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Region of birth and child mortality among black migrants to South Africa: is there a foreign-born advantage?

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Abstract

We investigate whether an immigrant health advantage exists among blacks in South Africa, an important emerging economy. Using the 2001 South African Census, this study examines differences in child mortality between native-born South African and immigrant blacks. We find that accounting for region of origin is critical: immigrants from southern Africa are more likely to experience higher lifetime child mortality compared to the native-born population. Further, both internal migrants and immigrants from outside of southern Africa are less likely than both groups to experience child deaths, suggesting a role for migration selection. Finally, in contrast to patterns observed in more developed countries, we detect a strong relationship between schooling and child mortality among black immigrants.

Keywords: Migration; South Africa; child mortality; health disparities; South-South Africa immigration

Introduction

The rapid growth of black immigrant populations in both developed and developing countries has made this population of increasing interest to researchers and policymakers (Anderson, 2015; Crush & McDonald, 2000). Like other immigrant groups, black immigrants and their offspring often possess a number of initial health advantages compared to native-born populations (Antecol & Bedard, 2006; Singh & Siahpush, 2002). Studies from the United States, for example, find that black immigrants experience lower rates of low birth weight and infant mortality and have better child health outcomes compared to native-born black mothers (D. Acevedo-Garcia, Soobader, & Berkman, 2005; David & Collins, 1997; Elo, Vang, & Culhane, 2014; Green, 2012; Hendi, Mehta, & Elo, 2015). Moreover, black African immigrants, a population driving the growth of the immigrant population in the

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United States appear to have significant health advantages relative to black immigrants from other regions of the world (Elo et al., 2014; Hendi et al., 2015).

However, one important limitation of the existing research on the health of black immigrant children is that it is primarily based on populations residing in the United States or other developed countries. This omission is critical because developing and developed countries often differ with respect to population-level characteristics and migration flows (Posel, 2004). These differences might generate comparatively different patterns of health outcomes (Collinson, Tollman, & Kahn, 2007; Coovadia, Jewkes, Barron, Sanders, & McIntyre, 2009; Posel, 2004). We address this important gap in the literature by focusing on the links between region of birth and immigrant/native child health disparities in a large developing country: South Africa. South Africa has experienced a significant increase in the number of black African immigrants due to the introduction of a de-racialized immigration policy (Crush & Williams, 2010; United Nations, 2013). Understanding the health profiles of the children of black South African immigrants is critical as they will shape the overall health of the black South African population in the coming decades. Moreover, the wellbeing of these children will also have important implications for the future labor force and for health and social policies. Thus, South Africa provides an important context for understanding immigrant/native health disparities in child mortality—an important indicator of socioeconomic inequality (Wagstaff, 2000).

Sources of South African migration

South Africa has three key sources of migration, including the SADC (Southern African Development Community[1]), the Rest of Africa (ROA) and internal migration. During the period of legalized racial segregation known as apartheid, neighbouring SADC countries such as Botswana and Malawi served as the primary source of low-skilled male migrant labourers (Adepoju, 2003). Although males still comprise the majority of all black immigrants in the post-apartheid era, the feminization of poverty in neighbouring countries has resulted in an increasing number of women seeking unskilled/semi-skilled work (Crush & Williams, 2010). Refugees from Zimbabwe and the Democratic Republic of the Congo also comprise a substantial share of South Africa's black migrant population (World Refugee Survey, 2008).

In contrast, pre-apartheid immigrants from more distant African countries (ROA) such as Ghana worked at South African universities and in other professions but their numbers were relatively small compared to those of the unskilled migrants due to discriminatory immigration policies (Adepoju, 2003; Crush & McDonald, 2001). Post-apartheid, the number of skilled workers from

[1] Southern African Development Community (SADC) countries include Angola, Botswana, Democratic Republic of the Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

these countries has grown substantially (Posel, 2004). Lastly, while internal migration was historically curtailed for native-born South African blacks, the elimination of apartheid-era restrictions has resulted in increasing numbers of native-born South Africans migrating from their provinces of birth to seek employment (Posel, 2004).

Healthy immigrant effect and child health

The healthy immigrant effect refers to the observation that immigrants often have better initial health outcomes than the native-born population. However, despite this initial 'healthy immigrant advantage', immigrant health outcomes tend to converge to that of the native-born population over duration of residence in the host country (Dolores Acevedo-Garcia, Bates, Osypuk, & McArdle, 2010; Jasso, Massey, Rosenzweig, & Smith, 2004). Researchers have advanced a number of explanations for the healthy immigrant effect, including cultural differences and migration selection (Akresh & Frank, 2008). Immigrants may also be more likely to engage in practices that improve child health, including smoking avoidance and more nutritious diets (Elo & Culhane, 2010; Guendelman & Abrams, 1995). On the other hand, increased time in the host country is often associated with worsening of health behaviors and health. Discrimination is also another potential culprit: black immigrants in South Africa face increasing levels of xenophobia and violence (Adjai & Lazaridis, 2013). These discriminatory practices might impact access to healthcare and health-related outcomes (Crush & Tawodzera, 2014).

Immigrants also likely differ from their country of origin counterparts on characteristics such as motivation and drive that are also associated with better health. This migration selection may also generate health selection, where immigrants are healthier than their country of origin counterparts. Researchers have also argued that since immigrants tend to be a highly selected group, migrants within the host country (internal migrants) are a more appropriate comparison group (Hamilton, 2015). However, evidence for whether internal migration is associated with health advantages or disadvantages in the South African context is mixed (Molatseli, Hamilton & Peters, 2014; Thomas, 2004).

While region of origin differences may proxy for unobserved factors and skill endowments, few researchers have investigated the links between maternal region of origin and child health outcomes in Sub-Saharan Africa. To our knowledge, Thomas (2004) and Thomas (2007) are the only studies that investigate nativity differences in child health in Sub-Saharan Africa—both making use of 1996 South African census data. Thomas (2004) describes the associations between child disability and parental migration status in South Africa. The results show that only the children of immigrants born outside of the SADC were less likely to be disabled relative to native-born South Africans. Interestingly, the children of internal migrants were more likely to be disabled relative to native-born non-movers, a finding that diverges from existing literature elsewhere. Thomas (2007) examines the relationship between

socioeconomic status and mortality among immigrants, native-born migrants, and native-born non-movers. The findings imply that socioeconomic status (SES) has a stronger relationship with child mortality among immigrants and documents the existence of a crossover effect in the likelihood of child mortality across SES. Overall, poor immigrants are more likely to experience child deaths. However, the role of region of birth differences in driving these patterns of child mortality remains unclear.

In this paper, we evaluate black immigrant/native-born differences in self-reported child mortality using 2001 South African Census data. We build on prior research (Thomas, 2004; Thomas, 2007) in several key ways. First, we account for heterogeneity among immigrants by including controls for region of birth. We do so because observed and unobserved differences in human capital attainment and economic resources across sending regions may point to one source of the immigrant health advantage (or lack thereof). We also investigate the role of migration selection by accounting for native South Africans who have migrated across provinces. Last, we examine child mortality differences across educational attainment and nativity. If some immigrants are positively selected on health (Akresh & Frank, 2008), then the expected positive association between education and health may diminish (Akresh & Frank, 2008).

Data and empirical approach

In this study we use a 10 percent sample from the 2001 South African census (Statistics South Africa and Integrated Public Use Microdata Series, International). Census data represent one of the most comprehensive sources of information on child mortality outcomes among immigrants and the native-born in South Africa.

Child mortality outcomes

Our outcome of interest is child mortality. Census interviewers asked each woman in the household between the ages of 12 and 50 about children ever born and children surviving. From this information, we derive two indirect measures of child mortality. The first is the lifetime child mortality rate, a continuous measure defined as the number of children ever born minus the number of children surviving per mother, divided by the number of children ever born. Our second mortality outcome is whether a mother ever experienced the death of a child, a dichotomous variable =1 if the number of children ever born > number of children surviving, and =0 otherwise.

Explanatory variables

Our main explanatory variable of interest is maternal immigration status. Interviewers asked each respondent about whether s/he was born in the Republic of South Africa. If the respondent reported being born outside of the

country of South Africa, the interviewer asked him/her about country of birth. Using these data, we create a migration status variable with the following categories: native-born South African, SADC[2]-born (excluding South Africa), and ROA-born. The SADC includes countries that share borders with or are in relatively close proximity to South Africa. The ROA immigrant category aggregates the remaining countries in Africa but mainly comprises mothers born in North and West Africa. This classification scheme follows that of prior work and allows us to determine whether there are child mortality advantages associated with region of birth (Molatseli, Hamilton & Peters, 2014). To further explore the role of migration selection we subdivide the SADC category into "immediate neighbours" and "other SADC countries", categorical variables we call SADC-Immediate and SADC-Other respectively. SADC-Immediate comprises all the countries that border South Africa[3]. The remaining SADC countries are classified under SADC-Other.

We also control for demographic and socioeconomic characteristics that are likely related to child mortality outcomes, including maternal age, education, marital status and income, and home ownership status. The associations among these characteristics and child mortality likely vary substantially across population subgroups. For example, educational attainment and marital status are known to vary greatly between native born and foreign-born blacks, and also across place of birth of the foreign born (Kent, 2007). We also include type of residential area and household size, given that migrants to South Africa tend to disproportionately relocate in formal suburbs and are more likely to migrate based on household size and familial support (McDonald, 2000).

Our analysis focuses on black women in the prime child-bearing ages (20 to 35) with complete information on child births and deaths, maternal immigrant status, and other relevant socioeconomic characteristics. Finally, given the very small percentages of mothers who report emigrating from outside of Africa, we eliminate this subgroup from our analyses. Our final sample consists of 291,321 mothers.[4]

Descriptive statistics

Table 1 summarizes the data on black South African natives and immigrants. There is considerable variation across and within native- and foreign-born groups. SADC migrants have the highest child mortality rates in the sample, 34

[2] Southern African Development Community (SADC) countries include those outlined in the introduction. Our analysis excludes South Africa (which is the immigrant host country) from the grouping.

[3] Botswana, Lesotho, Mozambique, Namibia, Swaziland, and Zimbabwe.

[4] Of the sample of black women between the ages of 12 and 50 years old (N=949,346), we eliminated the following number of observations for missing data: child births/deaths (n=380,778), maternal immigrant status (n=8,827), socioeconomic characteristics (n=16,902), arriving at a sample of 542,839 observations. Restricting maternal age to 20-35 produces a final sample of 291,321 mothers.

Table 1: Summary statistics for Black (African) mothers

		Foreign-born mothers			
	Native (n=286,188)	SADC (n=4,968)	SADC-Immediate (n=4,672)	SADC-Other (n=296)	ROA (n=165)
Individual-level Characteristics					
Childhood mortality rate	0.0284	0.0339	0.0348	0.0197	0.0040
	(0.1311)	(0.1383)	(0.1393)	(0.1192)	(0.0366)
At least 1 child death	0.0578	0.0729	0.0753	0.0338	0.0121
	(0.2332)	(0.2599)	(0.2640)	(0.1810)	(0.1098)
South African citizenship	0.9997	0.5248	0.5255	0.5135	0.4000
	(0.0177)	(0.4994)	(0.4994)	(0.5007)	(0.49140
Recent migrant	0.0004	0.2142	0.2046	0.3649	0.4727
	(0.0211)	(0.4103)	(0.4035)	0.4	(0.5008)
Age	27.85	27.52	27.51	27.59	28.6
	(4.39)	(4.24)	(4.24)	(4.19)	(3.9103)
Married	0.4239	0.7089	0.7065	0.7466	0.8424
	(0.4942)	(0.4543)	(0.4554)	(0.4357)	(0.3655)
Employed	0.2166	0.2373	0.2327	0.3108	0.3939
	(0.4119)	(0.4255)	(0.4226)	(0.4636)	(0.4901)
Highest level of education completed (in %)					
Some primary	0.1842	0.2663	0.2783	0.0777	0.0182
	(0.3876)	(0.4421)	(0.4482)	(0.2682)	(0.1340)
Completed primary	0.0709	0.0948	0.0982	0.0405	0.0303
	(0.0709)	(0.2930)	(0.2977)	(0.1976)	(0.1719)
Some High School	0.5541	0.3778	0.3619	0.6284	0.5333
	(0.4971)	(0.4849)	(0.4806)	(0.4841)	(0.5004)
Grade 12 and above	0.0589	0.0248	0.0178	0.1351	0.1879
	(0.2355)	(0.1554)	(0.1321)	(0.3424)	(0.3918)
College/university	0.0118	0.0095	0.0064	0.0574	0.1939
	(0.0118)	(0.0968)	(0.0799)	(0.2331)	(0.3966)
Household-level characteristics					
Household size	5.6905	4.1946	4.1640	4.6791	4.4606
	(3.20)	(2.58)	(2.57)	(2.65)	(2.05)
Single-parent household	0.0940	0.1012	0.1036	0.0642	0.0364
	(0.2918)	(0.3017)	(0.3048)	(0.2455)	(0.1878)
Homeowner	0.5689	0.3110	0.3136	0.2703	0.2364
	(0.4953)	(0.4629)	(0.4640)	(0.4449)	(0.4261)
Household monthly income (in logs-rand)	7.2765	7.0558	6.9321	9.0073	9.4878
	(4.27)	(4.38)	(4.38)	(3.89)	(3.86)
Urban formal	0.4244	0.4960	0.4724	0.8682	0.9515
	(0.4943)	(0.5000)	(0.4993)	(0.3388)	(0.2154)
Urban informal	0.1163	0.1862	0.1937	0.0676	0.0121
	(0.3206)	(0.3893)	(0.3952)	(0.2514)	(0.1098)

Note: Census weights are applied. Standard deviations are in parentheses. All proportions are converted into percentages.

deaths per thousand, closely followed by native-born South Africans with child mortality rates of 28 deaths per thousand. However, the high infant mortality rates among SADC migrants appear to be driven by mothers in the SADC-

Immediate group rather than those in the SADC-Other group (approximately 35 and 20 deaths per thousand, respectively). In contrast, the child mortality rate among ROA migrants is substantially lower than that of both native-born South Africans and SADC migrants, at 4 deaths per thousand. Similar patterns apply to the proportion of women who have experienced at least one child death.

One reason for the observed differences in child mortality among blacks may be the wide variation in socioeconomic status (SES). For example, black SADC immigrants have the are most likely to report having the least education ('some primary'), followed by black natives, approximately 26.63 and 18.42 percent, respectively. Similarly, black natives and black SADC migrants have the lowest (combined) proportion of 'grade 12 and above' and 'college/university' educational attainment (7.07 percent and 3.43 percent). This contrasts significantly with black ROA migrants, where the combined proportions of those with 'grade 12 and above' and 'college/university' education is 38.18 percent. Moreover, comparing schooling and income outcomes across SADC-Immediate and SADC-Other mothers suggests that the latter group displays higher educational attainment and income-related outcomes relative to the former. ROA blacks also report much higher rates of employment and household income compared to both native-born and SADC mothers. Taken together, the descriptive data suggest that ROA immigrant mothers - and to a lesser extent, mothers from 'Other' SADC countries - possess relatively more education and resources that may allow them to access health-related resources for their children compared to those from South Africa and the SADC countries that border South Africa.

Empirical approach

In this paper our two main outcomes of interest are the child mortality rate and the probability of child death. We use the following specification to estimate the relationships between child mortality and immigration status:

$$CMR_i = \beta_0 + \beta_1 Region_i + \delta_1 D_i + \delta_2 S_i + u_i \qquad (1)$$

where CMR_i is a measure of the lifetime child mortality rate. $Region_i$ is a categorical variable denoting maternal region of origin, D_i is a vector of individual demographic characteristics and S_i is a vector of individual and household socioeconomic factors. The disturbance term u_i includes unobservable characteristics such as motivation, ability, and family background.

Although CMR_i is a continuous variable, we estimate the child mortality rate, CMR_i, using quasi-maximum likelihood (QML) rather than ordinary least squares (OLS) estimation. The drawbacks of using OLS methods to estimate models with fractional dependent variables are analogous to the drawbacks of the linear probability model for binary variables (e.g., the predicted values of the OLS regression cannot be guaranteed to lie within the unit interval) (Papke

& Wooldridge, 2008). Since CMR_i contains a large number of zeros for those mothers who experience no child deaths, as well as a continuous fractional component bounded between zero and one, we employ a QML estimator. Under this data generating process, QML can provide consistent and unbiased estimates if we assume that these observable characteristics are randomly distributed across the population (Papke & Wooldridge, 2008).

We estimate our second outcome of interest, the probability of child mortality, using the following specification:

$$child\ died_i = \propto_0 + \propto_1 Region_i + \gamma_1 D_i + \gamma_2 S_i + u_i \qquad (2)$$

where $child\ died_i$ is a dichotomous measure of the probability of experiencing a child death (ever). All other variables are as reported above in equation 1. We estimate the probability of child death using probit methods (maximum likelihood). Similar to the QML, probit models also address the possibility of unbounded predicted values generated by OLS regressions. For ease of interpretation of the quantitative importance of the explanatory variables we report marginal effects.

As mentioned previously, immigrants are not typically a randomly selected sample of their home country's population and may be positively selected on factors such as health. This is especially likely in the South African case, since entry into the country is conditioned on passing minimum health requirements (Republic of South Africa Department of Home Affairs, 2014). In supplementary analyses, we attempt to minimize this potential for selection bias by comparing child mortality outcomes between external (international) migrants and internal (South African) migrants (Model 3). Since internal migrants are also likely to be selected on positive health characteristics, they may provide a better comparison group for external migrants. Prior evidence from the United States also suggests that within-country maternal mobility history is related to infant health outcomes, including among blacks (Urquia et al., 2010; Wingate & Alexander, 2006).

Results

In this section, we report the results of models that estimate the relationships among immigrant status, SES, and child mortality (Tables 2a, 2b, 3a and 3b). This study uses two measures of child mortality—the child mortality rate and the probability of child death—and estimates both using QML and probit specifications, respectively. We begin by presenting the results from a parsimonious specification (Model 1) that only includes region of birth and current age. Table 2a shows that SADC-born migrants report a lifetime child mortality rate 0.55 percent higher than the black native-born ($p<0.01$). By contrast, ROA-born migrants report lifetime child mortality 2.46 percent lower than the black native-born ($p<0.01$). In Table 3a, marginal effects from probit estimates of the probability of child death demonstrate qualitatively similar

patterns. SADC-born migrants are 1.63 percentage points more likely to report a child death than black native-born mothers (p<0.01), while being born in a

Table 2a: Quasi-maximum likelihood (QML) estimations for child mortality among black native-born, African-born immigrants, and black native internal migrants.

Variables	Model 1	Model 2	Model 3
Immigrant Region of Origin			
-SADC	0.0055***	0.0029	0.0015
	(0.0021)	(0.0019)	(0.0019)
-ROA	-0.0246***	-0.0211***	-0.0216***
	(0.0029)	(0.0049)	(0.0046)
Age	0.0005***	0.0004***	0.0004***
	(5.86e-05)	(6.01e-05)	(6.01e-05)
Education			
Some primary school		0.0081***	0.0082***
		(0.0009)	(0.0009)
Completed primary school		-0.0012	-0.0010
		(0.0012)	(0.0012)
Some high school		-0.0084***	-0.0083***
		(0.0008)	(0.0008)
Grade 12 and above		-0.0151***	-0.0151***
		(0.0011)	(0.0011)
College/University		-0.0181***	-0.0179***
		(0.0020)	(0.0020)
Married		-0.00066	-0.0004
		(0.0005)	(0.0005)
Household level characteristics			
Number of persons in the household		-0.0009***	-0.0009***
		(9.50e-05)	(9.61e-05)
Household income (log)		-0.0003***	-0.0002***
		(5.88e-05)	(5.89e-05)
Homeowner		0.0011**	0.0007
		(0.0005)	(0.0005)
Urban formal		-0.0138***	-0.0129***
		(0.0006)	(0.0006)
Urban informal		-0.0047***	-0.0034***
		(0.0008)	(0.0008)
Internal migrant			-0.0051***
			(0.0007)
Observations	291,321	291,321	291,321

Notes: Marginal effects are reported. Standard errors are in parentheses. Reference categories include native-born, no primary school, and rural.
*** p<0.01, ** p<0.05, * p<0.10

Table 2b: Quasi-maximum likelihood (QML) estimations for child mortality among black native-born, African-born immigrants, and black native internal migrants.

Variables	Model 1	Model 2	Model 3
Immigrant Region of Origin			
SADC-Immediate	0.0064***	0.0031	0.0026
	(0.0021)	(0.0020)	(0.0021)
SADC-Other	-0.0087	-2.11e-05	0.0001
	(0.0070)	(0.0095)	(0.0094)
ROA	-0.0246***	-0.0211***	-0.0211***
	(0.0029)	(0.0049)	(0.0050)
Age	0.0005***	0.0004***	0.0004***
	(5.86e-05)	(6.01e-05)	(6.01e-05)
Education			
Some primary school		0.0081***	0.0082***
		(0.0009)	(0.0009)
Completed primary school		-0.00124	-0.0010
		(0.0012)	(0.0012)
Some high school		-0.0084***	-0.0082***
		(0.0008)	(0.0008)
Grade 12 and above		-0.0151***	-0.0150***
		(0.0011)	(0.0011)
College/University		-0.0181***	-0.0179***
		(0.0020)	(0.0020)
Married		-0.0007	-0.0004
		(0.0005)	(0.0005)
Household level characteristics			
Number of persons in the household		-0.0009***	-0.0009***
		(9.50e-05)	(9.62e-05)
Household income (log)		-0.0003***	-0.0002***
		(5.88e-05)	(5.89e-05)
Homeowner		0.0011**	0.0007
		(0.0005)	(0.0005)
Urban formal		-0.0138***	-0.0129***
		(0.0006)	(0.0006)
Urban informal		-0.0047***	-0.0035***
		(0.0008)	(0.0008)
Internal migrant			-0.0051***
			(0.0007)
Observations	291,321	291,321	291,321

Notes: Marginal effects are reported. Standard errors are in parentheses. Reference categories include native-born, no primary school, and rural.
*** p<0.01, ** p<0.05, * p<0.10

Table 3a: Probit estimations for child death among black native-born, African-born immigrants, and black native internal migrants.

Variable	Model 1	Model 2	Model 3
Immigrant Region of Origin			
SADC	0.0163***	0.0091***	0.0065*
	(0.0039)	(0.0035)	(0.0035)
ROA	-0.0464***	-0.0338**	-0.0353**
	(0.0082)	(0.0149)	(0.0141)
Age	0.0038***	0.0032***	0.0032***
	(0.0001)	(0.0001)	(0.0001)
Education			
Some primary school		0.0166***	0.0168***
		(0.0017)	(0.0017)
Completed primary school		-0.0045**	-0.0042*
		(0.0022)	(0.0022)
Some high school		-0.0229***	-0.0226***
		(0.0014)	(0.0014)
Grade 12 and above		-0.0373***	-0.0372***
		(0.0019)	(0.0019)
College/University		-0.0467***	-0.0465***
		(0.0030)	(0.0030)
Married		0.0117***	0.0122***
		(0.0009)	(0.0009)
Household level characteristics			
Number of persons in the household		-8.25e-05	-0.0002
		(0.0002)	(0.0002)
Household income (log)		-0.0008***	-0.0008***
		(0.0001)	(0.0001)
Homeowner		0.0027***	0.0019**
		(0.0009)	(0.0009)
Urban formal		-0.0341***	-0.0323***
		(0.0010)	(0.0010)
Urban informal		-0.0141***	-0.0116***
		(0.0014)	(0.0015)
Internal migrant			-0.0097***
			(0.0013)
Observations	291,321	291,321	291,321

Notes: Marginal effects are reported. Standard errors are in parentheses. Reference categories include native-born, no primary school, and rural.
*** p<0.01, ** p<0.05, * p<0.10

Table 3b: Probit estimations for child death among black native-born, African-born immigrants, and black native internal migrants.

Variables	Model 1	Model 2	Model 3
Immigrant Region of Origin			
SADC-Immediate	0.0187***	0.0098***	0.0071**
	(0.0040)	(0.0037)	(0.0036)
SADC-Other	-0.0227**	-0.0046	-0.0073
	(0.0110)	(0.0152)	(0.0145)
ROA	-0.0464***	-0.0338**	-0.0353**
	(0.0082)	(0.0149)	(0.0141)
Age	0.0038***	0.0032***	0.0032***
	(0.0001)	(0.0001)	(0.0001)
Education			
Some primary school		0.0166***	0.0168***
		(0.0017)	(0.0017)
Completed primary school		-0.0045**	-0.0042*
		(0.0022)	(0.0022)
Some high school		-0.0228***	-0.0226***
		(0.0014)	(0.0014)
Grade 12 and above		-0.0373***	-0.0372***
		(0.0019)	(0.0019)
College/University		-0.0467***	-0.0464***
		(0.0030)	(0.0030)
Married		0.0117***	0.0122***
		(0.0009)	(0.0009)
Household level characteristics			
Number of persons in the household		-8.16e-05	-0.000218
		(0.0002)	(0.0002)
Household income (log)		-0.0008***	-0.0008***
		(0.0001)	(0.0001)
Homeowner		0.0027***	0.0019**
		(0.0009)	(0.0009)
Urban formal		-0.0341***	-0.0323***
		(0.0010)	(0.0010)
Urban informal		-0.0141***	-0.0116***
		(0.0014)	(0.0015)
Internal migrant			-0.0097***
			(0.0013)
Observations	291,321	291,321	291,321

Notes: Marginal effects are reported. Standard errors are in parentheses. Reference categories include native-born, no primary school, and rural.
*** p<0.01, ** p<0.05, * p<0.10

ROA country reduces the probability of child death by 4.64 percentage points (p<0.01).

Model 2, our main specification, includes controls for a number of socioeconomic factors thought to be related to child mortality, including educational attainment, marital status, household size, region of residence, wealth, and income. The inclusion of SES-related characteristics causes the

association between SADC migrant status and the child mortality rate to decrease to approximately 0.29 percent and to become statistically insignificant (Table 2a). ROA migrants report a 2.11 percent lower child mortality rate relative to black natives ($p<0.01$). For the probability of child death (Table 3a), the coefficients on region of birth maintain their direction and level of statistical significance; however, the magnitude of the coefficient on both region-of-birth variables declines. Black SADC-born migrants are 0.91 percentage points more likely to report a child death ($p<0.01$) and ROA migrants are 3.38 percentage points less likely to report a child death ($p<0.01$) compared to their native counterparts. The inclusion of socioeconomic characteristics in the second model reduces both the size of the region of birth coefficients. However, the inclusion of these additional controls does not explain the duality of ROA health advantage and SADC health disadvantage.

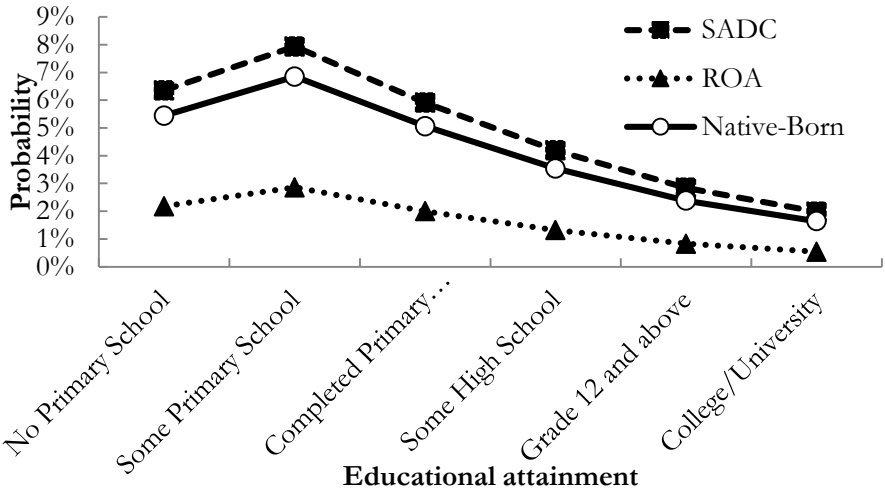
We also compare internal migrants—those that currently reside in a province other than their birth province—to both native-born South Africans and international migrants (Model 3). These individuals are likely to be selected on positive health characteristics and likely provide a better comparison group for international migrants. Our results show that internal migrant status is a significant predictor of the lifetime child mortality rate (Table 2a, Model 3). That is, internal migrants report 0.51 percent less lifetime child mortality than black native non-movers ($p<0.01$), while SADC migrants report 0.15 percent higher lifetime child mortality than black native non-movers, and ROA migrants report 2.16 percent less lifetime child mortality than the black native-born non-movers. Similarly, the results in Table 3a (Model 3) demonstrate that internal migrants have a lower probability of reporting a child death relative to native non-movers, approximately 0.97 percentage points ($p<0.05$). We note that for each outcome, the dual SADC health disadvantage and ROA health advantage remains fairly robust to the inclusion of our additional measures of immigrant characteristics.

To further explore the role of migration selection we run the same regressions using a disaggregated SADC variable. Generally, a larger distance between migrant region of origin and migrant host country is associated with higher cost of migration and thus migrants who incur those costs are likely select on positive characteristics. We find that across models (Tables 2b and 3b), mothers from neighbouring countries (SADC-Immediate) report higher levels of child mortality and probability of child death relative to black natives. In contrast, SADC immigrants born in countries outside of those bordering South Africa (SADC-Other) report lower child mortality and probability of child death relative to black natives which is a more similar profile to ROA mothers. Statistical significance does diminish in the CMR regressions but all signs are consistent with a selection hypothesis.

Education and child mortality

One important question to consider is whether or not the associations between immigrant status and childhood mortality differ by socioeconomic status. Previous research on nativity differences in health in the United States has suggested that a significant portion of immigrants' health advantage is attributed to their better health outcomes at lower levels of education attainment relative to their native-born counterparts (Elo, Mehta, & Huang, 2011). Our own results have also demonstrated that education is an important predictor of child mortality outcomes. We examine whether the South African educational gradient parallels that of the United States by predicting child mortality rates by educational attainment and region of origin. Figure 1 depicts education-child mortality gradients for black immigrants and black South African natives based on the regression results in Table 3a.

Figure 1: Black Education-Child Mortality Gradients



Note: Education-child mortality gradients depicting predicted probabilities of reporting any child death among black native-born South Africans and their foreign-born counterparts. This is based on probit regressions adjusted for the full set of controls (Table 3) using data from the 2001 South African Census.

As the regression results in Table 3a suggest, the predicted probability of experiencing a child death among blacks is highest among immigrants from SADC countries and lowest among immigrants from the ROA (Figure 1). Predicted probabilities for South African natives fall in the middle of these two extremes. Interestingly, with the exception of a slight increase in the predicted probability of child death for immigrants reporting having no primary school education compared to those with some, there appears to be a fairly strong inverse relationship between educational attainment and predicted child mortality among both immigrants and native-born blacks. Moreover, the observed education-child mortality gradient appears to be strong among all groups. For example, predicted mortality rates for South African and SADC-

born mothers who complete high school are approximately 56 and 55 percent lower, respectively, than their counterparts who report having no primary school education. The analogous advantage of a high school education is large for ROA migrants as well—about 62 percent. This is consistent with evidence from the United States on child health outcomes that suggests that the immigrant health advantage is strongest among the least educated immigrants (D. Acevedo-Garcia et al., 2005; Elo et al., 2011). The totality of our results broadly accord with the results obtained by Thomas (2007).

Discussion and conclusion

In this paper, we contribute to the growing literature on immigrant health outcomes in developing countries by providing new evidence on the relationships between region of origin and child mortality, using South African data on black migrants and natives. Does a foreign-born advantage exist with respect to infant mortality? We find some evidence that it does—but that region of origin matters. Our findings suggest that black SADC immigrants are more likely to suffer from health disadvantages compared to the native-born population. However, black immigrants from ROA appear to have better health outcomes than their native-born and SADC counterparts. Finally, while the immigrant/native-born health gap diminishes with higher levels of education, we detect the greatest returns to schooling among ROA immigrants, in contrast to prior research. This is similar to Thomas (2007) who finds that the gradient in health by socioeconomic status is much steeper among immigrants than it is among internal migrants and nonmigrants.

One reason that immigrant health outcomes may differ among blacks in the South African context compared to the United States is because of migration selection. Immigrants from SADC and ROA countries differ substantially on observed (and likely unobserved) demographic characteristics. Compared to black ROA mothers, native-born and SADC black mothers in our sample are overrepresented in the lowest levels of educational attainment, are less likely to be employed, and have lower levels of household income. Each of these characteristics may correlate with economic resources that enable mothers to purchase better health outcomes for their children.

Health selection may also play an important role in producing better infant mortality outcomes. As we note earlier, immigrants from SADC countries are more likely to immigrate to South Africa to perform semi-skilled and unskilled labour. Migrants who have to travel from further away (e.g. ROA countries) may possess comparatively better health and human capital endowments that contribute to better child health outcomes. Research conducted in the United States suggests that African immigrants exhibit a greater foreign-born advantage with respect to maternal health and health behaviours relative to Caribbean immigrants—suggesting that health selection may be involved when migrants travel longer distances to their ultimate destination (Elo & Culhane, 2010).

There are three important avenues for further investigation. First, researchers should examine other child health outcomes to understand whether they follow similar patterns to the ones found here. A related issue is the need to empirically model migration selection in South Africa across racial groups and immigrant regions of origin. Last, there is a need to disentangle the effects of the migration process itself (e.g., biological) from contextual factors in the receiving country (e.g., poor living conditions). Our findings suggest that as policymakers continue to address the problems of child mortality disparities in South Africa, it is critical to disentangle the relationships between immigration patterns and health outcomes among the black population.

Limitations

This study has a few important limitations. First, Census data do not contain information on when immigrants arrived in South Africa, leaving us unable to address cohort effects. Second, interviewers were required to rely on each mother's recollection of child deaths over a lifetime. It is highly likely that this measure is subject to recall bias. However, South Africa, like many other low- and middle-income countries, does not have reliable Vital Statistics death registrations. Therefore, many researchers use birth histories to construct indirect reports of child mortality as we do here (Nannan et al., 2012).

Despite these limitations, this study is one of the first to demonstrate the importance of understanding how migration patterns are associated with health disparities among blacks in a developing country.

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