

Open Data and COVID-19 mortality

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I-BioStat



Interuniversity Institute for Biostatistics
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Collaborators

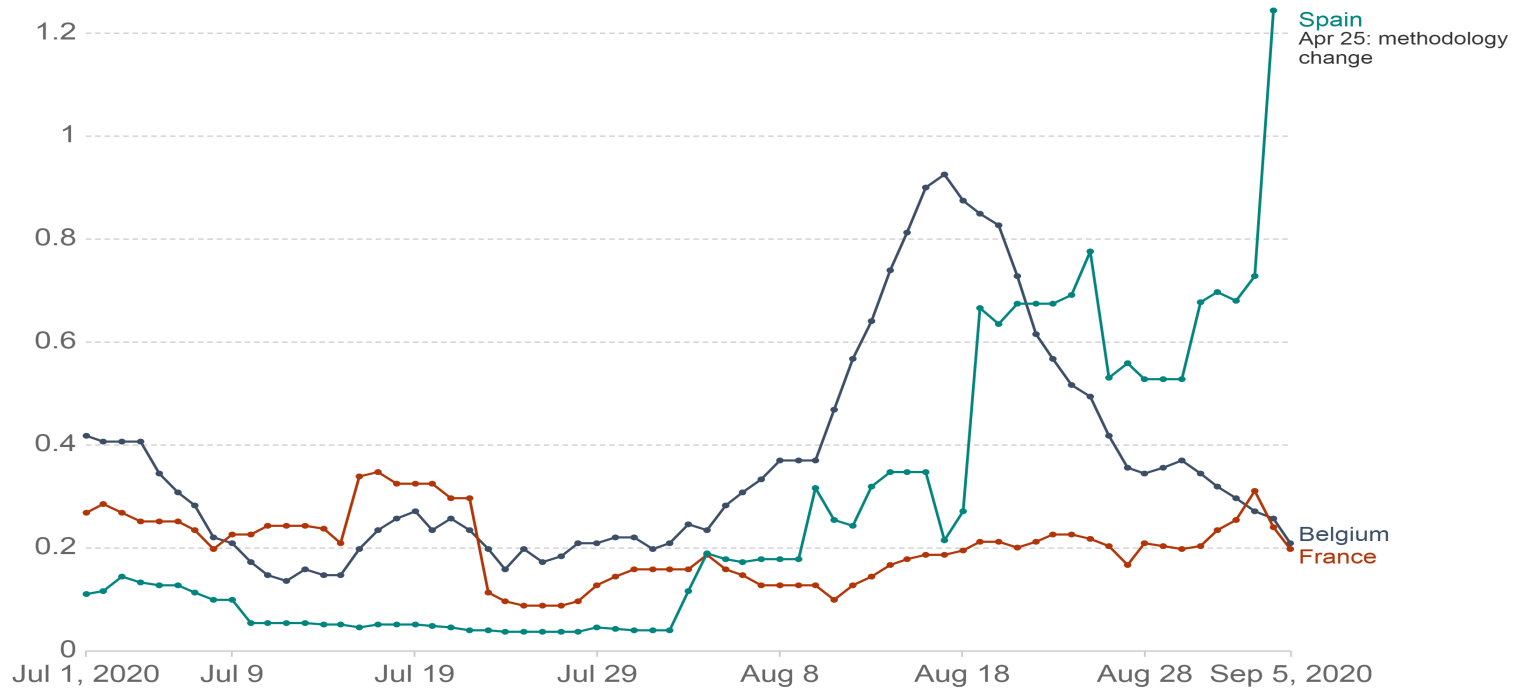
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- Jan Hertogen (sociologist)
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- Lander Willem (math. modeler)

Deaths Per Million: France, Spain, Belgium

Daily new confirmed COVID-19 deaths per million people

Shown is the rolling 7-day average. Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

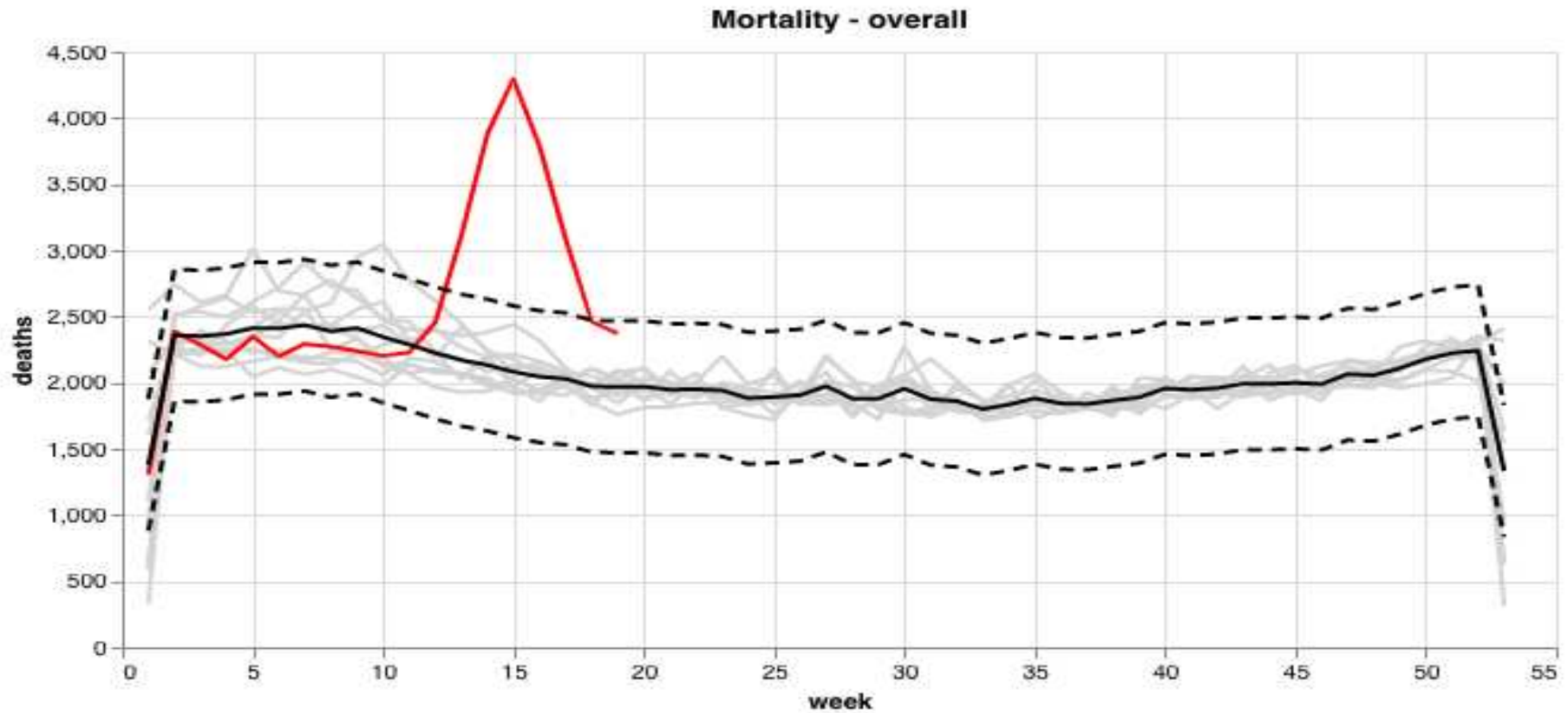
Our World
in Data



Source: European CDC – Situation Update Worldwide – Last updated 5 September, 10:04 (London time)

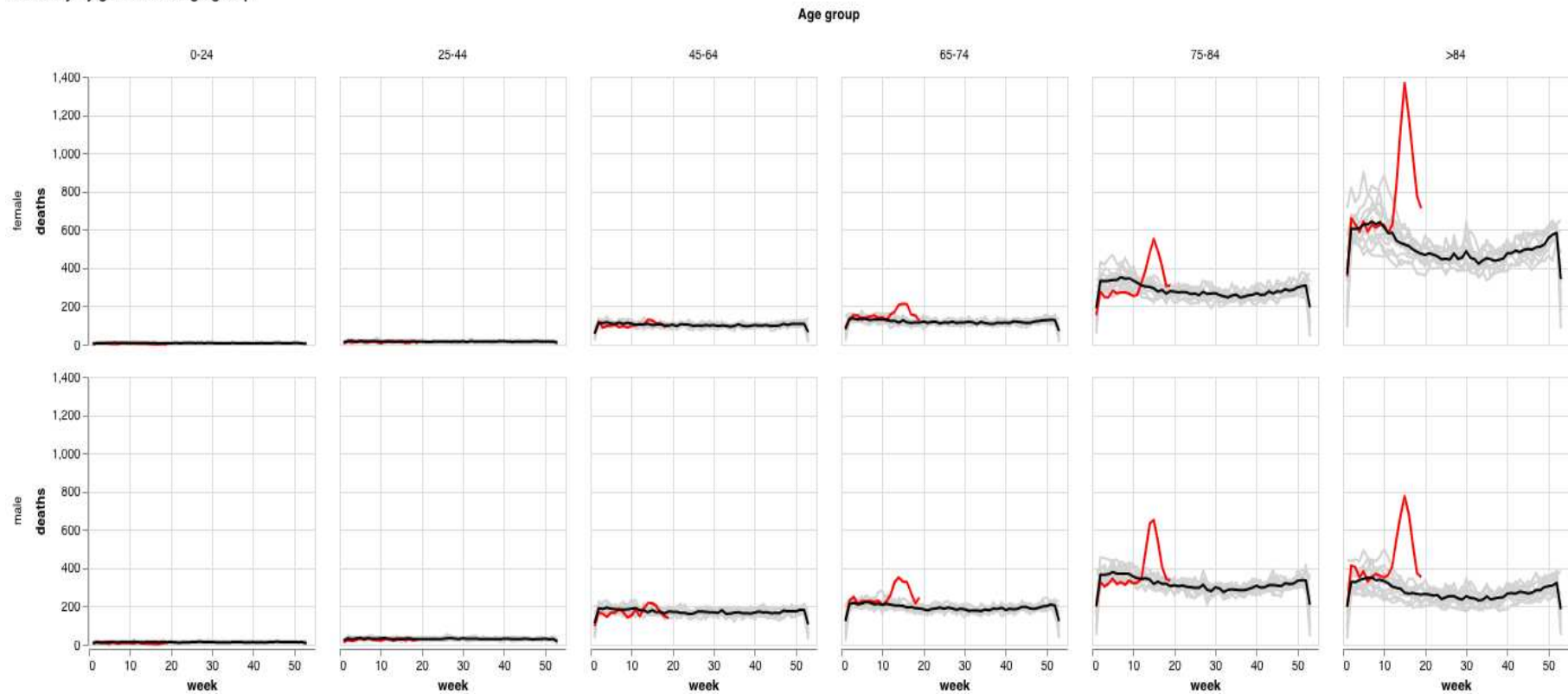
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2020... In Belgium... All-cause Mortality



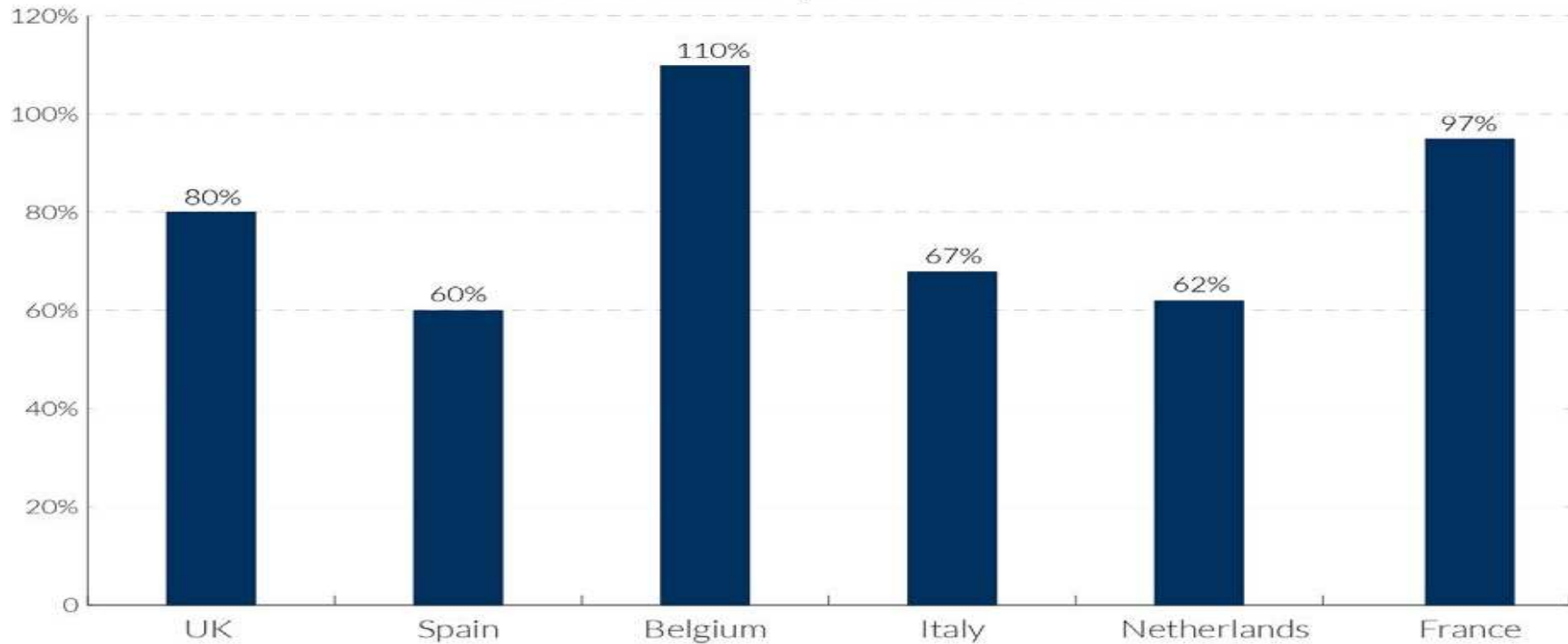
2020 All-cause Mortality (Age and Sex)

Mortality by gender and age group



Correction Factors

Confirmed COVID-19 deaths as a share of excess deaths:
cumulated over pandemic weeks



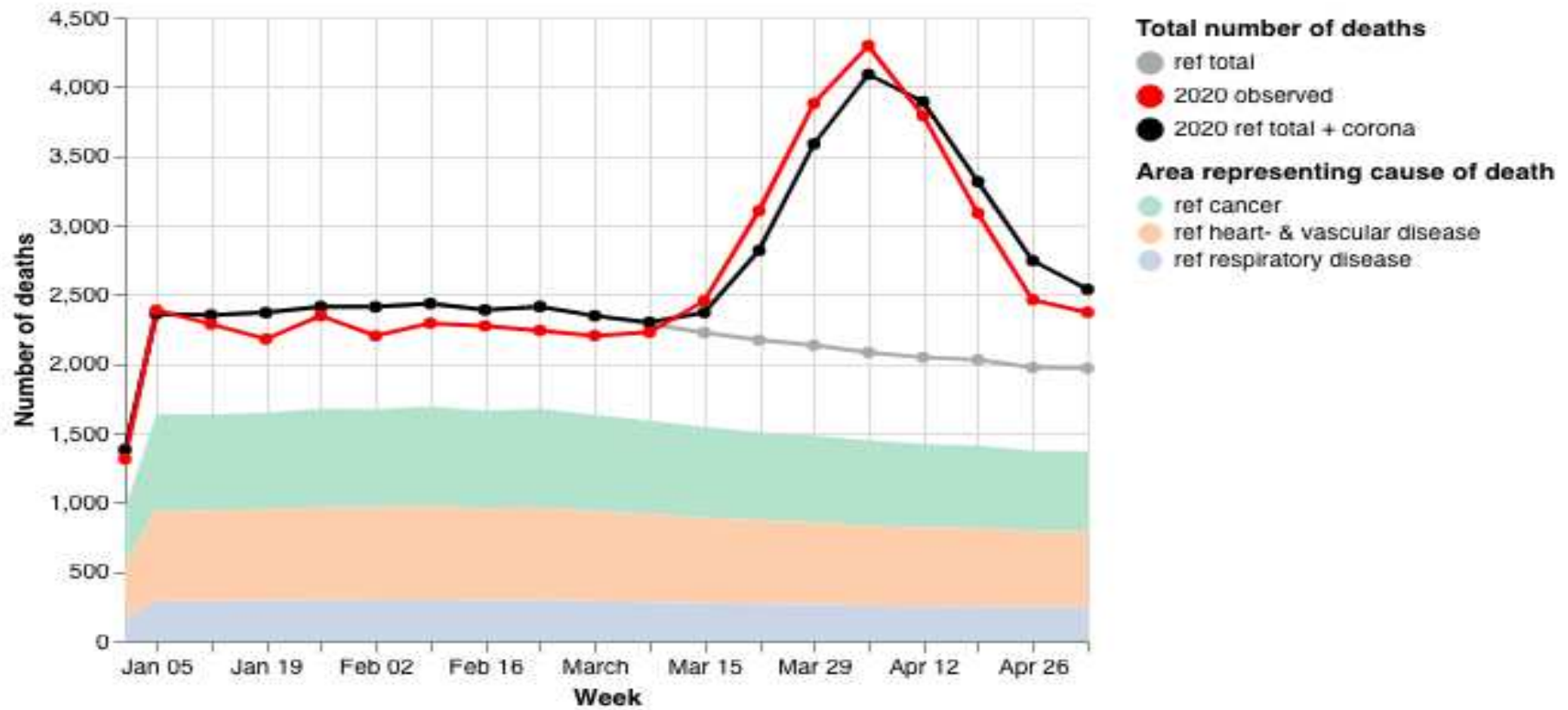
(Aron, Mullbauer et al. 2020)

Number Deaths Per Million (July 31, 20)

Country	Deaths Per Million	Country	Deaths Per Million
New York City	2471*	Luxembourg	182
New York State	1653*	Germany	109
Spain	608 → 1013	Denmark	106
Italy	581 → 867	Argentina	73
United Kingdom	678 → 848	Finland	59
Belgium	849 → 772	Norway	47
Sweden	568 → 693	Greece	19
Netherlands	359 → 579	Uruguay	10
France	463 → 477	Cuba	8
United States	459	Australia	7
Brazil	429	New Zealand	5
Ireland	357	Madagascar	4

Number of Deaths Per Million: Interpret With Care...

- Population density
- Size of the country
- Multiple entries
- All-out outbreak *versus* strong regional differences
- Demography: age pyramid
- **Very extensive death reporting** in some but not all countries

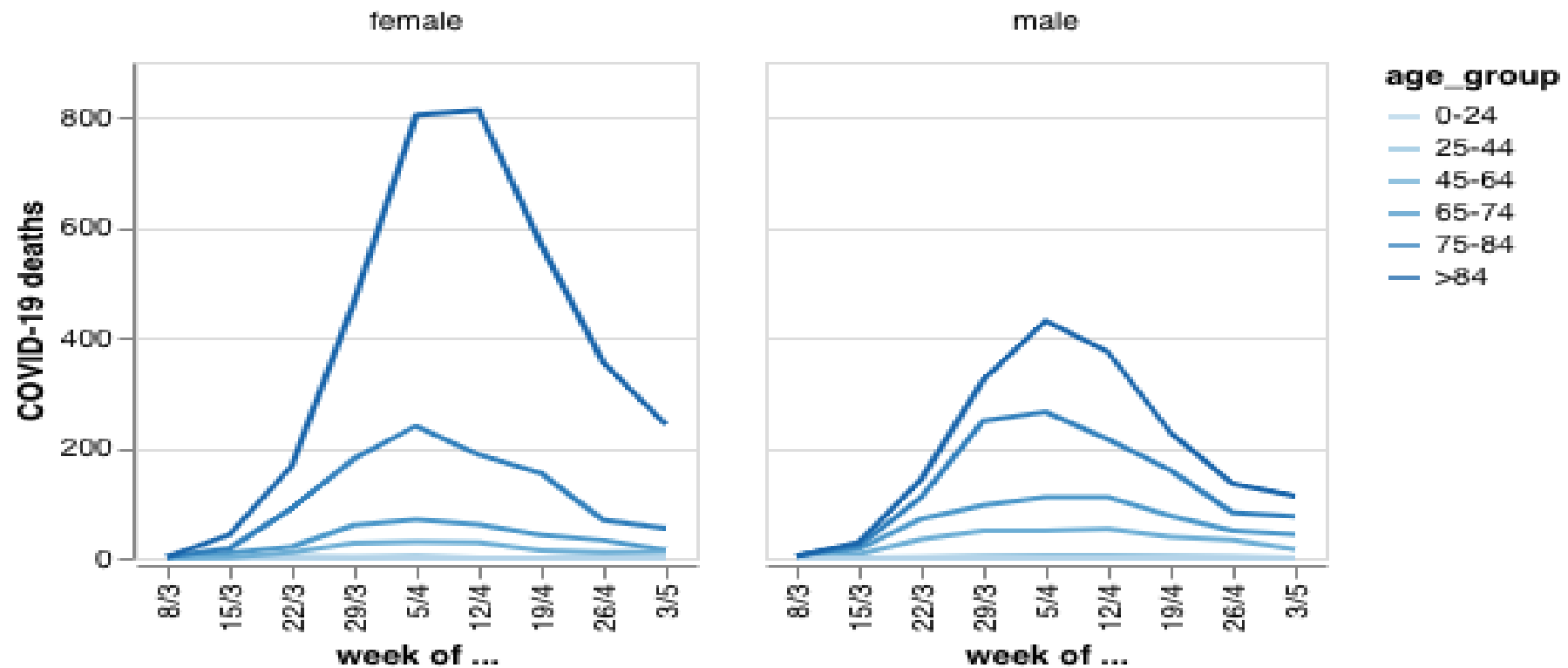


Excess Mortality

- Excess mortality is a good proxy for COVID-19 death...in Belgium!
- April 2020 deadliest April month since WWII: twice the average
- Similar figures in January 1951 and February 1960 (influenza)
- Over the entire peak: about 9500 COVID-19 deaths versus about 70,000 per annum

COVID-19 Curves per Age and Sex

Overview number of COVID-19 deaths



Mortality Tables: March 8, 2020 – May 9, 2020

- Overall dataset of 8732 deaths, but with 2524 records with incomplete sex/age
- Subset of 4494 deaths of NH residents in NH, but with 2505 incomplete records
- Separate dataset, but with subset-population of 1276 NH deaths in HOSP, with 571 incomplete records
- 66.0% of deaths occurred in NH
- Redistribution methods, partially based on excess mortality: 2020 mortality versus 2009–2019 average

Mortality Tables

Overall population – Male										
Age	11	12	13	14	15	16	17	18	19	Total
0-24	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
25-44	0,0	0,0	1,0	3,0	5,0	4,0	3,0	2,0	0,0	18,0
45-64	0,0	7,0	34,0	49,0	50,0	53,0	38,0	33,0	16,0	280,0
65-74	2,0	18,4	77,6	119,5	116,3	136,5	81,9	48,0	62,3	662,6
75-84	3,0	22,0	105,0	246,0	302,6	217,9	143,0	74,0	68,0	1181,5
85+	3,0	32,7	147,0	309,6	447,5	418,1	277,0	140,5	102,7	1878,1
Total	8,0	80,1	364,6	727,1	921,3	829,6	542,9	297,5	249,0	4020,2

Overall population – Female										
Age	11	12	13	14	15	16	17	18	19	Total
0-24	0,0	0,0	0,0	1,0	0,0	0,0	0,0	0,0	0,0	1,0
25-44	0,0	2,0	2,0	1,0	3,0	0,0	0,0	3,0	1,0	12,0
45-64	0,0	1,0	10,0	27,0	29,0	28,0	13,0	10,0	11,0	129,0
65-74	0,0	11,5	26,7	75,6	79,1	95,4	49,7	46,6	14,0	398,6
75-84	2,0	16,0	84,0	158,5	234,7	215,2	146,5	59,0	46,0	962,0
85+	2,0	34,4	159,6	462,8	738,9	676,8	531,8	354,9	248,0	3209,2
Total	4,0	64,9	282,4	725,9	1084,7	1015,4	741,1	473,5	320,0	4711,8

Overall population – Male and Female										
Age	11	12	13	14	15	16	17	18	19	Total
0-24	0,0	0,0	0,0	1,0	0,0	0,0	0,0	0,0	0,0	1,0
25-44	0,0	2,0	3,0	4,0	8,0	4,0	3,0	5,0	1,0	30,0
45-64	0,0	8,0	44,0	76,0	79,0	81,0	51,0	43,0	27,0	409,0
65-74	2,0	29,9	104,4	195,1	195,3	231,9	131,6	94,6	76,3	1061,2
75-84	5,0	38,0	189,0	404,5	537,3	433,1	289,5	133,0	114,0	2143,5
85+	5,0	67,1	306,6	772,4	1186,4	1094,9	808,9	495,4	350,7	5087,3
Total	12,0	145,0	647,0	1453,0	2006,0	1845,0	1284,0	771,0	569,0	8732,0

Nursing home population – Male										
Age	11	12	13	14	15	16	17	18	19	Total
45-64	0,0	1,0	3,0	5,0	12,0	3,0	7,0	1,0	0,0	32,0
65-74	2,3	10,4	36,6	61,0	53,4	66,7	17,6	7,0	32,4	287,3
75-84	2,0	5,0	25,0	84,8	160,7	91,8	37,4	19,0	16,0	441,7
85+	4,7	29,5	95,7	200,9	339,7	315,5	207,9	95,7	56,9	1346,5
Total	9,0	45,9	160,3	351,8	565,7	477,0	269,8	122,7	105,3	2107,5

Nursing home population – Female										
Age	11	12	13	14	15	16	17	18	19	Total
45-64	0,0	0,0	1,0	6,0	11,0	5,0	2,0	1,0	0,0	26,0
65-74	2,0	5,1	19,6	50,7	33,3	60,3	25,5	23,9	1,0	221,3
75-84	1,0	3,0	33,0	66,5	141,3	159,9	58,5	24,0	23,0	510,3
85+	7,0	20,0	149,1	446,0	684,7	609,9	467,1	319,4	201,7	2905,0
Total	10,0	28,1	202,7	569,2	870,3	835,0	553,2	368,3	225,7	3662,5

Nursing home population – Male and Female

Age	11	12	13	14	15	16	17	18	19	Total
45-64	0,0	1,0	4,0	11,0	23,0	8,0	9,0	2,0	0,0	58,0
65-74	4,3	15,5	56,2	111,7	86,6	126,9	43,1	30,9	33,4	508,6
75-84	3,0	8,0	58,0	151,3	302,0	251,7	95,9	43,0	39,0	952,0
85+	11,7	49,5	244,8	647,0	1024,4	925,3	675,0	415,1	258,6	4251,5
Total	19,0	74,0	363,0	921,0	1436,0	1312,0	823,0	491,0	331,0	5770,0

Number of Deaths Per Million (May 9)

Age	Male	Female	Both sexes
0-24	0	1	0
25-44	12	8	10
45-64	181 [161]	84 [67]	133 [114]
65-74	1208 [691] (52,385)	666 [299] (36,967)	925 [487] (44,339)
75-84	3986 [2578] (46,563)	2440 [1215] (22,706)	3103 [1809] (29,787)
85+	17,464 [5748] (89,433)	14,646 [1921] (47,862)	15,574 [3331] (56,124)
Total	714 [342] (70,188)	812 [184] (41,081)	764 [262] (48,414)

Infection Fatality Rates: Population and Cases

	Population		Estimated cases	
Age	Male	Female	Male	Female
0–24	1,649,324	1,579,570	98,795	94,616
25–44	1,481,713	1,474,971	86,828	86,433
45–64	1,544,678	1,535,850	96,079	95,530
65–74	548,448 (5485)	598,561 (5986)	22,670 (223–938)	24,741 (243–1024)
75–84	296,421 (9486)	394,264 (22,473)	21,253 (666–1622)	28,699 (1580–3843)
85+	107,542 (15,056)	219,117 (60,695)	14,228 (1992–2575)	28,989 (8030–10,379)
Total	5,628,126 (30,026)	5,802,333 (89,154)	339,852 (2881–5134)	359,008 (9853–15,245)

Sero-prevalence

Age	UAntwerp March–April	Nowcasting based on March
0–24	0.060(0.042;0.086)	0.068
25–44	0.059 (0.042;0.083)	0.072
45–64	0.062(0.047;0.083)	0.092
65–74	0.041(0.023;0.072)	0.086
75–84	0.070(0.042;0.117)	0.116
85+	0.132(0.089;0.196)	0.146

Infection Fatality Rates: Entire Population

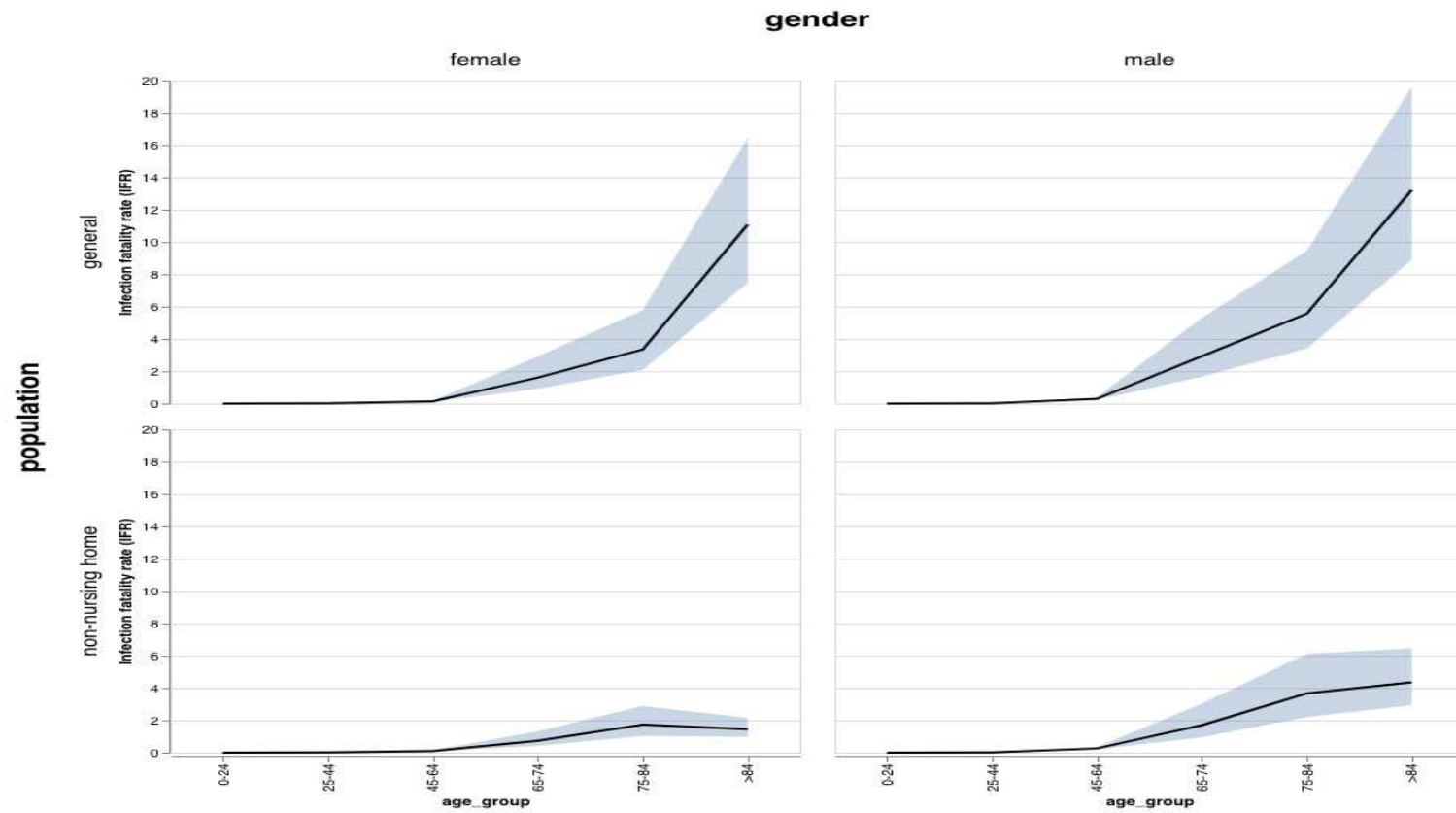
Age	Male	Female	Both sexes
0–24	0	0.0011	0.0005
25–44	0.021	0.014	0.017
45–64	0.29	0.14	0.21
65–74	2.92	1.61	2.24
75–84	5.56	3.35	4.29
85+	13.20	11.07	11.77
All ages	1.18	1.31	1.25

Infection Fatality Rates: Non-Nursing Home Population

Age	Male	Female	Both sexes
0–24	0	0.0011	0.0005
25–44	0.021	0.014	0.017
45–64	0.29	0.14	0.21
65–74	1.70	0.74	1.20
75–84	3.67	1.73	2.57
85+	4.34	1.45	2.52
All ages	0.57	0.30	0.43

Infection Fatality Rates: Nursing Home Population

Age	Male	Female	Both sexes
65–74	30.6–100	21.6–91.0	25.9–100
75–84	27.2–66.2	13.3–32.3	17.4–42.4
85+	53.3–67.6	28.0–36.2	32.8–42.4
All ages	41.0–73.1	24.0–37.2	28.3–45.3



Data Issues

- Complex governmental structure:
 - ▷ Hospital data: federal
 - ▷ Nursing home data: regional
- Mortality data public, except:
 - ▷ Not: split between NH and non-NH
 - ▷ Not at a very fine-grained level: town or statistical sector/date/age/sex
 - ▷ Not link with other relevant **individual** data, such as:
 - * COVID-19 history
 - * Risk factor
 - * SES data
- In some countries underreporting because of poor data architecture

- In some countries deliberate underreporting
- In US: even overall mortality data under pressure