

Disparities in infant mortality among children of immigrants in France, 2008-17

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In high-income countries, the number of children born to at least one foreign-born parent (the 'G2') has been steadily increasing to the point where the G2 now comprise a significant proportion of all annual births. In the US (25.0%) and the UK (28.2%), for example, the G2 represented one-quarter of all annual births in 2016 [1, 2]. In France, the proportion is even larger; children of migrants represented nearly one-third (30.9%) of all annual births in 2016 [3]. Despite this, in comparison with *adult mortality* of migrants (the 'G1') and the G2 little is known about *infant mortality* of the G2. With the exception of the US (which has a distinct Hispanic focus) [4-7] and the Netherlands (perhaps because infant mortality is known to be elevated among its migrant populations) [8-10], information on how G2 infant death rates vary relative to non-migrants in high-income countries and across specific origin groups is lacking.

This is unfortunate, given that information on G2 infant mortality could provide important insight into inter-generational disparities in the *adult mortality* outcomes of the G1 and G2. In short, the lower mortality often experienced by the G1 (a '*migrant mortality advantage*') relative to the non-migrant population often 'wears off' among the G2, and for some origins even deteriorate to excess mortality. Such a pattern has been observed among Northern Africans in France [11] and Belgium [12], Black Caribbeans in the UK [13], and Italians in Switzerland [14]. As researchers, we are still trying to understand why this loss of advantage occurs. Popular explanations include the "wearing off" of selection effects among the G1 (which are not passed on to the G2), negative acculturation (initially among the G1 and then among the G2), and/or a broader mix of social and economic factors (such as labor market access) [13]. Thus, observing exactly how infant mortality rates vary among the G2, and expanding the small evidence pool on inter-generational mortality differences to early ages, could go some way to advancing our understanding of the mechanisms behind the erosion of the 'migrant mortality advantage'. Irrespective, it is crucial to document such mortality disparities for migrant populations so as to inform explicit policies aimed at reducing such inequality.

In this article, we examine infant mortality among the G2 in France. We ask, "*Are children of migrants disadvantaged from birth or do they retain the mortality advantage of the G1?*" France provides a fascinating study context; it has a substantial G1 population (~10%), the largest G2 population in the EU [15] and a substantial proportions of births to foreign-born parents [3]. Additionally, up-to-date and specific information on how infant mortality varies by parent's foreign-born status in France is lacking. A 2011 report found *some* variation by parents' nationality [16]. However, this variation was not the focus of the article (perhaps explaining why broad region groups were used). Moreover, use of parents' current nationality (instead of nationality at birth) meant that foreign-born parents who had naturalised, or were born in former colonies, were excluded from foreign subgroups, masking the true extent of these important disparities. Finally, academic and public interest in G2 integration in rich

countries is intensifying and has extended beyond socio-economic disparities to health and mortality.

Data and Methods

The dataset used we use for this study is the *Permanent Demographic Sample* (*Échantillon Démographique Permanent*; EDP), France's largest socio-demographic sample. Our bespoke dataset matches birth and death certificates for a 4% sample of infants born between January 2008 and the end of December 2017. The sample is representative with respect to infant birth rates (compared to estimates from France's national statistical office, *Insee*) and infant death rates (compared to the *Human Mortality Database*) within the 10-year period. From the birth certificates, we benefit from valuable information on the parents (the date and place of birth, socio-professional category, marital status, and living arrangements), the infant (sex and commune of birth), and the pregnancy itself (whether it was a single birth or a multiple one). After excluding individuals with missing values (itself a very low number because the information on birth certificates is often complete), we study ~304,000 infants and ~1,000 deaths.

Infant mortality with and without socioeconomic (SES) controls are estimated using survival analysis (Cox PH models). In all models, age represents the baseline hazard, from zero to 365 days.

We use the most inclusive definition for the G2, defining them as being born to at least one foreign-born parent (the mother or the father). We first run a model (M1: broad definition) comparing all G2 combined to the reference group (those born in France to two parents who are born in France). In our second model (M2: region of origin), we investigate variation according to more detailed regions of origin relevant to France. Finally, in our third model (M3: country of origin), we investigate variation in infant mortality for the top ten parents' origin countries in France from 2008-2017. For each model, we first fit a baseline model (A) with core demographic variables, adjusting sex, year of birth and type of birth. Then, we fit a model (B) additionally adjusting for key SES characteristics (the parents' socio-professional categories, their marital status, their living arrangements, and a basic OECD urban/rural indicator).

Preliminary results

We present a summary table of several survival analyses in Table 1. Our preliminary results show that, for all G2 combined (M1), there is a sizeable disadvantage among children of at least one foreign-born parent, which persists after adjusting for explanatory variables. When we disaggregate by region (M2), we then observe substantial variation in infant mortality. There is a stark excess mortality among the children of Sub-Saharan African migrants, which mirrors the disadvantage among children of Sub-Saharan African living in Sweden [17] and persists after adjusting for other characteristics. Further, we observe an excess mortality among the children of migrants from North Africa, which also persists (albeit with marginal significance) in our SES-adjusted model. This excess is consistent, and intriguing, in light of the excess mortality observed among adult G2 North Africans in France [11] and merits further consideration and investigation. Infant mortality for remaining regions does not differ from the reference. Finally, we disaggregate by country. The ranked countries in Table 1 gives some indication of the composition of foreign-born births in France between 2008 and 2017. Eight of the top ten countries originate from Africa (three from the North; five

from Sub-Saharan). We observe a persistent excess infant mortality for Algeria, Mali and Senegal.

Table 1. Hazard ratios (infant mortality) for all G2, region, and country of parents' birth

	Baseline		SES-adjusted	
	HR	95% CIs	HR	95% CIs
M1: Broad definition	A		B	
Ref	1		1	
G2	1.41 **	(0.24-1.61)	1.30 **	(1.12-1.50)
M2: Region of origin	A		B	
South Europe	0.60	(0.30-1.21)	0.61	(0.31-1.23)
Other West Europe	1.05	(0.61-1.83)	1.11	(0.64-1.93)
Central and East Europe	1.48 +	(0.99-2.21)	1.29	(0.84-1.96)
North Africa	1.33 **	(1.10-1.60)	1.22 +	(0.99-1.50)
Sub-Saharan Africa	1.93 **	(1.57-2.38)	1.68 **	(1.35-2.10)
Asia	1.21	(0.87-1.65)	1.05	(0.75-1.46)
Rest of World	1.27	(0.94-1.72)	1.22	(0.89-1.67)
M3: Country of origin	A		B	
1 Algeria	1.52 **	(1.19-1.94)	1.42 **	(1.09-1.84)
2 Morocco	1.14	(0.85-1.54)	1.04	(0.76-1.43)
3 Tunisia	1.22	(0.78-1.91)	1.12	(0.70-1.78)
4 Turkey	1.24	(0.77-2.01)	1.10	(0.66-1.82)
5 Portugal	0.68	(0.30-1.51)	0.68	(0.30-1.52)
6 Senegal	2.49 **	(1.56-3.98)	2.36 **	(1.47-3.78)
7 Mali	2.89 **	(1.78-4.67)	2.41 **	(1.46-3.99)
8 Congo	1.73 +	(0.93-3.24)	1.46	(0.78-2.74)
9 Ivory Coast	1.47	(0.73-2.96)	0.81	(0.34-1.97)
10 Cameroon	1.49	(0.71-3.14)	1.38	(0.65-2.91)

Notes: significance levels at ** p<0.01, * p<0.05, + p<0.10

A models adjusted for sex, single/multiple birth, birth year & age of mother

B models further adjusted for living parents' marital status, living arrangements, & socio-professional category, & OECD urban/rural indicator for place of birth

Source: Permanent Demographic Sample (EDP)

Next steps

Our initial findings uncover important risks faced in early life by the children of migrants from North and Sub-Saharan Africa, the determinants of which merit further investigation. In the coming months, we are planning to look at different ways of defining the G2 to see how different definitions influence the presence and magnitude of disparities between G2 groups and the non-migrant population. First, we will restrict our definition to both parents being born abroad, to see whether the above variation becomes even more substantial (assuming that having one parent born in France confers some initial advantage to the child). Second, we will look at defining G2 by the mother or father's country of birth only, to see how the observed effects vary for foreign-born mothers versus foreign-born fathers. Finally, we have

detailed data on the place (i.e., *commune*) of birth. Resultantly, we are planning to merge ecological variables (such as a more detailed urban-rural typology variable, area-level SES information, and proximity and accessibility of health care services) into our data, to see if we can shed more light on some of the underlying mechanisms that generate these important disparities.

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ⁱ We note that for the explanatory variables, infant mortality is higher among males and for multiple births, is highest when the mother is younger (15-19) and old (40-45; forming a U-shape in-between), and when parents are not living together. There are no significant differences according to the socio-professional categories of the parents, their marital status, or in what type of commune the birth takes place.