The Mortality of Descendants of Migrants in England and Wales:
Does a 'Healthy Migrant Effect' persist beyond the first-generation?

Background:

1. Evidence of a '**Healthy Migrant Effect**' in the UK in **first-generation migrants** (Scott and Timaeus 2013; Wallace and Kulu, 2014).
2. However, low mortality in migrants may **wear off across generations** (Tarnutzer and Bopp, 2012; Das-Munchi, 2013).
3. Descendants of migrants may not share the low mortality of the first-generation and may **better reflect patterns of the host population**.

Why might the mortality of descendants of migrants differ from that of the first-generation?

Kohl's (2008) model (below left) shows main determinants of migrant mortality. Below right shows in what aspects migrants and descendants differ.

1. Aspects of origin country
   - Cultural values, norms, attitudes
   - Biological and genetics
2. Aspects of host country
   - Cultural values, norms, attitudes
   - Legal, socio-economic status
   - Ethnic support networks
   - Healthcare access
3. Selection processes
   - 'Healthy migrant effect', 'salmon bias effect'
   - Reasons for migration
4. Socio-demographic aspects
   - Age, sex, marital status
5. Other aspects
   - Acculturation, adaptation
   - Individual/family/social resources

Source: Kohls (2008)

Immigrants	Determinant	Descendants
Possible **selection processes** at work: '*Healthy Migrant Effect*' and '*Salmon Bias*'	**Selection Processes**	Born, and **do not select** into the host country
Development up to age 20 in the **origin country**	**Childhood Environment**	Development up to age 20 in the **host country**
May better **reflect origin country behaviours** in diet, smoking, alcohol, and attitudes.	**Cultural Values**	Depends on parents' level of acculturation. May **reflect host behaviours in** diet, smoking etc…
Educated in the **origin country**	**Education Level**	Educated in the **host country**

AIM 1

Determine whether the descendants of immigrants share the low mortality of their relatives.

AIM 2

Determine how much of the mortality in the descendants of immigrants is accounted for by social background.

Data

The Office for National Statistics Longitudinal Study (ONS LS) a **1% longitudinal sample** of **England & Wales**.

ONS LS = CENSUS DATA + EVENT REGISTER DATA

Entry events: (1) births (2) immigrations

- 1991: + info on sample members from census
- 2001: + info on sample members from census
- 2011: + info on sample members from census

Exit events: (1) deaths (2) embarkations

Entry events: (1) Births (2) Immigrations

Exit events: (1) Emigrations (2) Deaths

Sample size	***500,000** individuals*
Events	***32,000** deaths*
Study period	***1991-2011***
Lower age at entry	***20**-years old*
Upper age at entry	***65**-years in 1991 up to **85** in 2011*

Method: Event history analysis

- Measure period of time from entry to ***event***, ***censoring*** or ***end of study***.
- Baseline hazard follows ***Gompertz*** distribution where hazard increases at an ***exponential*** rate with age.
- Also run ***Cox*** and ***Piecewise constant*** survival models to compare rates.

$$\mu_i(t) = \mu_0(t) \times exp\left\{\sum_j \beta_j X_{ij}(t)\right\}$$

$\mu_i(t)$: hazard of mortality for individual *i*; $\mu_0(t)$: baseline hazard; β_j: parameter estimate; $X_{ij}(t)$: value of variables measuring socio-economic background

Analysis 1:

Run survival models for immigrants and their descendants as aggregated groups.

Results:

Mortality is low in migrants and high in descendants. The initial disadvantage in descendants in model [A] disappears in model [B] on control for socio-economic background.

Table 1. Hazard ratios of migrants and descendants (aggregated)

Covariates	Model 1 [A] Haz Ratio	95% CI	Sig	[B] Haz Ratio	95% CI	Sig
Host population	1.00			1.00		
Immigrants	0.79	(0.75-0.82)	***	0.73	(0.69-0.77)	***
Descendants	1.23	(1.07-1.40)	***	0.90	(0.79-1.03)	

Source: Calculations based on ONS LS
Note:
Model [A] controls age, sex and period; Model [B] adds social class, education level, marital status, Carstairs, Deprivation Score and area of residence
*Significance levels: *** 99% ** 95% * 90%*

Is high mortality in descendants a result of socioeconomic background?

Table 2. Hazard ratios of immigrants and their descendants (ethnic grp)

Covariates	Model 2 [A] Haz Ratio	95% CI	Sig	[B] Haz Ratio	95% CI	Sig
Host population	1.00			1.00		
Immigrants						
White	1.02	(0.98-1.06)		1.04	(1.00-1.08)	*
India	0.83	(0.77-0.89)	***	0.80	(0.74-0.87)	***
Pakistan & Bangladesh	0.84	(0.77-0.92)	***	0.71	(0.64-0.78)	***
China & Other Asia	0.52	(0.45-0.62)	***	0.58	(0.50-0.69)	***
Black Caribbean	0.83	(0.74-0.93)	***	0.71	(0.63-0.81)	***
Black African & Other	0.82	(0.70-0.96)	**	0.70	(0.60-0.83)	***
Other	0.74	(0.62-0.88)	***	0.76	(0.63-0.91)	***
Descendants						
India	0.88	(0.60-1.29)		0.62	(0.42-0.92)	**
Pakistan & Bangladesh	1.46	(1.01-2.12)	**	0.94	(0.65-1.36)	
Black Caribbean	2.15	(1.68-2.79)	***	1.66	(1.28-2.17)	***
Black African & Other	1.00	(0.72-1.39)		0.75	(0.54-1.05)	*
Other	1.07	(0.85-1.34)		0.80	(0.63-1.01)	*

Source: Calculations based on ONS LS
Note:
Model [A] controls age, sex and period; Model [B] adds social class, education level, marital status, Carstairs, Deprivation Score and area of residence
*Significance levels: *** 99% ** 95% * 90%*

NB: due to small sample size; descendants of Chinese/Other Asian migrants are grouped with 'Other' in descendants.

Analysis 2:

To check, we see if the same pattern persists across ethnic groups.

Results:

1. **Low mortality for all migrants except White.**
2. **Black Caribbean descendants have high mortality before and after SES control.**
3. **High mortality in descendants of Pakistanis and Bangladeshis a result of poor SES.**
4. **All other descendants have low mortality which is initially masked by social background.**

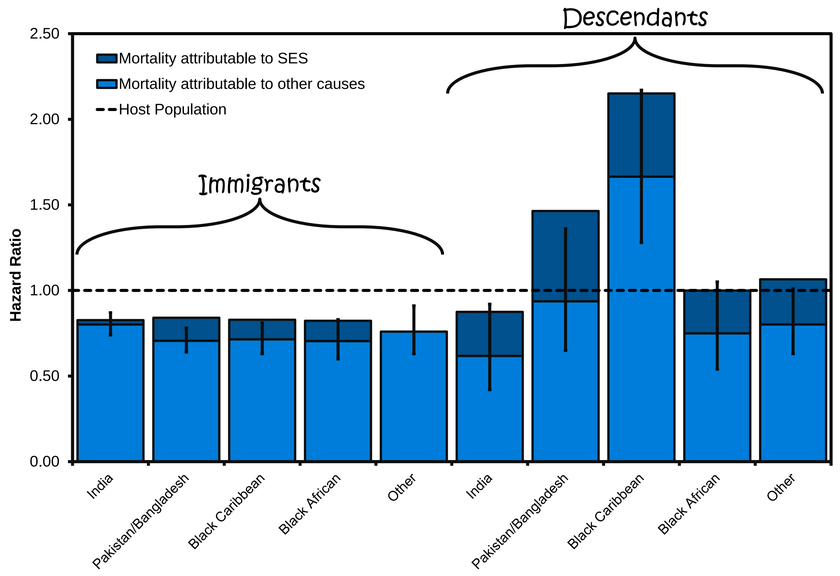

Figure 1. Impact of controlling for socioeconomic background on migrants and descendants.

Conclusion:

"A 'healthy migrant effect' is passed down in Indians, Black Africans and Other and lost in Black Caribbeans and Pakistani and Bangladeshis . SES plays a bigger role in descendants' mortality"

1	2	3	4
Selection	**SES position**	**Childhood**	**Behaviours**
Migrant's descendants **do not select** into migration for health or personality traits	Descendants may be **more susceptible** to the **health-damaging** effects of **poor SES**	Descendants, unlike migrants, experience **early life development in host country** not the origin	Health behaviours across generations **converge to less healthy practices** of majority popn
But descendants still **face the same challenges** that come with ethnic **minority status**	Migrants often **drop into a lower social position**, but their **health reflects origin country status**	Early life is a period in which **disease incidence** is determined for certain causes	Well-acculturated parents may **not pass down protective behaviours** to descendants
Descendants may **not cope as well with minority status**; it may place a greater **burden on their health**	Descendants' health may better **reflect the low social position** their relatives drop into on entry to the country	The first two decades of life, for example, are important in setting adult cancer mortality patterns	Descendants may never develop a **protective cultural buffer** to differentiate their health from natives

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