of the household head after inclusion of a potential mediating variable imply that some or all of the effect is due to differentials in risk profiles.[13]

Lastly we compared mortality rates between former Mozambican refugee household children resident in recognized refugee settlements and those resident in villages that had a greater proportion of South African residents. Refugee settlements were those where more than 75% of the households were former Mozambican refugee households. These settlements are locally recognized as different to other villages in the area.[14]

RR were adjusted for changes in the childhood mortality rate over the study period. Since some exposure variables were measured at the level of the household, CI have been adjusted to reflect this design effect.

Ethical clearance for the Agincourt DSS is provided by the University of the Witwatersrand Committee for Research on Human Subjects (M960720). Informed consent is obtained verbally each year.

## Results

The DSS contained data on 30 733 children who had spent time resident in the surveillance area, of whom 578 died. Data on all household factors (group 1) was available for 30 276 children (98.5%). Data on household and maternal factors (group 2) was available on 24 810 (80.7%) children, while data on household and health service utilization factors (group 3) was available on 13 336 (43.4%) children born into the study cohort.

Among group 1 there were 537 deaths over the follow-up period 1 January 1992 to 31 October 2000, occurring at a rate of 6.7 per 1000 PY. Mortality rates were approximately stable over the period 1 January 1992 to 1 January 1996 at 5.3 per 1000 PY. During the period 1 January 1996 to 31 October 2000 the overall mortality rate was also approximately stable at 8.0 per 1000 PY. The mortality rate was higher in the first year of life (16.2 per 1000 PY) than in the next 4 years (4.4 per 1000 PY). There was little difference in the mortality rate between male and female children. The pattern of mortality among the children in group 2 was comparable with group 1. However, the mortality rates in both periods of life was higher among children in group 3 (18.4 per 1000 PY, and 6.3 per 1000 PY respectively).

There was little difference in mortality rates during the first year of life between children from former Mozambican refugee and host South African households (RR = 1.02, from Poisson regression, adjusted for period of follow-up, 95% CI: 0.79, 1.32, Table 1). However, children from Mozambican households experienced a higher mortality rate than their South African counterparts during the next 4 years of life (adjusted RR = 1.91, 95% CI: 1.50, 2.42). The excess mortality among former Mozambican refugee children during this age range was seen during both the period 1 January 1992–1 January 1996 (adjusted RR = 1.80, 95% CI: 1.23, 2.62) and during the period 1 January 1996–31 October 2000 (adjusted RR = 1.99, 95% CI: 1.47, 2.70). A similar pattern was seen among groups 2 and 3.

Children born to the oldest mothers who survived the first year of life had significantly lower mortality rates during the next 4 years (adjusted RR = 0.52, 95% CI: 0.26, 1.02, compared with mothers aged 20–29 years), while children born to the small group of mothers who go on to post-school education had improved survival chances. The death of a child's mother during the early years of life was strongly predictive of infant mortality (adjusted RR = 7.27, 95% CI: 4.35, 12.16, compared with children with mothers present in the home at the census after cohort entry).

There was little evidence for a relationship between the sex of the household head and childhood mortality. However, children coming from large families were at greater mortality risk,

**Table 1** Univariate Poisson regression analysis on potential risk factors for childhood mortality

| Factor | No. of subjects | | Mortality rate (/1000 PY) (deaths / person years) | Adjusted IRR[a] (95% CI) 0–1years | Adjusted IRR[a] (95% CI) 1–5 years |
|---|---|---|---|---|---|
| **Group 1** | **30 276** | **100%** | **6.7 (537/80 462)** | — | — |
| Origin of nationality of HH[b] head | | | | | |
| South African | 18 890 | 62.4% | 5.7 (286/50 071) | 1 | 1 |
| Mozambican | 11 386 | 37.6% | 8.3 (251/30 391) | 1.02 (0.79, 1.32) | 1.91 (1.50, 2.42) |
| Sex of HH head | | | | | |
| Male | 22 461 | 74.2% | 6.4 (386/60 664) | 1 | 1 |
| Female | 7815 | 25.8% | 7.6 (151/19 798) | 1.29 (0.98, 1.69) | 1.07 (0.81, 1.41) |
| No. of adult women living in the home | | | | | |
| 1 | 8593 | 28.4% | 5.1 (115/22 422) | 1 | 1 |
| 2 | 7607 | 25.1% | 6.5 (134/20 507) | 1.06 (0.74, 1.51) | 1.50 (1.04, 2.14) |
| 3 | 6467 | 21.4% | 7.2 (124/17 191) | 0.98 (0.68, 1.43) | 1.84 (1.28, 2.66) |
| ⩾4 | 7609 | 25.1% | 8.1 (164/20 342) | 1.20 (0.85, 1.70) | 1.90 (1.34, 2.68) |
| No. of other children in the home | | | | | |
| 0 | 8504 | 28.1% | 6.2 (135/21 605) | 1 | 1 |
| 1 | 10 875 | 35.9% | 6.4 (188/29 260) | 0.99 (0.75, 1.34) | 1.16 (0.84, 1.60) |
| 2 | 5862 | 19.4% | 6.8 (107/15 769) | 0.96 (0.66, 1.39) | 1.34 (0.93, 1.94) |
| ⩾3 | 5035 | 16.6% | 6.4 (107/13 828) | 1.03 (0.69, 1.54) | 1.69 (1.18, 2.41) |
| Mother's status at census after cohort entry | | | | | |
| At home | 26 635 | 88.0% | 6.6 (476/72 045) | 1 | 1 |
| Circular migrant[c] | 3145 | 10.4% | 4.7 (34/7173) | 0.84 (0.50, 1.42) | 0.62 (0.39, 0.99) |
| Died | 496 | 1.6% | 21.7 (27/1244) | 7.27 (4.35, 12.16) | 1.54 (0.76, 3.09) |
| **Group 2** | **24 810** | **100%** | **6.4 (447/70 203)** | — | — |
| Age of mother | | | | | |
| 12–19 | 5283 | 21.3% | 7.2 (107/14 931) | 1.13 (0.79, 1.61) | 1.02 (0.74, 1.40) |
| 20–29 | 11 672 | 47.0% | 6.6 (211/31 838) | 1 | 1 |
| 30–39 | 6311 | 25.4% | 6.0 (113/18 826) | 0.94 (0.65, 1.36) | 0.92 (0.67, 1.24) |
| 40 and over | 1544 | 6.2% | 3.5 (16/4608) | 0.56 (0.26, 1.20) | 0.52 (0.26, 1.02) |
| Educational status of mother | | | | | |
| None | 7892 | 31.8% | 6.3 (139/22 046) | 1 | 1 |
| Some Primary | 7127 | 28.7% | 6.2 (125/20 263) | 0.86 (0.58, 1.27) | 1.01 (0.73, 1.39) |
| Some Secondary | 9024 | 36.4% | 6.9 (178/25 751) | 1.08 (0.76, 1.55) | 1.00 (0.74, 1.34) |
| Higher Education | 767 | 3.1% | 2.3 (5/2144) | 0.31 (0.07, 1.27) | 0.39 (0.12, 1.24) |
| **Group 3** | **13 336** | **100%** | **9.9 (411/41 368)** | — | — |
| Antenatal clinic | | | | | |
| Yes | 13 072 | 98.0% | 9.8 (399/40 531) | 1 | 1 |
| No | 264 | 2.0% | 14.3 (12/837) | 1.40 (0.82, 3.14) | 1.52 (0.67, 3.44) |
| Delivered in a health facility | | | | | |
| Yes | 9872 | 74.0% | 9.8 (298/30 380) | 1 | 1 |
| No | 3464 | 26.0% | 10.2 (113/11 038) | 0.91 (0.66, 1.24) | 1.26 (0.92, 1.73) |

[a] Incidence rate ratio from Poisson regression model, including a binary term coding for the time period of observed follow up (pre/post 1 January 1996).

[b] Household.

[c] The term 'circular migrant' refers to mothers who report that they were living away from the home for >6 months of the past year at the census after the birth of the child.

particularly during the ages 1–5 years (adjusted RR = 1.90, 95% CI: 1.34, 2.68, comparing households with four or more adult females to those with one).

Almost all mothers had some contact with an antenatal clinic during their pregnancy, while being born in a health facility did not have a significant impact on a child's chance of survival after birth.

There was little change in the RR value associated with coming from a former Mozambican refugee household with the addition to the Poisson regression model of most of the potential risk factors measured in this study (Table 2). Children from former Mozambican refugee households were much less likely to be born in a health facility (14.7% former Mozambican refugee children versus 43.8% South African children) and their mothers were much more likely to have received no formal education (59.7% versus 14.2%). However, the inclusion of the health service delivery variable into the model had almost no effect on the RR associated with coming from a former Mozambican refugee household, while the inclusion of the mothers education variable slightly increased the RR associated with coming from a former Mozambican refugee household on mortality in the next 4 years of life.

Finally, we investigated differences in mortality between former Mozambican refugee children from households located in recognized refugee settlements and those from homes located in more established villages comprised both South African and former Mozambican refugee households. Among group 1, 38.6% of children from former Mozambican refugee households resided in refugee settlements. There was a higher mortality rate during the first year of life (adjusted RR = 1.50, 95% CI: 1.01, 2.22), and during the next 4 years of life (adjusted RR = 1.34, 95% CI: 0.95, 1.89) among these children.

## Discussion

In this rural population resident in South Africa, the rate of mortality among infants from former Mozambican refugee households was comparable to that among children born in host South African households during 1992–2000. However, there was a significantly higher mortality rate among former Mozambican refugee children during the next 4 years of life (adjusted RR = 1.91, 95% CI: 1.50, 2.42). Differentials in childhood mortality were not the result of differences in maternal, household, or health care utilization risk factors measured in this study. Among children from former Mozambican refugee households, those residing in recognized refugee settlements had higher mortality rates than those who were resident in more established, mixed population villages.

There are limitations to this analysis. We measured all exposure variables at a single point in each child's life. This approach does not fully capture the complexity of the situation. Changes in situation during childhood (for example, a change in household structure) may also be important in predicting mortality patterns. It is not clear how this might have affected the results we present. We have also measured a relatively limited number of risk factors in this study. Since it is highly unlikely that the mortality differential described in this paper is the result of intrinsic differences between former Mozambican refugee and South African children, they *must* be mediated by differences in proximate risk factors.[7] More detailed research, including data on cause of death, anthropometric measures and nutritional factors, housing quality, or immunization rates might highlight interventions that could improve the health of children born into former Mozambican refugee households. Finally, we did not have complete data on all children which may have resulted in selection bias. Mortality rates were higher among the children on whom data for health service utilization factors were available, all of whom were born into the study cohort. However, the RR associated with coming from a former Mozambican refugee household was comparable in all three groups for both age bands, suggesting a limited impact of selection bias on the relationship under examination in this study.

The overall rate of childhood mortality seen in this study was low compared with many other DSS sites in developing country settings,[15] but significantly higher than that seen in most developed country settings.[16] The area is experiencing a severe HIV/AIDS epidemic. The prevalence of human immunodeficiency virus (HIV) infection among antenatal clinic attenders in the health region was 19.1% in 1998.[17] Previous work from the Agincourt DSS has described the impact of HIV/AIDS on adult mortality,[18] and HIV/AIDS may help explain the increased childhood mortality seen during the later period of this study. While migrant populations may be particularly vulnerable to HIV infection,[19] isolated populations may also exhibit lower HIV prevalence than roadside or peri-urban areas.[20,21] The excess mortality associated with coming from a former Mozambican refugee household was only present during ages 1–5 years. It is possible that children from host South African households experienced high infant mortality rates if there is a greater burden of HIV among this community. Prolonged breastfeeding among Mozambican mothers may also help explain this pattern. However, in the absence of additional data it is difficult to assess the extent to which HIV/AIDS or breastfeeding practices are responsible for the disparities in childhood mortality reported here.

The inequality in childhood mortality described in this paper may be closely linked to inequalities in wealth. Former Mozambican refugee households generally have a lower standard of living than host South African households. Asset data collected during the 2001 Agincourt DSS census have been used to construct a relative index of household economic status using principal components analysis. Mozambican households were approximately three times more likely to fall in the 'poorest' quintile than South African households. Furthermore, Mozambican households in refugee settlements were over twice as likely to fall in this category than Mozambican households located in mixed villages (unpublished census data). An environmental survey conducted in 1993 also demonstrated that refugee settlements were consistently worse off than 'mixed' villages with respect to access to water, fuel, sanitation, and waste disposal.[22] In 2000, refugee settlements still generally had no schools, the quality of housing was poor and they are particularly isolated from public transport.[14] Other recent analyses have pointed to child mortality disparities between ethnic groups in 11 countries of sub-Saharan Africa closely linked to economic inequity and differential use of health services.[23]

The economic vulnerability of many former Mozambican refugees is likely to have been influenced by tenuous legal status over much of the follow-up period. Serious deficiencies in the UNHCR-Mozambique-South Africa tripartite agreement

**Table 2** Mediation of the impact of coming from a Mozambican household by other potential risk factors for childhood mortality

| Risk factor | High risk categories | % at high risk in Mozambican households | % at high risk in South African households | IRR[a] (95% CI) associated with Mozambican Household upon inclusion of factor to model 0–1 years | IRR[a] (95% CI) associated with Mozambican Household upon inclusion of factor to model 1–5 years |
|---|---|---|---|---|---|
| **Group 1** | | | | | |
| **Nationality of household head** | **Mozambican** | — | — | **1.02 (0.79, 1.32)** | **1.91 (1.50, 2.42)** |
| Sex of household head | Female | 15.7% | 31.9% | 1.08 (0.83, 1.48) | 1.98 (1.54, 2.54) |
| Adult women in the home | ⩾4 | 27.9% | 23.5% | 1.01 (0.78, 1.31) | 1.87 (1.47, 2.37) |
| Other children in the home | ⩾3 | 26.3% | 10.8% | 1.02 (0.78, 1.34) | 1.81 (1.40, 2.34) |
| Status of mother | Died | 1.6% | 1.7% | 1.02 (0.79, 1.31) | 1.88 (1.48, 2.38) |
| | Migrated | 7.3% | 12.3% | | |
| **Group 2** | | | | | |
| **Nationality of household head** | **Mozambican** | — | — | **0.91 (0.67, 1.22)** | **1.81 (1.41, 2.33)** |
| Age of mother | 12–19 years | 18.2% | 23.3% | 0.92 (0.68, 1.24) | 1.84 (1.43, 2.36) |
| Educational status of mother | None | 59.7% | 14.2% | 0.88 (0.63, 1.23) | 2.21 (1.64, 2.97) |
| **Group 3** | | | | | |
| **Nationality of household head** | **Mozambican** | — | — | **1.02 (0.78, 1.33)** | **1.88 (1.39, 2.53)** |
| Attended antenatal clinic during pregnancy | No | 2.0% | 2.0% | 1.02 (0.78, 1.33) | 1.88 (1.39, 2.53) |
| Delivered in a health service | No | 43.8% | 14.7% | 1.05 (0.79, 1.40) | 1.88 (1.35, 2.61) |

that granted group refugee status to Mozambicans in 1993 meant that it had little effect on the situation on the ground,[10] while the 1996 amnesty failed to adequately reach rural areas.[6] However, some Mozambicans did get residency papers during the 1990s through a variety of means, with pre-existing social network structures influencing the progress of refugees as they fled into South Africa (personal communication, Fred Golooba-Mutebi 2002). Our analysis suggests that some Mozambican households have fared better in South Africa than others. Further research is needed to explore the link between legal status and childhood mortality among this population.

Two recent policy shifts might have a significant impact on health inequities in this population. In 1999, former Mozambican refugees were again granted the opportunity to apply for permanent residency within South Africa. This regularization process sought to address the shortcomings of previous efforts, and significant attempts at rural outreach were made.[6] More recently, in March 2003, a South African High Court order paved the way for former Mozambican refugees to gain access to a range of social assistance grants. The DSS system used in this study is well placed to monitor absolute and relative changes in health status within this population over the coming years.

## Acknowledgements

Core support for the Agincourt DSS is through a grant from the Wellcome Trust, number 058893/Z/99/A. The Andrew W Mellon Foundation continues to support the work of the Agincourt Unit addressing migration and refugee studies. Long term support by the Department of Health and Welfare, Limpopo Province, South Africa, the University of the Witwatersrand, Johannesburg and the communities of the Agincourt sub-district is acknowledged with appreciation. James Hargreaves is supported by a grant from the UK Government Department for International Development Enterprise Development Fund (EDIF). Samuel Clark is supported through NIH grant number R37 AG10168. We are also grateful to Tara Polzer from the Rural Research Project of the Forced Migration Studies Programme at Wits University for her useful comments, and to Fred Golooba-Mutebi for sharing some insights from his ethnographic work in the study area.

KEY MESSAGES

- Many of the world's population of internationally displaced people settle long term in their host countries. These populations may experience different health profiles from their hosts.
- In rural South Africa between 1992 and 2000, infant mortality rates were similar among children of former Mozambican refugee households compared with their South African hosts. However, former Mozambican refugee children were at much greater risk of dying over the next 4 years of life.
- Maternal, household, and health utilization characteristics measured in this study did not help to explain why former Mozambican refugee children were at greater risk of dying.
- This finding may partly represent wealth inequalities between the two populations that have resulted from the socio-legal position of former Mozambican refugees in rural areas of South Africa.

## References

[1] Feachem RGA. Poverty and inequity: a proper focus for the new century. *Bull World Health Organ* 2000;**78:**1–2.

[2] Spiegel P, Sheik M, Gotway-Crawford C, Salama P. Health programmes and policies associated with decreased mortality in displaced people in postemergency phase camps: a retrospective study. *Lancet* 2002;**360:**1927–34.

[3] Moore PS, Marfin AA, Quenemoen LE *et al*. Mortality rates in displaced and resident populations of central Somalia during 1992 famine. *Lancet* 1993;**341:**935–38.

[4] Jacobsen, K. *The Forgotten Solution: Local Integration for Refugees in Developing Countries*. Working Paper No.45. 2001. Geneva, United Nations High Commission on Refugees. New Issues in Refugee Research.

[5] Kibreab G. Local settlements in Africa: a misconceived option? *J Ref Stud* 1989;**2:**468–90.

[6] Johnston NL. *The Regularisation of Former Mozambican Refugees in South Africa: Experiences and Lessons*. Acornhoek, Refugee Research Programme, 2000.

[7] Mosley WH, Chen LC. An analytical framework for the study of child survival in developing countries. *Popul Dev Rev* 1984;**10:**25–45.

[8] Lestrade-Jefferis J. The labour market. In: Udjo EO (ed.). *The People of South Africa Population Census 1996*, Pretoria: Statistics South Africa, 2000.

[9] Tollman S, Herbst K, Garenne M, Gear JSS, Kahn K. The Agincourt Demographic and Health Study—site description, baseline findings and implications. *S Afr J Med* 1999;**89:**858–64.

[10] Dolan C, Nkuna V. *'Refugees', 'Illegal aliens' and the Labour Market—the Case for a Rights Based Approach to Labour Movement in South Africa*. Acornhoek, University of Witwatersrand Rural Facility, 1995.

[11] Tollman S. The Agincourt Field Site—evolution and current status. *S Afr J Med* 1999;**89:**855–57.

[12] Collinson MA, Mokoena O, Mgiba N *et al*. Agincourt DSS, South Africa. *Populations and their Health in Developing Countries Volume 1. Population, Health and Survival at INDEPTH Sites*, Ottawa: IDRC Press, 2001.

[13] Victora CG, Huttly SR, Fuchs SR, Olinto MTA. The role of conceptual frameworks in epidemiological analysis. *Int J Epidemiol* 1997;**26:**224–27.

[14] Hargreaves JR. *Village Typology; Agincourt sub-district*. 2000.

[15] INDEPTH. Comparing Mortality Patterns in *INDEPTH* Sites. *Populations and their Health in Developing Countries Volume 1. Population, Health and Survival at INDEPTH Sites*, Ottawa: IDRC Press, 2001.

[16] *The Progress of Nations*. New York: UNICEF, 2000.

[17] Department of Health. *Summary Report: National HIV Sero-Prevalence Survey of Women Attending Public Antenatal Clinics in South Africa 1999*.

Pretoria, Directorate: Health Systems Research and Epidemiology, Department of Health, 2000.

[18] Tollman SM, Kahn K, Garenne M, Gear JS. Reversal in mortality trends: evidence from the Agincourt field site, South Africa, 1992–1995. *AIDS* 1999;**13:**1091–9.

[19] Parker RG, Easton D, Klein CH. Structural barriers and facilitators in HIV prevention: A review of international research. *AIDS* 2000;**14(Suppl.1):**1.

[20] Barongo LR, Borgdorff MW, Mosha FF *et al*. The epidemiology of HIV-1 infection in urban areas, roadside settlements and rural villages in Mwanza Region, Tanzania. *AIDS* 1992;**6:**1521–28.

[21] Grosskurth H, Mosha F, Todd J *et al*. A community trial of the impact of improved sexually transmitted disease treatment on the HIV epidemic in rural Tanzania: 2. Baseline survey results. *AIDS* 1995;**9:**927–34.

[22] Dolan C, Tollman S, Nkuna V, Gear JSS. The links between legal status and environmental health: A case study of Mozambican refugees and their hosts in the Mpumalanga (Eastern Transvaal) Lowveld, South Africa. *Int J Health Hum Rights* 1997; **2:**62–84.

[23] Brockerhoff M, Hewett P. Inequality of child mortality in sub-Saharan Africa. *Bull World Health Organ* 2000;**78:**30–41.