

Inequalities in COVID-19 mortality in Belgium by socio-economic status and by nationality of origin

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Introduction

COVID-19 virus infections spread rapidly in Belgium after the school holidays in the week of 22 February upon return from ski vacation in Northern Italy and Austria, and through local carnival festivities. The first confirmed COVID-19 death was a 90-year-old lady from Brussels on 11 March 2020. Two other patients died the same day.

The following day, on 12 March 2020, the Belgian government decided to close schools, cafes, and restaurants, and to cancel all public gatherings.

By 1 April 2020 Belgium had the highest death toll in absolute cases after Italy and Spain and at the end of the month, on 30 April, Belgium reported the highest number of COVID-19 deaths per head worldwide. At the end of 2020, as COVID-19 involved increasingly more countries, Belgium remained the country with the third highest number of officially registered COVID-19 deaths per head with 19.840 COVID-19 deaths based on surveillance data. The resulting excess mortality for Belgium in 2020 was about 18.000 deaths or 16,6% more than expected.

Excess mortality unfolded in three waves: a COVID-wave from 1st March to 21st June, a short heat wave in the summer, and a second COVID-wave from 31st August onwards.

Death certificates in 2020 contain for the first time a new code for COVID-19. Compared to surveillance data, death certificates reported 2.176 more COVID-19 cases, and COVID-19 was the highest single cause of death in 2020 with 22.016 cases on a total of 126.850 deaths. The timing of COVID-19 mortality based on deaths certificates corresponds almost exactly with the observed excess mortality. The coverage of hospital deaths corresponds for 98% with the death certificates. The higher number of COVID-19 death certificates is mainly due to COVID-19-related mortality at home not included in the surveillance data but attested by a physician.

During the pandemic and in the immediate aftermath, it was difficult to conclude on socio-economic inequalities in COVID-19 mortality. A previous study using nationwide individually linked data and looking at age-standardized all-cause mortality rates during the first COVID-19 wave concluded that most male elderly migrant groups showed higher mortality than natives, as opposed to 2019 and to women (1). In the absence of cause specific mortality, it was however difficult to identify the relation with COVID-19 and to include a more direct link to socioeconomic variables.

The present study, based on the information on death certificates linked to socio-economic information from the census of 2011 and to information on income based on tax declarations from 2011 to 2017, allows for a more in depth analysis of socio-economic inequalities in COVID-19 mortality.

Data and methods

Total Belgian population by age and sex on 1/1/2020 in the National Register: 11.492.625 persons

Information on income: tax declarations 2011 and 2017

Information on educational level, work status, housing, etc.: administrative census of 2011 (11.000.638 persons)

Cause specific mortality for 126.850 deaths in 2020: death certificates

Analyses are first limited to the population aged 35 and older.

Direct Age standardisation: multiplying the age-specific mortality rates of the subpopulation with the agegroups of the national population gives the expected deaths and, divided by the national population, the age-adjusted mortality rate. The Comparative Mortality Figure (CMF) is the age-adjusted mortality rate of each subgroup divided by the national mortality rate.

Cox proportional hazard models fitted to attained age and age-adjusted hazard ratios are calculated by sex, educational level, income and nationality of origin for all-cause mortality and for COVID-19 mortality in 2020.

Population at risk aged 35-94, mortality and COVID-19 mortality in 2020 by educational level

35-94	men			women		
	N	Deaths	COVID	N	Deaths	COVID
total population	3.260.199	59.132	10.320	3.488.518	58.041	10.169
primary	312.149	14.744	2.701	400.453	19.811	3.362
lower secondary	645.403	14.965	2.401	660.536	16.183	2.581
higher secondary	905.790	11.318	1.669	866.650	8.955	1.195
higher education	903.183	9.226	1.389	1.065.970	6.342	738
no diploma	74.205	3.962	873	103.079	5.039	979
missing info	247.099	5.892	1.132	263.038	7.043	1.207
not in census	177.675	903	155	147.848	657	107

Results

Population 35-94 CMF for men and women for all-cause mortality (incl. COVID-19) and for COVID-19 mortality

	men		women	
	CMF	COVID	CMF	COVID
total population	123	128	83	81
primary	150	151	95	94
lower secondary	128	125	86	81
higher secondary	114	115	74	65
Higher education	93	93	63	54
no diploma	160	194	110	127
missing info	152	171	98	105
not in census	136	200	93	108

Population 35-94 hazard rates for all-cause mortality and for COVID-19 mortality

population 35-94		Frequency	Exp(B)	95.0% CI for Exp(B)		Exp(B)	95.0% CI for Exp(B)	
				Lower	Upper		Lower	Upper
sex	male	3260199	1.912	1.860	1.966	1.965	1.911	2.021
	female	3488518	ref			ref		
education	no diploma	175653	1.751	1.645	1.864	1.714	1.610	1.825
	primary	703889	1.330	1.265	1.398	1.470	1.398	1.546
	lower secondary	1300631	1.335	1.268	1.404	1.402	1.332	1.475
	higher secondary	1769468	1.229	1.162	1.300	1.290	1.219	1.364
	Higher education	1966637	ref			ref		
	missing info	507092	1.550	1.461	1.644	1.574	1.483	1.669
	not in census	325347	2.356	2.072	2.679	2.100	1.846	2.388
region	Flanders	4001850				ref		
	BCR	625710				1.877	1.792	1.965
	Wallonia					1.711	1.661	1.762

In a second step, analyses have been limited to the population aged 40 to 74. This corresponds more or less with the active population in 2011 with more comparable

variables on attained education, work status, housing and income. In total 2.477.593 men and 2.512.167 women. We have information on education and income available for 2011 when most of them were still active (30 to 64 years old). There were 36.164 deaths in this agegroup in 2020 and among them 4.184 COVID-19 deaths (11,6%).

From the 4.989.760 persons 221.014 (4,4%) were not in Belgium in 2011 (we lack info from the census for this group, but we have for many of them information about their income based on tax declarations between 2011 and 2017).

mortality by sex and family income population 40-74

36164 deaths in total		Exp(B)	95.0% CI for Exp(B)	
	Frequency		Lower	Upper
male	2477593	1.946	1.905	1.988
female	2512167	ref		
no taxable income	274956	7.040	6.621	7.485
less than 10.000	129890	2.449	2.246	2.669
11-20.000	883997	2.566	2.429	2.711
21-30.000	869776	1.489	1.408	1.576
31-40.000	782418	1.284	1.212	1.361
41-50.000	555923	1.246	1.170	1.328
51-60.000	402100	1.109	1.031	1.192
61-74.000	392407	1.085	1.004	1.172
75.000 +	698293	ref		

COVID-19 mortality by sex and family income population 40-74

4184 COVID deaths		Exp(B)	95.0% CI for Exp(B)	
	Frequency		Lower	Upper
male	2477593	2.236	2.098	2.383
female	2512167	ref		
no taxable income	274956	10.716	8.783	13.074
less than 10.000	129890	3.359	2.577	4.379
11-20.000	883997	3.299	2.743	3.969
21-30.000	869776	1.771	1.467	2.138
31-40.000	782418	1.438	1.185	1.745
41-50.000	555923	1.323	1.071	1.634
51-60.000	402100	1.180	0.929	1.498
61-74.000	392407	1.132	0.876	1.463
75.000 +	698293	ref		

For those not in the census of 2011, we do have information on their nationality and on their nationality of origin.

Mortality & COVID19mortality by nationality of origin

		Exp(B)	95.0% CI		Exp(B)	95.0% CI	
	Frequency		Lower	Upper		Lower	Upper
male	2.477.593	1.80	1.76	1.84	2.01	1.89	2.15
female	2.512.167	ref			ref		
belgium	3.742.451	ref			ref		
asia	63.625	1.12	0.98	1.27	2.63	1.99	3.47
africa	79.896	1.92	1.74	2.12	6.24	5.17	7.54
afgh, syr & iraq	17.741	1.22	0.95	1.57	3.38	2.07	5.52
turkey	79.081	1.51	1.37	1.67	3.53	2.85	4.38
north africa	194.959	1.26	1.18	1.35	3.34	2.91	3.83
central & south america	36.601	1.17	1.00	1.37	2.26	1.58	3.24
other EU	608.191	1.11	1.07	1.15	1.56	1.42	1.71
other europe	167.215	1.56	1.46	1.68	1.78	1.43	2.21

Discussion

We are only looking at the mortality outcome, differences in infection fatality rates and recovery rates are not taken into account

Even if middle class and higher class were probably more involved in spreading the virus across countries, the death toll was higher among persons with low income and lower educational levels

This pattern was reinforced during the second wave with higher mortality in the Walloon part of the country (but not in Brussels!)

A possible intermediate process of uptake of health?

The high levels of COVID-19 mortality amongst persons with missing information on educational level and newcomers is largely the effect of high mortality in the population with a migrant background

The massive virus circulation in nursing homes and the vulnerable socio-economic position of the population with a migrant background have largely contributed to the high COVID-19 mortality in Belgium

Conclusions

We were not all in the same boat, but as adequately pointed out we have been in the same storm, but in different boats. Inequality in COVID-19 mortality appears to be bigger than inequality in overall mortality.

It is an important challenge for public health policies to take into account socio-economic inequalities and have particular attention for vulnerable populations when confronted with future pandemics.

- (1) Katrien Vanthomme, Sylvie Gadeyne, Patrick Lusyne, Hadewijch Vandenneede (2021): A population-based study on mortality among Belgian immigrants during the first COVID-19 wave in Belgium. Can demographic and socioeconomic indicators explain differential mortality? In SSM - Population Health, Volume 14, 2021