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Immigrant Mortality in Belgium: The Person and the Place

by

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Abstract

Migrants generally have lower mortality than the indigenous population. In the present study we consider to what extent this migrant effect depends on the place in which the immigrants live. Working with matched records of the 9,978,654 residents enumerated in the 1991 Belgian census, followed up over almost six years (600,264 deaths), we computed the Cox survival models for each of the 588 Belgian municipalities. The municipalities were characterised by location, urbanisation and various Quality of Life indicators. By analysing the parameters of the Cox models, we were able to show that:

1. *both men and women non-Belgians have a lower mortality risk than Belgian nationals, and this risk is even lower when personal characteristics are allowed for;*
2. *immigrant status is a more important determinant of mortality risk in areas with a high proportion of immigrants, weak family structures and low social power;*

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3. *in municipalities with a high proportion of immigrants and/or a socially powerful population and weak family structures, non-Belgians tend to have a lower mortality risk;*
4. *municipality-level effects on migrant mortality remain, even after controlling for individual social characteristics;*
5. *net of local quality of life indicators, there are few regional differences in migrant mortality risks.*

We suggest, in conclusion, that lower immigrant mortality may derive from the development, in areas with a high concentration of immigrants, of a supportive milieu which substitutes for a strong family structure, but this is less effective under conditions of poverty.

Keywords

Immigrants, Mortality, Relative Risks, Community, Quality of Life indicators.

Introduction

Migrants have a peculiar epidemiology. They often suffer poorer health, but nonetheless generally have lower mortality than the indigenous population (1-4) although their children may have a higher level of mortality (5). Various explanations have been offered for this phenomenon, from statistical artefact to genuine selection, but have often been found wanting (2). The weight of evidence does suggest, however, that in most cases, adult migrant mortality risks differ significantly from those of the parent and the host populations.

Initial analyses of the effect of place on mortality suggested that aggregate locality effects were little more than reflections of the characteristics of the individuals living in the localities. More sophisticated analyses (6-7), however, have indicated that there may be place effects on mortality which are independent of individual risk factors, or may even interact with them. In particular, the mortality risks of poorer individuals appear to be much more affected by neighbourhood quality than those of wealthier individuals. One particular aspect of these later analyses has been the characterisation of localities by macro-level, distributional, properties which are not mere aggregations of individual level characteristics.

Belgium is a particularly propitious location to study migrant demography, and the effects of location on migrant mortality in particular. Belgium is, and for long has been, a country of migrants. At the 1991 census, of the almost 10 million population enumerated, six percent were of foreign nationality born abroad, three percent were Belgians born abroad (including naturalised immigrants) and a further three percent were foreign nationals born in Belgium (8). Over the years the source, the composition and the location of migrants have changed (9-10), so that today's migrant population ranges from imported industrial and service workers, to top-level European officials. Furthermore, the special geography of the Belgian urban system, a small country made up of a network of middle size interdependent cities, rather than one central metropolitan node overshadowing all others, and the multi-focal growth of the Belgian economy in the past half century, have led to migrants being dispersed over a large number of locations, rather than being concentrated at the centre or in a small number of migrant cities (in 1991, 30 percent of the foreign nationals were located in the city of Brussels, 40 percent in Wallonia and 30 percent in Flanders). To what extent do the different locations in which migrants have settled influence their mortality risks?

Methods

Migrants have settled in all the major regions of Belgium. Our purpose in the present analysis is to compare the mortality of migrants from various backgrounds with that of the Belgian born, Belgian national population. In particular, we wish to isolate the effects of individual migrant characteristics (household, education, work, etc.) from the effects of the particular location and the broader effects of the socio-economic region or district, in which migrants are resident. To do so, we shall evaluate the mortality risks (hazards) of non-Belgian nationals and persons born abroad, by sex, relative to that of the Belgian born, Belgian national population, in each of the 588 municipalities which make up the Belgian municipal system (one municipality, with fewer than 100 residents, is excluded). Then, using the municipalities as cases, and the hazard coefficients and goodness-of-fit statistics as characteristic properties of the municipalities, we shall look at the distribution of these properties. If migrant mortality is a function of place characteristics then the hazard coefficients should correlate with the social variables characterising the Quality of Life (QoL) of the municipalities. However, if place is irrelevant, and only individual characteristics are important, then the hazard coefficients should vary randomly over the municipalities, and in particular, should bear no consistent relation to local level QoL indicators. The analysis is based on the population enumerated in the 1991 census, linked to the national register of deaths over almost six years.

Data

Data were taken from two sources. The population records from the census of March 1st, 1991 for the whole of Belgium were combined with information from the population registry covering the years 1991-1996 (11). We were thus able to note every death, and every emigration that occurred between 1st March 1991 and 31st December, 1996 – a total of 70 months. Internal migration between municipalities, however, is not fully recorded in the database, and we have therefore treated all non-emigrants as continually resident in their municipality of enumeration at the time of the census.

Using this data base, two sets of data were created:

1. Municipality File. For each of the 589 municipalities, we computed a standardised ratio of the prevalence of various social conditions. These ratios were computed in the same way as a Standardised Mortality Ratio[1]:

i. for the whole of Belgium we computed the proportion of total occurrences divided by the total population in each five-year age group, from age 0-5 up to age 90 and over;

ii. these national age-specific proportions were then multiplied by the population in each age group in each municipality, and the results summed to obtain a municipality-specific expected value;

iii. the sum of total occurrences in each municipality was divided by the expected value to obtain the municipality-specific standardised ratio;

iv. the ratios were logged (to base 10) to create symmetry between deviations above and below the mean national level.

These standardised ratios were then combined by varimax rotation of principal components to create orthogonal factors representing various measures of the quality of life in each municipality. Factor scores are presented in Table 1, figures in bold identify the variables principally associated with each factor.

TABLE 1
Quality of Life (QoL) Indicators: Varimax Rotated Principal Components

Variable	Family Centred	Social Power	Migration	Cohabit-ation	Institution-alisation	Commu-nalities
Parent	**0.951**	– 0.091	– 0.094	– 0.072	– 0.038	*0.928*
Owner-Occupier	**0.918**	0.075	– 0.267	0.003	– 0.082	*0.925*
Single	**– 0.898**	0.019	0.337	0.131	– 0.015	*0.937*
Married	**0.860**	– 0.052	– 0.410	– 0.086	0.014	*0.918*
Child	**0.806**	0.302	– 0.159	– 0.196	– 0.092	*0.814*
Diploma	– 0.147	**0.933**	– 0.157	– 0.048	0.059	*0.923*
Studying	– 0.018	**0.907**	0.182	– 0.061	– 0.021	*0.860*
Manager	0.034	**0.791**	– 0.498	– 0.071	0.088	*0.887*
Education	0.351	**0.785**	– 0.234	0.187	– 0.016	*0.829*
Non-Belgian	– 0.502	0.028	**0.778**	0.173	0.002	*0.889*
Foreign Born	– 0.536	0.084	**0.749**	0.167	– 0.002	*0.884*
Full Time Income	0.481	0.326	**– 0.776**	0.047	0.034	*0.944*
Unemployment	– 0.370	– 0.440	**0.770**	0.002	– 0.013	*0.924*
Social Security	0.018	– 0.568	**0.650**	0.271	– 0.072	*0.824*
Cohabitation	– 0.250	– 0.046	0.166	**0.922**	0.028	*0.943*
Non-Private Households	– 0.083	0.060	– 0.039	0.023	**0.992**	*0.997*
Variance Explained	*31.7*	*23.0*	*22.3*	*6.87*	*6.38*	*Total 90.2*

a. *Family centeredness* (based on personal statuses within the household):

Parents with one or more children in the household
Individuals living in owner-occupied home
Single-adults living alone (Negative)
Married partners in households
Children living in adult-headed household
Total: 31.7 percent of common variance

b. *Social Power*

Graduation diplomas (0 = none; 1 = secondary; 2 = tertiary)
Currently studying (including all children under age 6)
Managerial responsibility for work of others
Number of years full time education
Total: 23.0 percent of common variance

c. Immigration and Social disadvantage

Non-Belgian nationality
Born abroad
Full Time incomes in the household (none, one or two)
Unemployed (age < 65, neither working nor studying) (Negative)
Social security income in the household
Total: 22.3 percent of common variance

d. Cohabitation

The 1991 Census did not recognise cohabitation as a household status. In constructing the National Mortality Database, the authors imputed cohabitation to all persons of opposite sex living jointly as heads of household, not married to each other and separated by less than 20 years in age. This variable did not correlate with other household variables, and was therefore identified as a separate factor, indicative of social anomia (6.87 percent of common variance).

e. Non-private Households

Persons living in old-age homes, institutions, etc. This variable, too, did not correlate with other variables, and was included as a control factor because of the particularly high mortality risk of this population (6.38 percent of common variance).

In constructing orthogonal factors we cannot totally overcome the empirical interdependencies between analytically separate concepts. Thus the factor scores show family centred municipalities, generally, to have a low concentration of immigrants; and municipalities with a high immigrant concentration are also those with higher unemployment and few people living off full time incomes. These interdependencies need to be borne in mind when interpreting the results. The second factor has been identified as “Social Power” as its main correlates are education and management responsibilities, though naturally municipalities with high social power also tend to be those with less unemployment and less dependency on social security incomes.

2. Proportional Hazards File. For each municipality, we computed Cox proportional hazard models for the population resident in the municipality on the date of the census. Three models were computed for each municipality:

a. the relative risks of mortality by age, age-squared and sex;

b. the relative risks of mortality, by migration status (non-Belgian nationality and born-abroad), for men and women, controlling for sex, age and age-squared;
c. as (b), but controlling also for the other social variables used in constructing the municipality Quality of Life indicators.

From these models, three sets of indicators were extracted:

i. the relevance of nationality and nativity for the mortality risk, defined as the gain in chi-squared (– 2*log-likelihood) attributable to the addition of the nationality and nativity variables in model (b);
ii. the male and female nationality and nativity hazard coefficients (log relative risk) in model (b), controlling for age and age squared but without controlling for individual social characteristics;
iii. the male and female hazard coefficients in model (c), controlling for all individual characteristics.

Geographical Locations

Analysis was performed by municipality, of which there were 589 at the time of the census. One municipality (Herstappe, with a population of 93) was excluded from the analysis. These municipalities are administratively organised in 10 Provinces (five in Flanders, north of the language border; five in Wallonia, south of the border) and the Brussels Capital Region. However, the social meaning attributable to these provinces is limited. Willaert (12) has suggested the Belgian municipalities can be clustered within 17 "migration basins", each one focussed on one central urban area, and delimited by the density of the migration nexus within and between the basins. The basins may be aggregated into four major regional divisions: Brussels; Antwerp; other Flemish; Walloon (see Table 2). Most of the basins cross provincial boundaries and, except for Brussels, they are effectively unilingual (in Liège and Tournai the minority areas are less than one percent of the basin's population, and in Kortrijk less than five percent). The Brussels basin, which covers almost a quarter of the country's population, has about 40 percent of its population in the bilingual (but predominantly Francophone) Brussels Capital Region, another close-to 40 percent in the Flemish suburbs of Vlaams-Brabant, and the remainder in the Walloon suburbs of Brabant-Wallonie.

TABLE 2
Migration Basins

Migration Basin	Regional Division	Provinces	Language area	Communes	Population
Antwerp	Antwerp	Antwerp	Flemish	70	1,605,165
		E. Flanders		8	213,164
		Vlaams-Brabant		5	64,200
Arlon	Wallonia	Luxemburg	Walloon	25	143,809
		Namur		2	5,692
Brugge	Flanders	West Flanders	Flemish	12	286,430
Brussels	Brussels	Brussels	Bilingual	19	954,038
		East Flanders	Flemish	17	381,101
		Vlaams-Brabant	Flemish	37	562,365
		Brabant wallon	Walloon	27	321,144
		Hainaut	Walloon	16	165,938
		Liege	Walloon	3	16,484
		Namur	Walloon	2	25,870
Charleroi	Wallonia	Hainaut	Walloon	22	465,777
		Namur			122,067
Gent	Flanders	East Flanders	Flemish	40	741,526
		West Flanders		1	4,933
Hasselt-Genk	Flanders	Vlaams-Brabant	Flemish	4	49,053
		Limburg		42	746,113
Kortrijk	Flanders	West Flanders	Flemish	21	398,336
		Hainaut	Walloon	1	17,849
La Louvière	Wallonia	Hainaut	Walloon	7	177,970
Leuven	Flanders	Vlaams-Brabant	Flemish	19	295,096
Liège	Wallonia	Liege	Walloon	56	740,964
		Limburg	Flemish	2	4,319
		Luxemburg	Walloon	18	87,537
		Namur	Walloon	3	18,698
Mons	Wallonia	Hainaut	Walloon	14	273,080
Namur	Wallonia	Luxemburg	Walloon	1	1,467
		Namur		20	250,990
Oostende	Flanders	West Flanders	Flemish	14	206,813
Roeselare	Flanders	West Flanders	Flemish	15	208,517
Tournai	Wallonia	West Flanders	Flemish	1	1,797
		Hainaut	Walloon	9	178,173
Verviers	Wallonia	Liege	Walloon	25	242,196

Within the basins, we have distinguished between those municipalities which are strictly urban (central cities), and the other – suburban and rural – municipalities (12). The distributions are presented in Figure 1. Brussels is clearly the most urbanised of the divisions, with 43 percent of the population living in urban areas, followed by Wallonia (38 percent) and Antwerp (34 percent). Flanders, with only 30 percent living in urban areas, is the most suburban-rural of the four divisions.

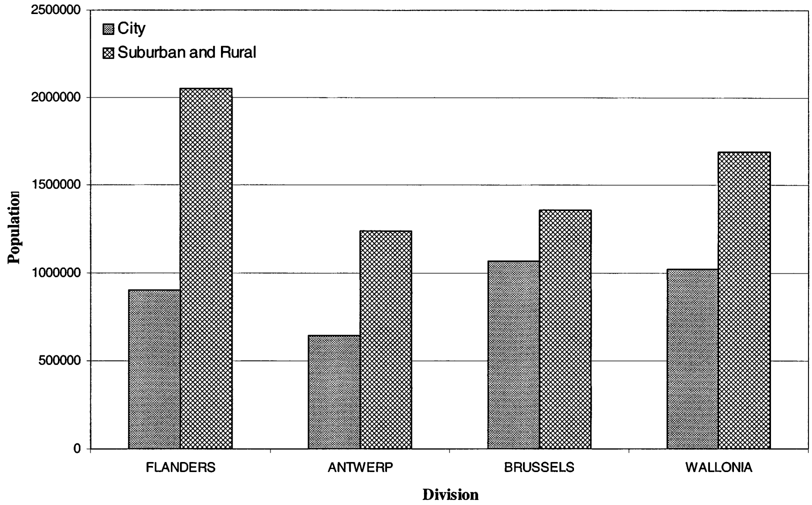

Fig. 1: Population by Division and Urban types

The main questions we wish to ascertain are:

1. To what extent are there local variations in the effect of nationality and nativity status on the risk of mortality?
2. If such variations exist, to what extent do they reflect differences in quality of life, as measured by the factors defined above?
3. Is there any residual variation attributable to type of locality (central city: other) or regional division?

Results

1. National Estimates

Table 3 presents the Cox regression models for the risk of mortality by age and sex (Model 1); with nationality and nativity added (Model 2) and with the social variables added (Model 3). The model is computed for the whole of the Belgian population, as enumerated at the census (9,978,654, of whom 600,264 died during the 70 months analysed). As this is a total population, the concept of significance has no meaning in terms of hypothesis testing. Nonetheless, it may be used as a guide to strength of relationships, and the consistency of results based on a rare phenomenon (death) subject to random variation (13).

TABLE 3

Mortality Risks by Sex, Age, Nationality, Nativity and Personal Characteristics

Variable	Coefficient *(Standard Error)*	Relative Risk	Coefficient *(Standard Error)*	Relative Risk	Coefficient *(Standard Error)*	Relative Risk
Model	1. Age and Sex		2. Nationality and Nativity		3. Characteristics	
Sex	0.570***	1.77	0.567***	1.76	0.683***	1.98
	(0.00264)		*(0.00275)*		*(0.00288)*	
Age	0.0778***	1.08	0.0777***	1.08	0.0780***	1.08
(centred on 40)	*(0.000182)*		*(0.000183)*		*(0.000303)*	
Age squared	0.000404***	1.00	0.000403***	1.00	0.000238***	1.00
	(0.00000356)		*(0.00000357)*		*(0.00000506)*	
Non-Belgian			0.00246^x	1.00	– 0.112***	0.894
Nationality (M)			*(0.0116)*		*(0.0117)*	
Non-Belgian			– 0.0834*	0.920	– 0.164***	0.849
Nationality (F)			*(0.0121)*		*(0.0122)*	
Born Abroad (M)			– 0.0263**	0.974	– 0.0263**	0.974
			(0.00976)		*(0.00975)*	
Born Abroad (F)			– 0.0285***	0.972	– 0.0490***	0.952
			(0.00832)		*(0.00834)*	
Child					0.0929***	1.10
					(0.0130)	
Parent					– 0.0855***	0.918
					(0.00432)	
Living Alone					– 0.215***	0.806
					(0.00470)	
Married					– 0.378***	0.685
					(0.00455)	
Owner-Occupier					– 0.188***	0.828
					(0.00292)	
Cohabiting					– 0.145***	0.865
					(0.00967)	
Non-Private					0.245***	1.28
Household					*(0.00659)*	
Diploma					– 0.123***	0.884
(1 = 2^{ry}; 2 = 3^{ry})					*(0.00310)*	
Years Education					– 0.0137***	0.986
					(0.000386)	
Currently					– 0.231***	0.794
Studying					*(0.0198)*	
Managerial					– 0.243***	0.785
Responsibilities					*(0.0114)*	
Unemployed					0.116***	1.12
					(0.00425)	
Household					– 0.135***	0.874
Full Time Incomes					*(0.00390)*	
Household social					0.0169***	1.02
security incomes					*(0.00228)*	
Model -2 Log Likelihood	1,684,745		1,684,885		1,725,992	
Total -2 Log Likelihood	19,300,413					

Note: * p < 0.05; ** p < 0.01; *** p < 0.001.

a. Men have a far higher mortality risk than women, rising from 1.8 in the first two models to almost double the risk in the final model, allowing for personal characteristics. Men's advantaged social position, relative to women, thus creates a more favourable mortality situation than would otherwise be the case;

b. The nationality and nativity variables are introduced nested within sex, that is, there are separate variables representing the hazard and relative risks for men and women of non-Belgian nationality and those born abroad. In the second model the effects are small, but mainly significantly negative (except for non-Belgian men, for whom the coefficient is non-significant but positive). When personal characteristics are introduced into model 3, the effect of nationality is greater (coefficients more negative), and for non-Belgian nationality are clearly significant, with the coefficient for women being greater in absolute value than that for men. The effects for being born abroad, however, remain small, though here too, they are greater for women than for men. Among the personal characteristics, most of the effects are as expected: the household variables are relative to the omitted category of "other" (adult non-householder), chosen in expectation that this group would have the highest relative risk. With the exception of Child, all household statuses have a negative coefficient (relative advantage). The positive Child coefficient may reflect a selectivity effect in young adulthood (below age 18 the variation for this variable is imperceptible). The Cohabiting status has little more than a third the value of the coefficient for Married status, and less than the absolute value for living alone. Being in an old-age home or institution substantially increases the mortality risk, though here, too, there may well be a selectivity component at work; and social resources greatly reduce the mortality risk, in particular managerial responsibility and high levels of education. However it must be remembered that most of these variables are interdependent, and their effects are cumulative: a male manager with 20 years of education, a university degree and two full-time household incomes has 0.357 the expected mortality risk of an unemployed man with 10 years of education and one household social security income.

Taken across the whole of the Belgian population, we see that there is a minor negative effect on the mortality risk of being non-Belgian, an effect that is increased (more negative) when social conditions are taken into account: in other words, the social conditions of non-Belgians are making for a less advantageous mortality situation than would otherwise be the case. This situation appears true for all non-Belgian nationals: substantively, being born in Belgium or abroad affects the mortality risk far less than does nationality.

We now ask, how are these results affected by geography and the social conditions prevailing in the municipality of residence?

2. Municipality-Level Effects

The analyses presented in Table 2 were repeated for each of the 588 municipalities. The results of this analysis, in the form of hazard regression coefficients and goodness of fit statistics, may be viewed as measures of the particular conditions prevailing in each municipality, though subject to a certain measurement error, which will vary in inverse proportion to the population size of the municipality. If mortality risks reflect no more than individual characteristics, that is, if there is no community level effect, then there will only be random variation among the results obtained (hazard coefficients and goodness of fit) for the different municipalities, and, in particular, there will be no correlation between these measures and the other social properties of the municipalities, as represented by the QoL factors. On the other hand, if there is a socially meaningful local level effect, this will be reflected in a statistical relation between the municipality-specific hazard coefficients and goodness of fit statistics and the QoL factors defined above. It is this which we now wish to investigate. To do so, we shall regress the municipality level hazard coefficients and goodness of fit on the QoL factors, urbanisation (central city-other) and regional division (Brussels, Antwerp, Other Flanders, Wallonia)[2]. All linear regressions are weighted by the total population of the municipality.

2.1. The reduction in uncertainty

We consider first the gross importance of nationality and nativity as predictors of mortality, as measured by the chi-square gain accruing from

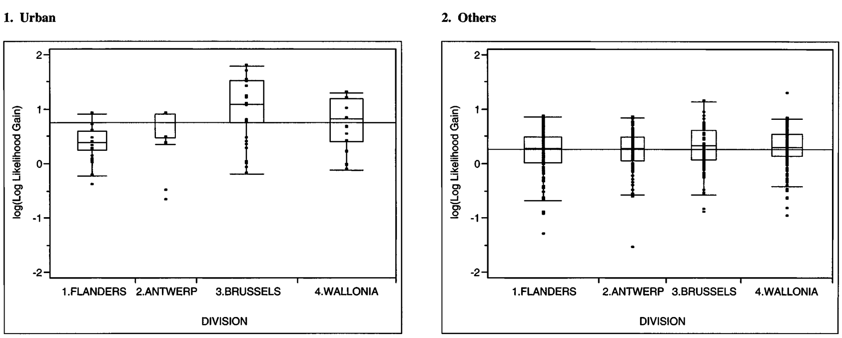

Fig. 2: Oneway analysis of $\log_{10}$ (Log Likelihood Gain) by division communes weighted by population

adding in these two variables over and above the age and sex effects. Figure 2 plots the chi-square gain (logged$_{10}$ to approach a symmetrical distribution), by urbanisation – central cities versus the rest – and the four regional divisions discussed above. In cities the log-likelihood gain is distinctly greater than in the rest of the country, but this extra gain is largely accounted for by the effects of Brussels (the Capital Region plus Halle, Nivelles, Ottignies-LLN and Vilvoorde). Note that for the non-city municipalities of the Brussels basin, the gain, i.e. the effect of nationality and nativity status on the mortality risk, is no different from that in the rest of the country.

TABLE 4
Regression Analysis of log (Log Likelihood Gain)

Term	Estimate *(Std Error)*
Intercept	0.447*** *(0.0151)*
Family Centredness	– 36.7*** *(1.97)*
Social Power	– 5.21** *(1.97)*
Immigration	23.2*** *(1.97)*
Cohabitation	– 5.00* *(1.97)*
Institutionalisation	0.218 *(1.97)*

Regional Division	Urbanisation: Central City	Urbanisation: Other	Total (Main effects)
	Interaction		
Flanders	– 0.0655* *(– 0.0279)*	0.0655* *(– 0.0279)*	**– 0.0441** ***(– 0.0321)***
Antwerp	0.0220 *(0.0331)*	– 0.0220 *(0.0333)*	**0.0217** ***(.0312)***
Brussels	– 0.0358 *(0.0313)*	0.0358 *(0.0313)*	**0.0579†** ***(0.0318)***
Wallonia	.0793** *(0.0282)*	– 0.0793** *(0.0282)*	**– 0.0356** ***(0.0345)***
Total (Main Effects)	**– 0.0147** ***(0.0281)***	**0.0147** ***(0.0281)***	

R^2 Step 1: Social factors = 0.461.
Step 2: Region and city = 0.480.
Notes: † p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001.
Regressions hierarchical and weighted by total population of communes: Step 1 social (QoL) factors; step 2 regional divisions and urbanisation added.
Coefficients for nominal variables (Division, Urbanisation and interactions) are deviations from grand mean and sum to 0 across rows and column.

TABLE 5

*Regression Analysis: Municipality-Level Effects on the Mortality Hazard, **without** controls for individual social characteristics*

Non-Belgian Nationality				Non-Belgian Nativity			
Males		Females		Males		Females	
Term	Estimate *(Std Error)*	Term	Estimate *(Std Error)*	Term	Estimate *(Std Error)*	Term	Estimate *(Std Error)*
Intercept	– 0.0125 *(0.0203)*	Intercept	–0.00314 *(0.0213)*	Intercept	– 0.0375* *(0.0153)*	Intercept	– 0.0504*** *(0.0138)*
Family Centredness	5.70* *(2.53)*	Family Centredness	13.0*** *(2.67)*	Family Centredness	6.56*** *(1.91)*	Family Centredness	– 0.128 *(1.73)*
Social Power	– 4.37† *(2.58)*	Social Power	– 4.99† *(2.72)*	Social Power	– 1.53 *(1.95)*	Social Power	– 2.44 *(1.76)*
Immigration	– 5.62* *(3.70)*	Immigration	– 10.8*** *(2.84)*	Immigration	– 2.55 *(2.04)*	Immigration	– 2.27 *(2.84)*
Cohabitation	0.00784 *(2.62)*	Cohabitation	– 6.25* *(2.75)*	Cohabitation	– 0.223 *(1.97)*	Cohabitation	0.675 *(2.79)*
Institutionalisation	– 0.739 *(2.93)*	Institutionalisation	– 7.18* *(3.08)*	Institutionalisation	– 0.101 *(2.21)*	Institutionalisation	3.32† *(2.00)*
Flanders	– 0.0411 *(0.0414)*	Flanders	0.0343 *(0.0435)*	Flanders	0.0454 *(0.0312)*	Flanders	– 0.0301 *(0.0279)*
Antwerp	– 0.0156 *(0.0399)*	Antwerp	– 0.0499 *(0.0420)*	Antwerp	0.0172 *(0.300)*	Antwerp	0.0877** *(0.0269)*
Brussels	0.00237 *(0.0404)*	Brussels	0.00901 *(0.0425)*	Brussels	– 0.0151 *(0.0304)*	Brussels	– 0.0473* *(0.0272)*
Wallonia	0.0543 *(0.0445)*	Wallonia	0.0147 *(0.0468)*	Wallonia	– 0.0474 *(0.0335)*	Wallonia	– 0.0104 *(0.0300)*
Urbanisation (City = 1, Other = 0)	0.459 *(0.0662)*	Urbanisation (City = 1, Other = 0)	0.0230 *(0.0697)*	Urbanisation (City = 1, Other = 0)	0.00749 *(0.498)*	Urbanisation (City = 1, Other = 0)	0.0620 *(0.0446)*
R^2 Step 1: Social factors = 0.0239. Step 2: Region and city = 0.0281.		R^2 Step 1: Social factors = 0.0881. Step 2: Region and city = 0.0921.		R^2 Step 1: Social factors = 0.0281. Step 2: Region and city = 0.0356.		R^2 Step 1: Social factors = 0.0141. Step 2: Region and city = 0.0458.	

Notes:

† $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. N = 270 (90% of total population).

Regressions hierarchical: Step 1 social (QoL) factors; step 2 regional divisions and urbanisation added. All regressions weighted by total population of communes. Coefficients for Regional Divisions are deviations from grand mean and sum to 0.

May it not be, however, that this extra gain in Brussels derives from a different social composition of the central Brussels municipalities, as reflected in the QoL indicators? To consider this proposition, we regressed the log(chi-square gain) on the QoL factors and the variables of City, Regional Division, and their interaction. The results (in this and subsequent regressions) are presented in hierarchical fashion: first we present coefficients for the QoL factors *without* the city and regional variables, then we present coefficients for the city and regional effects. R-squared values refer to the QoL factors, and to the *total* R-square after adding the city and regional effects[3].

These results (Table 4), indicate that the main influences are family centredness and (to a lesser extent) social power and cohabitation, which significantly reduce the effect of nationality and nativity; and migrant concentration, which enhances it. With the QoL variables included, there remains a marginally significant positive effect in the Brussels basin, but with no significant difference between the central city and the other areas. In the other divisions, however, there remains a contrast between Flanders, where the effect is now greater outside the main cities, and Wallonia, where it is greater in the cities. However, these effects are substantively minor in comparison with the effects of the QoL variables, which between them account for 46 percent out of the 48 percent of total variance explained. Thus, although there are important differences between different regions of the country, and between some of the urban forms, in the importance of nationality and nativity for determining individuals' mortality risks, most of these differences reflect basic elements of the municipalities' social structure: in particular, in municipalities which are typified by a relatively high degree of family-centredness the importance of personal migration and nativity status is diminished; in municipalities typified by a high immigrant concentration it is enhanced.

2.2. The Gross Effect of Nationality and Nativity

To see how nationality and nativity actually affect the mortality hazard in the different municipalities, without controlling for individual social characteristics, Table 5 (left hand columns) presents a similar analysis, regressing the municipality-specific mortality hazard of having non-Belgian nationality on the QoL factors, regional division and urbanisation (in this and all subsequent regressions, the city-region interaction was not significant and has not been included). For males, the immigration factor has a significant negative effect on the size of the mortality risk of non-Belgian nationals, and family-centredness has a positive effect. For females there are significant negative effects for the immigration, cohabitation and institu-

TABLE 6

*Regression Analysis: Municipality-Level Effects on the Mortality Hazard, **wih** controls for individual social characteristics*

Non-Belgian Nationality				Non-Belgian Nativity			
Males		Females		Males		Females	
Term	Estimate *(Std Error)*	Term	Estimate *(Std Error)*	Term	Estimate *(Std Error)*	Term	Estimate *(Std Error)*
Intercept	– 0.0960 *(0.0203)*	Intercept	–0.0744*** *(0.0212)*	Intercept	– 0.0419** *(0.0153)*	Intercept	– 0.0714*** *(0.0139)*
Family Centredness	8.66*** *(2.55)*	Family Centredness	12.6*** *(2.67)*	Family Centredness	5.66** *(1.92)*	Family Centredness	– 0.914 *(1.75)*
Social Power	– 5.32* *(2.59)*	Social Power	– 5.33* *(2.71)*	Social Power	– 0.211 *(1.95)*	Social Power	– 1.72 *(1.78)*
Immigration	– 6.39* *(2.71)*	Immigration	– 9.21** *(2.84)*	Immigration	– 2.19 *(2.04)*	Immigration	– 1.79 *(1.86)*
Cohabitation	1.68 *(2.63)*	Cohabitation	– 6.66* *(2.74)*	Cohabitation	– 0.00671 *(1.98)*	Cohabitation	0.248 *(1.80)*
Institutionalisation	– 0.800 *(2.94)*	Institutionalisation	– 8.43** *(3.07)*	Institutionalisation	– 0.493 *(2.21)*	Institutionalisation	3.02 *(2.02)*
Flanders	– 0.0412 *(0.0416)*	Flanders	0.0545 *(0.0435)*	Flanders	0.0484 *(0.0313)*	Flanders	– 0.0338 *(0.0281)*
Antwerp	0.00958 *(0.0401)*	Antwerp	– 0.0243 *(0.0419)*	Antwerp	0.0225 *(0.0301)*	Antwerp	0.0960** *(0.0270)*
Brussels	– 0.0188 *(0.0406)*	Brussels	– 0.0207 *(0.0424)*	Brussels	– 0.0118 *(0.0305)*	Brussels	– 0.0474 † *(0.0274)*
Wallonia	0.0504 *(0.0447)*	Wallonia	– 0.00958 *(0.0467)*	Wallonia	– 0.0590 *(0.0336)*	Wallonia	– 0.0148 *(0.0302)*
Urbanisation (City = 1, Other = 0)	0.263 *(0.065)*	Urbanisation (City = 1, Other = 0)	– 0.000665 *(0.0695)*	Urbanisation (City = 1, Other = 0)	– 0.0183 *(0.0500)*	Urbanisation (City = 1, Other = 0)	0.0568 *(0.0449)*
R^2 Step 1: Social factors = 0.0406. Step 2: Region and city = 0.0449.		R^2 Step 1: Social factors = 0.0853. Step 2: Region and city = 0.0891.		R^2 Step 1: Social factors = 0.0204. Step 2: Region and city = 0.0291.		R^2 Step 1: Social factors = 0.0099. Step 2: Region and city = 0.0445.	

Notes:

† $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. N = 270 (90% of total population).

Regressions hierarchical: Step 1 social (QoL) factors; step 2 regional divisions and urbanisation added. All regressions weighted by total population of communes. Coefficients for Regional Divisions are deviations from grand mean and sum to 0.

tionalisation factors, a marginally significant negative effect for social power, and a significant positive effect for the family-centredness factor. In neither case are there significant differences by urbanisation or regional division. The mortality risk for non-Belgians thus tends to be lower in those communes with a high concentration of migrants, and higher in those with a family-centred household pattern. For women, this risk is further diminished in municipalities with a relatively high degree of cohabitation, institutionalisation and social power. For non-Belgian nativity (Table 5, right hand columns) there is a significant increase in the male risk in those municipalities with high family-centredness. For females, however, there is only a strictly marginal ($t = 1.66$, $p = 0.098$), and positive, effect for institutionalisation. There is no difference between cities and other places, for males or females, but, unlike the males, for which there is no regional effect, there is a significant contrast, for females, between a higher mortality risk for those born abroad in the Antwerp basin, and a lower risk in the Brussels basin. The low R-squared values suggest caution in interpreting these results, but it does appear that whereas for males, being of foreign nationality, and having been born abroad, have similar social sensitivities in terms of mortality risks, this is not the case for females.

2.3. The Net Effect of Nationality and Nativity

Table 6 (left hand columns) repeats the above analysis for the coefficients of non-Belgian nationality, after controlling, within each municipality, for the effects of the individual measures of quality of life (as in Table 2, Model 3). For males, the QoL factors reproduce, effectively, the results in Table 5, with lower mortality hazards in communes with a high concentration of immigrants, and in those with high social power; and a higher hazard in family-centred communes. The same is true for females, but the mortality hazards of non-Belgian nationals is also lower where there is high cohabitation and institutionalisation. There are no marginal effects for either urbanisation or region. Controlling for individual social characteristics, therefore, does not substantively affect the relation between non-Belgian nationals' mortality risks and the social structure and conditions of the areas in which they live.

With respect to nativity (Table 6, right hand columns), here too the introduction of social controls at the individual level does not affect the distribution of hazard coefficients at the municipality level. For males, the hazard is significantly greater in family-centred communes, but for females there are no QoL effects. On the other hand, for males there are no city or regional effects, whereas for females the hazard remains significantly higher in the Antwerp, and marginally lower in the Brussels region. Thus, as with the nationality hazards, the effects of nativity remain approximately the same as they were before individual-level social controls were introduced.

Discussion

Mortality, as a social phenomenon, is multifaceted. Various studies have shown that it is responsive to individual characteristics, not only sex and age, but also background characteristics such as education and migrant status, and current wealth, employment and living arrangements. At the same time, there is growing evidence of the effects of location, an effect that cannot be explained solely in terms of the aggregate characteristics of those living in that particular location. In the present analysis we have sought to take a further step towards disentangling these various components, using the particular advantages that Belgian society, and the data available, provide. For each of the 588 municipalities in Belgium we computed the Cox hazard coefficients for non-Belgian nationality and non-Belgian nativity for males and females, and considered whether these coefficients were randomly distributed with respect to the location, level of urbanisation and particular social characteristics of the municipalities. Our first analysis, of the gain in log-likelihood, showed there to be clear differences in the importance of nationality and nativity between the different municipalities, differences which are largely attributable to the distribution of household structures, immigrant concentration and social power among the different municipalities. The specific effects of local quality of life indicators showed that in municipalities with a higher concentration of immigrants, and greater social power, non-Belgian nationals had a reduced relative risk of mortality; on the other hand greater family-centredness increases non-Belgians' relative risk. This effect was stronger for females than for males, and was unaffected by region of residence or degree of urbanisation. With respect to place of birth, males born abroad had a greater mortality risk in family-centred municipalities, whereas for females there was a regional contrast between a higher relative risk in the Antwerp region, and a lower relative risk in the Brussels area. We also saw that the specific effects of locality on the mortality hazard of being of foreign nationality and being born abroad did not depend on residents' individual characteristics: the variation in the hazard coefficients was the same with respect to location and municipality quality of life whether we controlled statistically for individuals' social characteristics or not. There thus appears to be genuine, and consistent, variation in migrants' mortality risks between the municipalities, variation which would be appear to reflect genuine aspects of the social structure, and not just individual level characteristics of municipality residents.

Conclusions

We find in these results evidence that the risk of mortality is responsive both to individual characteristics and to the social environment in which they live. We may speculate that the lower mortality risks for migrants living in municipalities with a relatively high concentration of immigrants is indicative of the creation of migrant-focussed milieus, including first and second generation migrants, in those municipalities in which there are large migrant communities. These milieu then serve to strengthen migrant resilience. At the same time, the significance of the social power factor suggests that this is most efficacious where good work opportunities are to be found – poverty and unemployment do not appear to be conducive to the generation of strong and supportive networks. Similarly, the greater relative mortality risk for migrants in family-centred municipalities may be indicative of an alternative mechanism for generating social support. The slightly greater sensitivity of women than men to these conditions, as indicated in the larger coefficients and the larger goodness of fit measures is intriguing, and runs counter to other evidence that men are usually more sensitive to social conditions. More evidence is required on the ways in which particular community situations translate into a lowering of men and women migrants' mortality risks. The evidence from this study does clearly suggest, however, that these risks do vary according to the local situation in which migrants live, but there is far more work that needs to be done in order to unravel the relationship.

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Notes

1. Most, if not all, of these measures vary considerably according to the age of the population. In part this reflects a life cycle effect (e.g. marital status, childbearing, work) and in part a cohort effect (e.g. education), and often both of these effects combined. Age, however, is also directly related to the mortality risk. As the municipalities vary quite considerably in their age distributions, the building of social indicators using crude prevalence rates (proportion married, etc.) is liable to confound age effects with true effects of the phenomenon being measured (13). For many of the municipalities, size precludes the calculation of reliable age specific rates and we have therefore used indirectly standardised measures to control for the effects of age as a confounding variable.

2. Ideally, such an analysis would be conducted using a multilevel model (14), which would enable the joint estimation of micro-level individual-characteristic effects and area-level municipality-characteristic effects. Computing facilities available, however, did not enable such an analysis with the number of cases at hand (close to 10 million). The choice was therefore between drastically reducing, by sampling, the size of the population analysed, and in the process also losing the smaller municipalities and a sizeable proportion of the population, or the approach undertaken here. In either case, the result is a far less powerful and sensitive, and hence statistically conservative, analysis. While not ideal, therefore, we may argue that the results of the present analysis will probably *underestimate* the level of statistical significance, hence reducing the probability of a Type I error (false rejection of the null hypothesis) and increasing the risk of a Type II error (false rejection of the alternative hypothesis).

3. Note that as the QoL factors are orthogonal, the inclusion of non-significant factors enables comparison between the regressions without confounding the coefficients for other factors.

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