

Supporting Information for

Variability in excess deaths across countries with different vulnerability during 2020-2023

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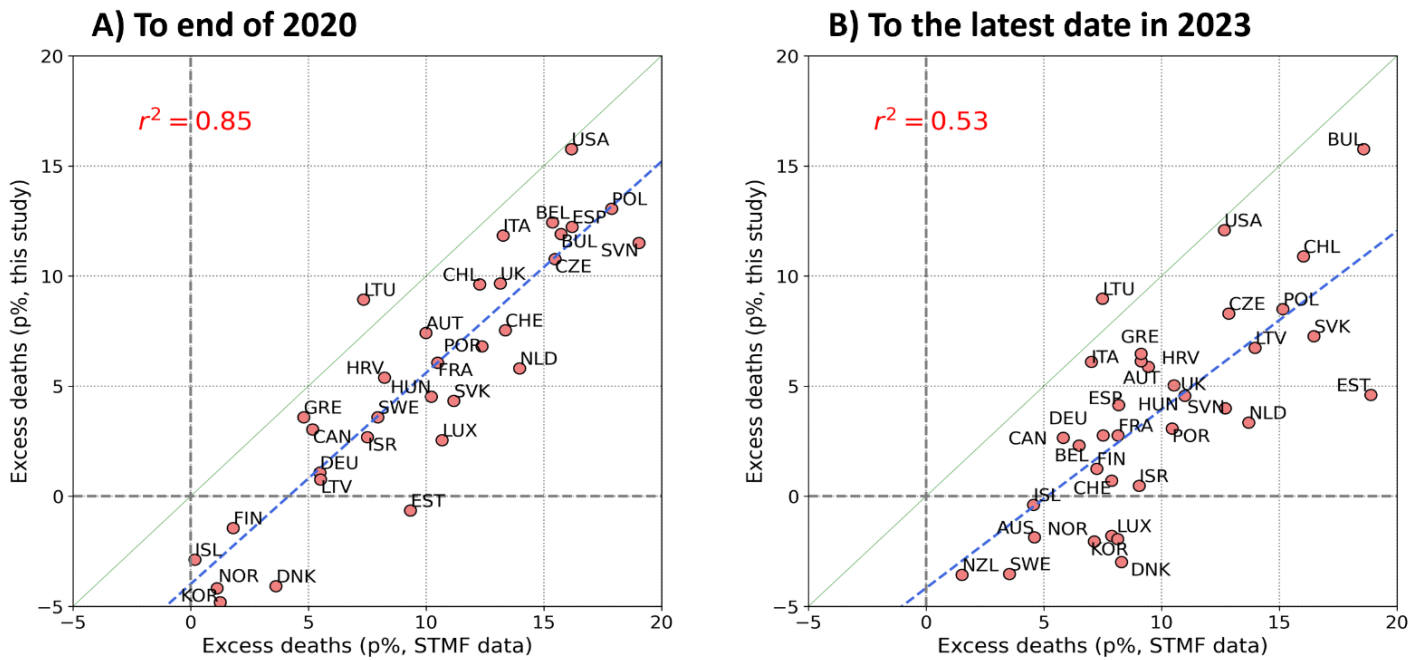


Fig. S1. Scatterplot of excess deaths p%. A. until the end of 2020 and B. over the entire 2020-2023 period (to latest available date in 2023) using the average of 2017-2019 as reference versus using the week-specific trend method with a linear trend⁷ and considering the 2000-2019 period (or longest span of consecutive years if start year with available data is later than 2000) as reference (estimates from STMF).

Table S1. **Table S1. Mean and standard deviation of excess deaths p% (% of expected deaths) at different time points for more and less vulnerable countries**

Time point	Excess deaths in less vulnerable countries, mean p% (standard deviation)	Excess deaths in more vulnerable countries, mean p% (standard deviation)
March 2020 (week 12)	-7.4 (3.7)	-7.7 (3.9)
Mid-2020 (week 26)	-1.6 (4.7)	0 (8.1)
End-2020 (week 52)	1.2 (5.6)	8.2 (4.5)
Mid-2021 (week 78)	-0.7 (4.4)	9.8 (4.3)
End-2021 (week 104)	0.3 (4.2)	11.8 (4.7)
Mid-2022 (week 130)	0.5 (3)	10.2 (4.5)
End-2022 (week 156)	1.2 (3)	9.5 (3.7)
Mid-2023 (week 182)	0.3 (2.8)	7.3 (3.3)
July 2023 (week 185)	0.2 (2.7)	7.2 (3.3)

Table S2. Correlations between excess death estimates p% and vulnerability indicators at different time points

Time point	Pearson (Spearman) correlation with per capita nominal GDP	Pearson (Spearman) correlation with Gini for income inequality	Pearson (Spearman) correlation with proportion living in poverty
March 2020 (week 12)	-0.07 (0.17)	0.19 (0.18)	0.12 (0.08)
Mid-2020 (week 26)	0.02 (0.22)	0.34 (0.23)	0.05 (0.00)
End-2020 (week 52)	-0.30 (-0.33)	0.23 (0.15)	0.32 (0.26)
Mid-2021 (week 78)	-0.55 (-0.65)	0.30 (0.18)	0.49 (0.49)
End-2021 (week 104)	-0.59 (-0.69)	0.32 (0.2)	0.59 (0.57)
Mid-2022 (week 130)	-0.62 (-0.72)	0.41 (0.26)	0.67 (0.62)
End-2022 (week 156)	-0.62 (-0.7)	0.41 (0.26)	0.66 (0.61)
Mid-2023 (week 182)	-0.6 (-0.69)	0.46 (0.29)	0.66 (0.60)
July 2023 (week 185)	-0.6 (-0.69)	0.45 (0.29)	0.66 (0.61)

Table S3. Estimates of p% from 1/2020 to the end of each calendar year and to the latest available 2023 data according to the week-specific trend analyses provided in the SMTF (ref. 7 and ref. 11)

Country	End-2020	End-2021	End-2022	Latest-2023	Reference period start year
Australia	-2.0%	0.2%	4.4%	4.6%	2015
Austria	10.0%	9.7%	10.3%	9.4%	2000
Belgium	15.4%	8.8%	7.8%	6.5%	2000
Bulgaria	15.7%	27.7%	22.4%	18.6%	2000
Canada	5.2%	4.9%	6.6%	5.8%	2010
Chile	12.3%	16.9%	17.7%	16.0%	2016
Croatia	8.2%	13.3%	11.6%	9.1%	2001
Czechia	15.5%	19.7%	15.2%	12.8%	2005
Denmark	3.6%	6.0%	8.3%	8.3%	2007
Estonia	9.3%	19.0%	20.0%	18.9%	2000
Finland	1.8%	3.8%	7.6%	7.2%	2000
France	10.5%	9.4%	9.6%	8.1%	2000
Germany	5.5%	5.2%	8.1%	7.5%	2000
Greece	4.8%	9.7%	10.2%	9.1%	2015
Hungary	10.2%	16.0%	13.1%	11.0%	2000
Iceland	0.2%	0.4%	4.8%	4.5%	2000
Israel	7.5%	9.3%	10.2%	9.0%	2000
Italy	13.3%	10.1%	9.0%	7.0%	2011
South Korea	1.3%	2.6%	8.5%	8.1%	2010
Latvia	5.5%	16.6%	15.7%	14.0%	2000
Lithuania	7.3%	12.5%	10.1%	7.5%	2000
Luxembourg	10.7%	9.2%	8.3%	7.9%	2000
Netherlands	14.0%	14.4%	14.2%	13.7%	2000
New Zealand	-4.9%	-2.6%	1.2%	1.5%	2010
Norway	1.1%	3.3%	7.2%	7.1%	2000
Poland	17.9%	22.7%	18.3%	15.1%	2000
Portugal	12.4%	12.9%	12.9%	10.4%	2000
Slovakia	11.2%	24.0%	19.9%	16.5%	2000
Slovenia	19.0%	16.8%	14.7%	12.7%	2000
Spain	16.2%	10.8%	9.9%	8.2%	2000
Sweden	7.9%	4.5%	4.3%	3.5%	2000
Switzerland	13.4%	9.3%	9.5%	7.9%	2000
UK	13.1%	11.3%	10.2%	10.5%	2015
USA	16.2%	16.7%	14.3%	12.7%	2015

Table S4. p%, absolute and per million excess deaths in non-elderly age strata (0-14, 15-64)

Country	Excess deaths for 0-14			Excess deaths for 15-64		
	p (%)	absolute	per million	p (%)	absolute	per million
Australia	-12.1	-562	-118.4	-1.53	-1442	-86.6
Austria	-9.3	-118	-92.5	6.6	2,687	454.7
Belgium	-21.8	-460	-237.4	-1.4	-760	-103.1
Bulgaria	-16.5	-318	-318.3	15.1	11,114	2,509.9
Canada	14.5	1,072	178.1	9.3	15,975	637.0
Chile	-18.7	-1,318	-379.6	18.8	18,357	1,507.1
Croatia	-5.7	-41	-71.3	2.7	780	298.9
Czechia	-17.0	-272	-161.4	5.2	3,300	491.3
Denmark	-4.9	-48	-51.4	-7.0	-1,973	-531.5
Estonia	-6.5	-12	-57.2	5.6	585	696.1
Finland	-7.8	-45	-52.7	-3.3	-898	-262.7
France	-4.9	-618	-53.9	-4.2	-13,705	-340.0
Germany	-5.8	-750	-65.6	3.7	17,371	324.5
Greece	-11.3	-170	-112.9	8.9	4,707	693.9
Hungary	-8.8	-150	-105.7	0.9	818	128.5
Iceland	NR	NR	NR	2.0	26	108.0
Israel	-14.4	-417	-161.2	-1.5	-391	-71.4
Italy	-17.2	-1,094	-142.5	6.3	14,551	384.5
South Korea	-19.2	-938	-147.0	1.0	2,276	61.8
Latvia	-24.8	-97	-320.1	7.5	1,637	1,358.1
Lithuania	-21.2	-108	-255.8	10.2	3,033	1,669.9
Luxembourg	NR	52	NR	-5.8	-152	-348.0
Netherlands	0.2	4	1.6	1.7	1,247	110.4
New Zealand	-3.4	-41	-42.7	-2.2	-507	-153.1
Norway	-10.3	-69	-74.8	-2.8	-552	-157.8
Poland	-13.2	-996	-169.1	3.5	11,430	449.8
Portugal	-8.0	-107	-77.2	4.6	2,550	386.0
Slovakia	-4.1	-60	-70.1	5.8	2,606	709.4
Slovenia	-8.3	-18	-59.7	-3.0	-341	-252.9
Spain	-4.2	-221	-32.4	6.0	12,041	385.7
Sweden	-5.8	-80	-43.7	-7.1	-2,308	-358.4
Switzerland	-3.4	-48	-37.6	-1.3	-372	-65.2
UK	-5.9	-823	-69.4	12.5	40,564	957.8
USA	-3.3	-3,456	-56.7	18.8	458,821	2,132.2

NR: not reliable due to small numbers (see discussion in Table 2)

Table S5. p%, absolute and per million excess deaths in elderly age strata (65-74, 75-84, 85+)

Country	Excess deaths for 65-74			Excess deaths for 75-84			Excess deaths for 85 Plus		
	p (%)	absolute	per million	p (%)	absolute	per million	p (%)	absolute	per million
Australia	-2.3	-2,181	-921.8	-3.48	-5564	-4302.6	-0.5	-1198	-2308.7
Austria	2.7	1,285	1,498.7	10.41	8933	14304.2	3.88	4817	21263.1
Belgium	4.0	2,560	2,163.5	1.23	1305	1864.4	3.88	6579	19657.8
Bulgaria	24.2	20,537	23,255.3	13.59	16084	33660.4	12.11	11650	79215.5
Canada	1.4	2,451	620.7	0.33	838	411.9	1.55	5562	6496.1
Chile	10.0	8,243	6,315.0	9.79	10790	15698.6	7.88	9732	45783.1
Croatia	11.5	4,232	8,808.3	5.74	3420	12004.6	5.1	3090	32613.9
Czechia	9.8	9,043	7,027.6	8.16	10260	15752.2	9.37	10957	53482.7
Denmark	-0.9	-324	-505.9	-3.92	-2687	-6718.1	-1.65	-1212	-9591.6
Estonia	4.4	498	3,489.0	4.62	738	8178.1	4.28	847	23913.5
Finland	4.2	1,528	2,147.0	-0.89	-527	-1392.7	3.1	2490	16249.7
France	4.9	16,667	2,278.1	-1.72	-8785	-2180.9	6.61	67633	30138.9
Germany	4.4	23,916	2,745.2	7.04	73654	10468.3	-1.14	-16647	-6793.7
Greece	9.7	5,957	5,041.8	2.8	3549	4254.51	7.3	14575	38147.9
Hungary	10.7	11,881	10,361.3	4.67	6460	10468.0	1.99	2403	11987.5
Iceland	2.2	28	929.4	-6.54	-158	-10033	1.51	50	7687.6
Israel	3.8	1,144	1,729.1	-1.92	-903	-2879.2	2.07	1398	10507.5
Italy	7.0	21,251	3,099.1	6.34	41637	8576.3	5.83	64102	29131.4
South Korea	-5.7	-10,814	-2,332.4	-2.54	-9201	-3390.3	-1.03	-3906	-4975.4
Latvia	7.8	1,528	7,542.4	8.13	2371	16624.1	4.56	1353	28503.2
Lithuania	10.9	2,734	9,667.3	9.97	3776	18980.8	6.55	2878	38447.1
Luxembourg	-7.7	-209	-4,152.1	-3.93	-165	-5692.4	3.16	191	15560.1
Netherlands	3.7	3,674	1,882.3	3.9	6683	6154.1	3.33	7687	19776.5
New Zealand	-4.1	-904	-1,972.6	-5.19	-1901	-7811.0	-2.69	-1265	-14298
Norway	-2.4	-614	-1,142.3	-5.21	-2371	-7920.3	0.71	445	3793.2
Poland	13.9	49,720	11,486.6	8.27	30686	16079.7	8.41	37775	45940.1
Portugal	3.6	2,157	1,827.9	-0.78	-958	-1214.9	5.17	9311	26820.1
Slovakia	12.8	6,131	10,712.7	8.22	4702	17840.5	2.55	1287	15261.6
Slovenia	4.7	648	2,738.0	4.74	1017	7377.4	5.97	1749	31830.8
Spain	6.7	13,998	2,988.8	-0.26	-1052	-343.4	5.41	40006	25406
Sweden	-3.4	-1,673	-1,529.7	-3.84	-3969	-5508.6	-2.52	-3600	-13674
Switzerland	-1.2	-410	-492.5	-0.58	-397	-717.1	2.5	3037	13120.5
UK	7.0	25,601	3,812.1	2.56	17318	4187.7	3.57	31758	19011.8
USA	12.9	263,333	8,089.1	10.23	258053	16171	8.16	243543	40198.7

Table S6. Standardized excess death rates for 2020-2023 using the average of 2017-2019 as reference and using the 2013 European Standard Population

Country	Standardized excess death rate (per 100,000 population)
Australia	-41
Austria	174
Belgium	51
Bulgaria	574
Canada	63
Chile	308
Croatia	178
Czechia	265
Denmark	-103
Estonia	157
Finland	14
France	38
Germany	71
Greece	166
Hungary	105
Iceland	-39
Israel	0
Italy	151
South Korea	-33
Latvia	262
Lithuania	323
Luxembourg	-21
Netherlands	97
New Zealand	-97
Norway	-53
Poland	246
Portugal	83
Slovakia	199
Slovenia	110
Spain	86
Sweden	-94
Switzerland	23
UK	135
USA	342

The 2013 European Standard Population has 16%, 64.5%, 10.5%, 6.5%, and 2.5% of the population in the 0-14, 15-64, 65-74, t5-84, and 85 and above years strata, respectively.