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## COVID-19 deaths in children

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## **COVID-19 deaths in children: comparison with all- and other causes and trends in incidence of mortality**

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Our analysis of COVID-19 in children until the end of May 2020 indicated mortality was rare and lower than from influenza, for which children already have a vaccine. We feared and wrote that over time the severity of the virus in children might increase. We published this in May 2020<sup>1</sup> and now examine childhood mortality from COVID-19 over time and compared with other causes in seven countries: USA, United Kingdom, Italy, Germany, Spain, France and Republic of Korea.

As before, we extracted COVID-19 mortality data for 0-19 year olds (only 0-14 is group data were available in USA) from The National Institute of Demographic Studies (INED)<sup>2</sup>, which is collated from national statistical agency reports. This analysis was for five months between 1 March 2020 until 31 July 2020 (5 months). We extracted mortality data for other- and all- causes from the latest Global Burden of Disease estimates (2017<sup>3</sup>) except for influenza deaths which we obtained for the last three years from national statistical agencies. We estimated deaths from these annual data for the five month period through simple division (5/12) of the annual numbers. BO, SB and JB cross-checked all data.

In an estimated population of 137,047,945, from March-July there were 78 deaths from COVID-19. For comparison, there were an estimated 21,966 deaths from all-causes (1,755 from unintentional injury, 510 from lower respiratory tract infection, 178 from influenza), with COVID-19 accounting for 0.355% of deaths (Table 1 & Figure 1). We examined mortality weekly, finding that the peak of cases and deaths in children mainly matched that of adults (USA continues to report child deaths from COVID-19 which is in-line with the continuation of that country's overall epidemic) (Figure 2). The proportion of deaths attributable to COVID-19 in children was stable over May, June and July. We predict this proportion will decline assuming the continuation of public health control measures and improvements in treatments.

Five months of data show that in these countries, children are at much greater risk of death from other elements of normal life, than from COVID-19. Our fears of increased virulence in children, so far, are unfounded. Nonetheless, vigilance is necessary as the pandemic may unfold differently. Children were hit hard by the 1918-19 influenza pandemic, and were key to spread of that disease<sup>4</sup>; this, fortunately, does not so far appear to be the case with COVID-19<sup>5</sup>. Close monitoring is essential following relaxation of 'lockdown' policies, particularly as there are genetic changes in the virus.

Children have sacrificed much to international efforts to contain COVID-19<sup>6</sup>. We know that negative experiences in childhood matter lifelong<sup>7</sup>. Cases, hospitalisations and deaths from COVID-19 may increase during the northern hemisphere winter. If this happens we must remember the minimal direct risk to children of COVID-19, and to act to minimise the harmful effects of future lockdown measures,- including school-closures,- on children especially those without good evidence of likely efficacy<sup>8,9</sup>. Our data have implications for quantitatively demonstrating the safety and effectiveness of potential vaccines in children<sup>10</sup> and planning for vaccination should a safe and effective vaccine be invented.

Data 31 Jul 2020		Population	All Cause deaths		Unintentional injury deaths		LRTI deaths		Influenza deaths	COVID-19 deaths		COVID-19 deaths as % of all deaths
			n	per 100,000	n	per 100,000	n	per 100,000	n	n	per 100,000	
USA	0-4y	19,810,275	10838	54.71	870	4.39	265	1.34	77	23	0.12	0.212%
	5-14y	41,075,169	2268	5.52	323	0.79	59	0.14	72	19	0.05	0.838%
United Kingdom	0-9y	8,052,552	1724	21.41	57	0.70	56	0.70	7	3	0.04	0.174%
	10-19y	7,528,144	504	6.70	44	0.58	10	0.13	3	12	0.16	2.380%
Italy	0-9y	5,090,482	713	14.01	28	0.54	18	0.34	8	4	0.08	0.561%
	10-19y	5,768,874	351	6.08	33	0.57	5	0.09	5	0	0.00	0.000%
Germany	0-9y	7,588,635	1265	16.66	60	0.79	23	0.30	2	1	0.01	0.079%
	10-19y	7,705,657	568	7.37	40	0.52	8	0.11	1	2	0.03	0.352%
Spain	0-9y	4,370,858	622	14.23	33	0.74	15	0.34	2	4	0.09	0.643%
	10-19y	4,883,447	242	4.95	25	0.51	4	0.09	2	5	0.10	2.069%
France	0-9y	7,755,755	1325	17.09	97	1.25	21	0.27	NA	3	0.04	0.226%
	10-19y	8,328,988	485	5.83	48	0.58	5	0.06	NA	4	0.05	0.824%
Korea	0-9y	4,148,654	690	16.64	65	1.56	16	0.39	NA	0	0.00	0.000%
	10-19y	4,940,455	370	7.49	35	0.70	5	0.09	NA	0	0.00	0.000%
<b>TOTAL</b>		<b>137,047,945</b>	<b>21,966</b>	<b>16.03</b>	<b>1,755</b>	<b>1.28</b>	<b>510</b>	<b>0.37</b>	<b>178</b>	<b>80</b>	<b>0.06</b>	<b>0.364%</b>

Table 1: Mortality for USA, England & Wales, Italy, Germany, Spain, France and South Korea in 0-9 and 10-19 year olds (0-4y & 5-14y in USA) from all-causes, unintentional injury, lower respiratory tract infection, influenza, and COVID-19 with estimated absolute numbers and mortality per 100,000 population.

Notes: 1. South Korea did not report age-specific mortality from early July, but reported no deaths 2. Spain stopped reported age-specific mortality on 22 May 2020; Red Nacional de Vigilancia Epidemiológica shows two further COVID-19 related deaths in 0-9 year olds between that date and 31 July 2020 which have been added.

(<https://www.isciii.es/QueHacemos/Servicios/VigilanciaSaludPublicaRENAVE/EnfermedadesTransmisibles/Documents/INFORMES/Informes%20COVID-19/Informe%20n%C2%BA%2039.Situaci%C3%B3n%20de%20COVID-19%20en%20Espa%C3%B1a%20a%2013%20de%20agosto%20de%202020.pdf>). 3. Influenza deaths calculated for five-month period from mean number of deaths from up to last 5 years available from national statistical agencies, except USA which is extrapolated from actual data reported for period 1 Feb 2020 to 9 May 2020. Available online: [https://www.cdc.gov/nchs/nvss/vsrr/covid\\_weekly/index.htm#AgeAndSex](https://www.cdc.gov/nchs/nvss/vsrr/covid_weekly/index.htm#AgeAndSex)

## Figures

Figure 1: (A) Proportion of deaths from all- and specific-causes including COVID-19 for 0-9 and 10-19 year olds (0-14y, 5-14y in USA) in each of USA, England & Wales, Italy, Germany, Spain, France and South Korea (B) Mortality from all- and specific causes in these countries and age-groups as a percentage of the population in that age group.

Figure 1a

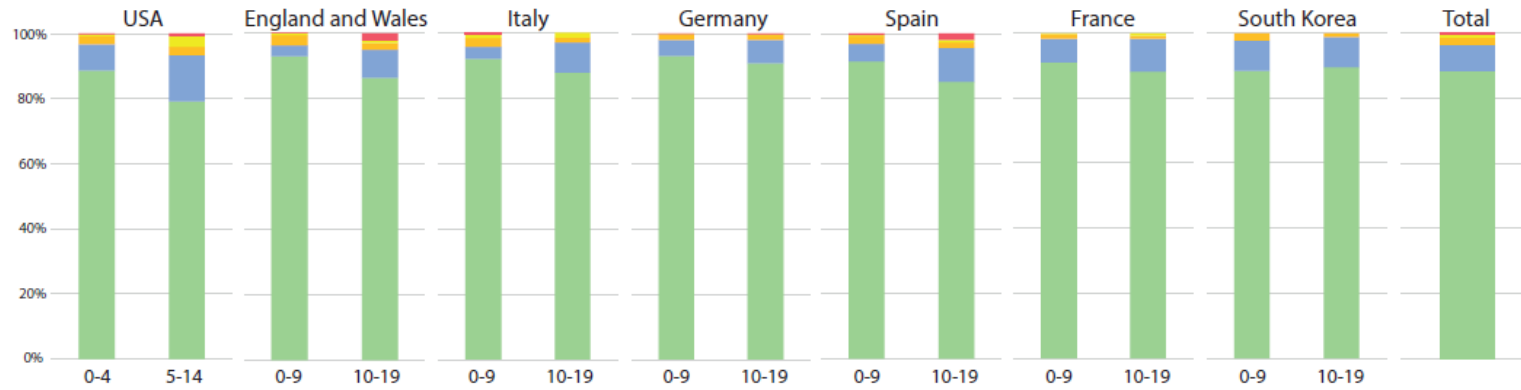


Figure 1b

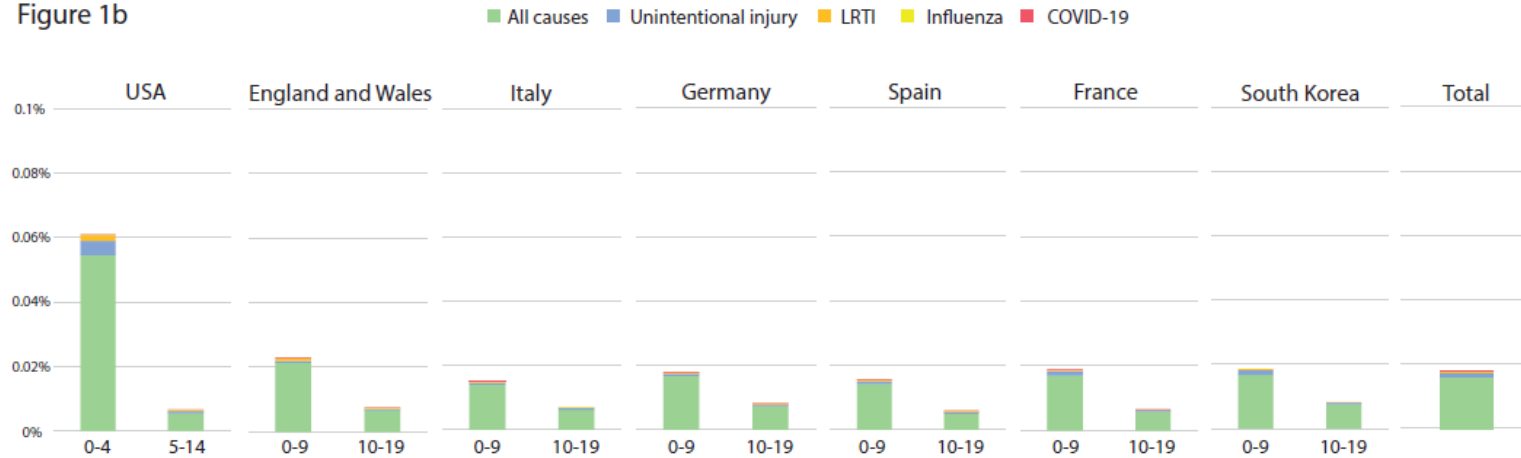
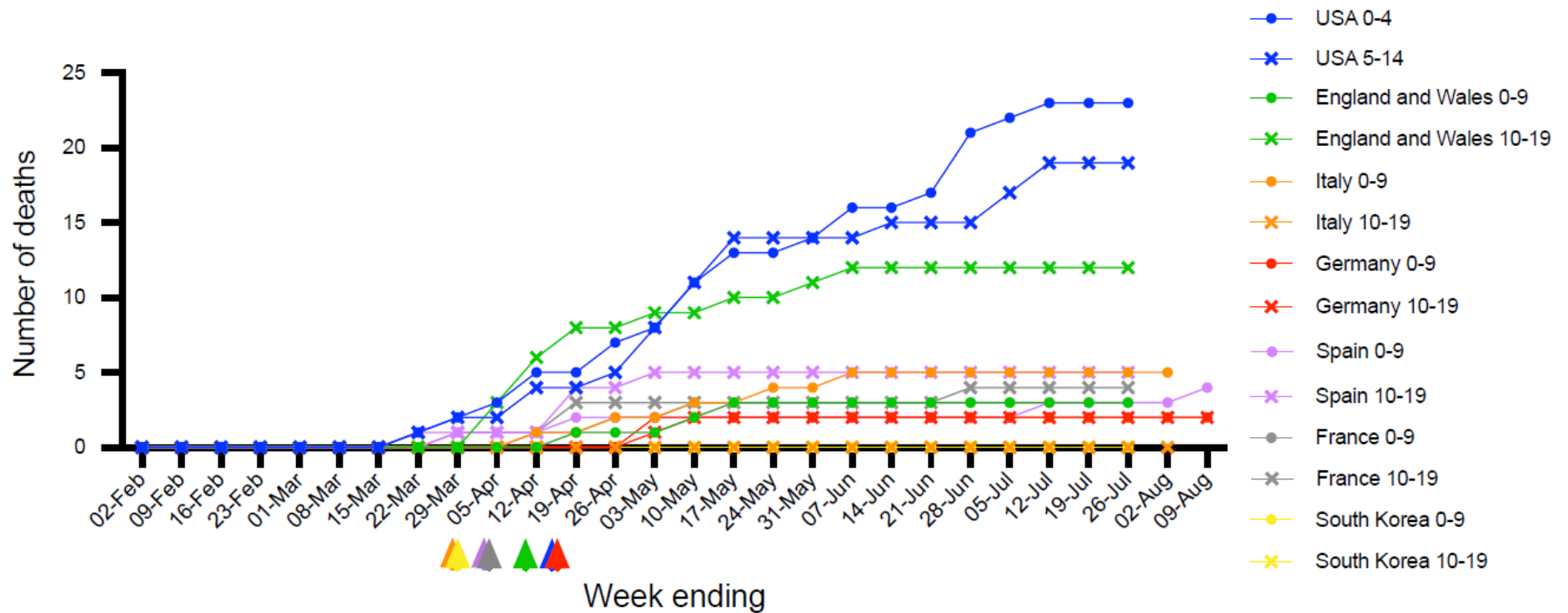


Figure 2: Number of deaths in children aged 0-19 years in each of USA, England & Wales, Italy, Germany, Spain, France, and South Korea by week from 1 March 2020 to 31 July 2020. Coloured arrows indicate the date of peak reported deaths for all ages (from: <https://ourworldindata.org/grapher/daily-new-confirmed-cases-of-covid-19-vs-cumulative-cases-positive-rate>)



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