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REVIEW ARTICLE

Don't Forget About the Children - A narrative review of how COVID-19 pandemic policy in the UK and Sweden impacted children's wellbeing.

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ABSTRACT:

It is the purpose of this narrative review to examine the impact of COVID-19 and the countermeasures deployed by central authorities on the health and wellbeing of children in the UK and in Sweden.

The COVID-19 pandemic of 2020-2023 was the most momentous and impactful public health event since the "Spanish Flu" pandemic of 1918-1920. Many fatalities ensued, largely but not completely confined to older subjects. However, taking a broader lens than just counting fatalities, it is clear that the pandemic exposed dramatic societal inequalities, whose impacts also were felt differently by different age groups. Health policy interventions were conceived in the main around the needs of adults, not children.

The special focus of this paper is the comparison between a full "lock down" country such as the UK, which had amongst the longest COVID-mandated school closures in the free world, and Sweden, which almost uniquely declined to impose distance learning on school children aged 15 and under. Similarly, the opportunity afforded by the immunisation of children against COVID-19 using novel vaccines was taken up to a very variable degree with some countries strongly advocating its routine use, while others only administered such vaccines to those at the highest risk of adverse outcomes (Sweden).

The authors searched (using Google Scholar and PubMed) for relevant pre-print/fully-published articles, periodicals, books, press reports, government policy pronouncements and publications for the period January 2020 to October 2023; in addition, the publicly-available outputs of the completed Swedish and ongoing UK COVID-19 enquiries were examined. Finally, a detailed in-person interview was undertaken in 2023 by one of the authors (DG) with the former State Epidemiologist of Sweden (Dr Anders Tegnell), who was in day-to-day charge of that country's actions between 2020 and 2022.

Using these diverse lines of evidence, the authors have attempted to understand what measures were undertaken in the two countries which directly affected children's health, why those policy choices were made, and any lessons learned which may be useful in the certain expectation of similar if not worse future pandemics.

Introduction:

The Covid-19 pandemic (2020-23) was a global outbreak of a novel coronavirus (nCoV), an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus. The pandemic disease is usually described as COVID-19.[1]

The first cases of nCoV were detected in China in December 2019, with the virus spreading rapidly over months to most other countries across the world. This led the World Health Organisation (WHO) to declare a Public Health Emergency of International Concern (PHEIC) on 30 January 2020, and to characterise the outbreak as a pandemic on 11 March 2020.[2]

In May 2023, more than three years into the pandemic, the WHO Emergency Committee on COVID-19 recommended to the Director-General that given the disease was by now well-established and ongoing, it no longer fitted the definition of a PHEIC. This did not mean that the pandemic itself was declared over, but the global emergency it had caused was. Debate and speculation about the causation pathway for the entry of this nCoV pathogen into humans in 2019, though intense, fundamental and contested, are not germane to the present discussion. What is germane is the huge death toll, and, just as important, the long-term impacts on society and health it has left in its wake. For a more detailed review see.[3]

As a result of the pandemic infections, and also of the many different mitigation strategies employed to "protect" people from the ravages of infection, there were diverse consequences for all affected populations: deaths, hospitalisations, chronic illness, economic strain, threats to or curtailment of employment, education, services, work habits, and transport systems. The negative impact of the case load surge imposed acute severe strain on healthcare systems faced simultaneously with "business as usual" healthcare demands (often suppressed, with later adverse consequences) and by a poorly understood and barely characterised viral infection 'tsunami' requiring both "surge" facilities and advanced ITU capabilities which were often either unavailable, or inadequate to the tasks at hand.[4] Various mitigations to slow the spread of the pandemic locally were put in place in different parts of the world, and these typically involved restrictions (sometimes voluntary, sometimes legally enforced) being placed on freedom of movement, behaviour (mask wearing, hand washing), education, employment, social activities and travel [5-8]. Later, specific pharmaceutical interventions [9] and of course vaccination [10] were developed and brought to bear.

Background to the issues around age and outcomes in COVID-19:

One of the most remarkable early findings about COVID-19 (and something not seen to anything like this extent with previous Influenza epidemics) was its extreme age-selectivity in terms of severe illness and mortality developing as a result of infection. The majority of hospitalisations, and 89% of the mortality globally from COVID-19, occurred in those aged > 60 years.[11] The precise biological reasons which underlie this unusual characteristic remain obscure, but, obesity, diabetes, raised blood pressure and many other cardiometabolic risk factors are much more prevalent as populations age, and these seemed to predispose infected people to more severe outcomes. The infection itself seemed able, under certain circumstances, to "linger" (possibly sequestered) – often associated with longer-term symptomatology ("Long-COVID") though complete body clearance of the virus and resolution of all symptoms was the norm. [12]

Hyper-stimulation of the immune system, endothelial and blood vessel damage, and local *in-situ* thromboses were seen in severe cases as early as February 2020 as especially high-risk sequelae to primary infection.[13] People with deranged immune systems (too much, or too little, activity) were at particular risk and this seemed to extend down even into young children, albeit very rarely (as has been seen before with acute severe respiratory illnesses).[14]

Nevertheless, when taken as a group, *children had much lower rates of Covid-19 infection, were less infectious to other children and adults, and suffered very rarely indeed from acute or chronic consequence of clinical infection (a large proportion of children indeed had no symptoms as they interacted with the virus)*.[15] This is a key point, as treating the whole population from toddlers to pensioners in the same way – e.g. stay at home orders covering movement for education, work, socialising etc risks inconveniencing (at best), or hurting (at worst), a section of the population at little to no intrinsic risk of harms themselves from COVID-19, but susceptible to harms from the mitigation measures. This dichotomous strategy of course was the *raison d'etre* underpinning the Great Barrington Declaration in the Autumn of 2020, [16] hugely controversial though that discussion remains today. But, this viewpoint is really central to the dilemma of what to do with

children in the COVID-19 pandemic which faced societies in early-to-mid 2020, around 9 months before the rapid development then deployment of vaccines which were capable of reducing the risks of severe sequelae in the elderly population directly.

This "trade-off altruism" lay at the heart of the often-vexatious disputatiousness seen in some countries which emerged around stay-at-home-orders, mask-mandates, vaccination mandation, and many other more 'controversial' interventions. At the sharp edge of these difficult decisions were (a) the closure or retention of pre-university education through the maintenance or cancellation of normal schooling and (b) the routine population immunisation by vaccination of younger adults and children against COVID-19 (as was seen so successfully in adults aged 18 years or over starting at the very end of 2020). We will examine in this paper the situation seen in the UK (which saw amongst the greatest disruption of education by imposition of home-schooling) and Sweden (which uniquely in the EU tried to avoid the use of home schooling in younger children, largely successfully, by maintaining in-school teaching for all those aged 15 years and younger). In addition, this same pair of countries came to different conclusions about the wisdom of, or need for, vaccination of low-risk children (aged under 15) against COVID-19:the UK recommending it, though diffidently, while Sweden did not license the use of a vaccine in children aged under 11 except for those at exceptional risk from COVID-19 infection.

These inter-country comparisons are aided by the facts that first one author (DG) lived through the whole UK epidemic, while the other (EO) lived first in the UK (2020-21) then later in Sweden (2021-23), and second by the recent lengthy interviewing by DG of Dr Anders Tegnell [17] the "Statsepidemiolog" (State Epidemiologist) in Sweden's Public Health Agency Folkhälsomyndigheten (FoHM) [18] from 2013 until 2022. This individual had the most significant role in shaping the Swedish nation's response to the Covid-19 epidemic, during which interview a number of relevant questions were posed and answers provided.

What did Sweden and the UK do in the context of the COVID-19 pandemic?

Between 2020 and 2022 a slew of legal changes were enacted across many countries in response to the perceived threats posed to life, health, and national prosperity from the COVID-19 pandemic. These threats were some of the most draconian seen in the last 100 years. Impacts on to day-to-day living, and personal rights and freedoms, were profound almost everywhere.

In a previous publication [19] we outlined these measures from the perspective of the response to the "first viral wave" in 2020 in the Western World (before any viral genome mutations had occurred to render changes to the innate transmissibility and lethality of the original strain, and of course before any vaccinations were possible). While an enormous amount of commentary was made about Sweden's supposed laxity, and potentially, the UK's excessive zeal, in these regards, *in reality there were far more similarities than differences between the two countries' actions*. However, there are some key and important policy differences between the two countries, and none more so than school closure policies, and the vaccination of children.

In Sweden, there was an assumption that it would take at least 3-5 years to have a viable safe effective vaccine to counter COVID-19 (if that was even possible). Thus, the mainstay of their national response was to ensure that the healthcare facilities available (boosted acutely to accommodate the need for more ventilated bedspaces) were sufficient to cope with the "surge" of admissions in the first viral wave, and then thereafter to rely on natural post-infectious immunity in those less badly infected to produce an immunological 'wall' of post-infectious 'herd immunity'. However, this policy was flawed (or unlucky) in that while the healthcare resources available for the first wave surge were just able to cope, the resulting immunity that people acquired from milder infections proved to be weaker, and more transient, than imagined or hope for. Further, though long downplayed in Sweden, it became clear that Long-COVID issues would be relevant for around 5-10% of those adults infected.

This Swedish approach was exactly the one chosen by the UK policy makers ("mitigation/delay/herd immunity") in January 2020, and this lasted until approximately 13-15th March 2020 (barely 10 days before the UK's legally-underpinned stay-at-home instructions were issued on 23rd March). In the UK in mid-March 2020, officials had become mortified by the prospect of around 250,000-750,000 deaths which were predicted by the original Imperial College infectious disease modelling. It was clear that this level of impact would overwhelm or overtop available healthcare resources (particularly ventilated bedspace

capacity). Though Sweden's ventilated bedspace capacity was as badly constrained as the UK's was, the Swedes had rejected the forecast of around 80,000 deaths in Sweden from the Imperial modelling as being too pessimistic (Dr Anders Tegnell, personal communication, 2023).

As a result of a dramatic policy *volte face* in the UK (but not in Sweden) there were widespread rushed-to-precipitate actions including stay-at-home and work-from-home orders, and closure of educational establishments for all children except for those of key workers / and individuals vulnerable for health reasons.[20] There was though much more UK-led optimism that a vaccine could be made available withing a considerably shorter timeframe than Sweden expected. No national stocks of appropriate grade surgical masks as part of a non-pharmaceutical intervention (NPI) strategy existed in either country to underpin population use; in both countries, but especially in Sweden, there was an almost totemic refusal to countenance the use of protective masks in non-medical settings. Non-medical mask use was basically not seen for the first 9 months in Sweden (and even after that masks for non-healthcare workers were barely mentioned as an infection-mitigation strategy in Sweden). In the UK, non-medical mask use in crowded locations became the norm from late Summer 2020 onwards.

Table One below describes some major pandemic strategy differences between Sweden and the UK (both countries treated as a whole entity, not constituent geographic subsections).

MEASURE	**SWEDEN**	**UK**	**COMMENTS**
FREEDOM OF MOVEMENT	Significantly restricted using recommendation and exhortation under existing regulation.	Severe restrictions ("stay at home" orders) initially voluntary then on a statutory (legal) basis from March 2020	Level of restrictions highly variable over both time and geographic location in UK. Less variability in Sweden
WORKING REMOTELY FROM HOME	Strongly encouraged	Strongly encouraged; furlough scheme	Only feasible for those with education, resources and property
EDUCATION: SCHOOLING FOR CHILDREN AGED 4-15	Kept open for face-to-face education throughout the pandemic Hand washing, some social distancing. No routine use of masks anywhere. No routine use of ventilation.	Schools for all children were all closed from March 2020, except for children of key workers, or highly vulnerable children. Most primary school children did not return to school until September 2020 A further period of school closures happened in Jan to March 2021 in response to surges in infection rates due to a new viral variant.	The argument for closing schools was to suppress viral spread in UK society. Individual schools might close in both countries in the face of a severe local outbreak, or unwell teachers The pressure to close schools in UK diminished once vaccination programmes were rolled out starting in Dec 2020
SCHOOLING FOR CHILDREN AGED 16-18	Placed on-line	Placed on-line	
COVID-19 VACCINATION: ADULTS 18 AND OVER CHILDREN 15-17*	All About 75% vaccinated overall, around 10% of all children under 18 (See Figure 6 from OECD data)	The UK had a scheme to vaccinate children at special risk, either from their own health concerns, or living with higher risk older adults (so vaccinating the children	SWEDEN: SpikeVax ™ banned for those under 30 years of age (Oct 2021) SWEDEN:

MEASURE	SWEDEN	UK	COMMENTS
CHILDREN 12-14} CHILDREN 5-11} CHILDREN 6 MONTHS TO 4 YEARS}	None unless immuno-incompetent	to prevent illness in someone else)	Children aged 12-15 who are to be vaccinated against Covid-19 only to receive Pfizer/Biontech's Comirnaty® vaccine (Oct 2021) UK: Pfizer-BioNTech COVID-19 vaccine Comirnaty® for all

LEGEND TO TABLE 1: Timings and Nature of the various pandemic responses in the UK and Sweden (2020-2023).

Sweden and the UK – immediate COVID-19 policy decision differences with on-going implications:

Of the EU/EEA area countries, Sweden followed a unique policy concerning school closures, keeping schools for children aged 7 to 15 and preschools open. On 13th March 2020, a new act in Sweden [21] was adopted, allowing the Government to temporarily close preschools, schools and other educational activities should the situation deteriorate. A new ordinance was put in place, giving the responsible organiser the right temporarily to close an educational activity under certain conditions, for example if a large number of teachers should be unable to teach due to illness or if Covid-19 should become widespread locally. Following recommendations from FoHM upper secondary schools, municipal adult education, vocational adult education and higher education institutions provided distance learning from mid-March 2020 onwards. Figure 1 shows some of the timings and severity grades for the different mitigation measures applied in the UK and Sweden.

Comparison between the countries of the known consequences for children:

In the UK, in the run up to the first widespread pandemic measures in March 2020, the UK Government's Scientific Advisory Group for Emergencies (SAGE) and its subgroups had discussed school closures several times. It was considered that the closure of schools, particularly for the youngest children, would have at best a marginal impact on societal COVID-19 spread. *No evidence has been produced subsequently which establishes whether or not there was any "societal", or individual children's, benefits ensuing from closure of face-to-face education in the UK in terms of viral spread or societal outcomes*. This deficiency is disturbing.

The recent Royal Society review of the effectiveness of NPIs summarised this aspect thus [22]: '*most children were at much lower risk of severe outcomes of COVID-19. Nonetheless, in many countries, because of the potential for children to transmit SARS-CoV-2 to vulnerable older people (as was known to be the case for influenza infection), school closures were implemented. When schools remained open for children of key workers or were reopened, social distancing measures were frequently implemented in schools to limit transmission risks. The evidence generally indicated that school closures and other school-based measures were associated with reduced COVID-19 incidence within schools and the community. However, the effectiveness of these measures was more varied (compared to community-wide measures such as stay-at-home orders), time-dependent, and often contingent on the adherence to the measure or measures implemented (for example, mask wearing) and the targeted age group of school children*'.

Remarkably, this august Royal Society document failed either to describe or quantify the harms of the COVID-19 NPI policies, or, more remarkably still, the positive impact in terms of lives saved, or reduced hospitalisations. Two separate studies have tried to do this, notably first the excellent meta-analysis by Hume et al. [23], but their mildly positive findings (as with the Royal Society document referenced), that reduced community transmission and overall positive health impact of COVID-19 on adults were 'demonstrable', are confounded by the reality that many NPIs were used, often simultaneously, or closely overlapping in time and geography. Ascribing any positive outcomes to a single NPI seems highly selective. Concordance rates for these measures were largely unknown or incompletely assessed, and crucially often in comparisons examining several different countries – thus, *knowing the individual contribution of say just masking, or, of school*

closures, is still remarkably hard to establish in isolation. Indeed, as stated clearly in the Royal Society meta-analysis, 'the GRADE system evidence quality for changes in viral transmission, morbidity and mortality *is all very low*'.

A second study compiling data from 30 different countries, and confining itself to the first wave (so only the original viral characteristics) by Stokes et al [24] showed that after adjusting, earlier and stricter school closures (−1.23 daily deaths per million (95% CI −2.20 to −0.27)) and workplace closures (−0.26 ddpm, (95% CI − 0.46 to − 0.05)) were associated with lower Covid-19 mortality rates. Other interventions were not significantly associated with differences in mortality rates across countries. Findings were robust across multiple statistical approaches. However, at best the linkage is modest, entirely associative, and any causality between such associations potentially confounded by other factors.

Using part of their publication's Figure 1 (below) [24] it is possible to try to compare the UK and Sweden in the first viral wave:

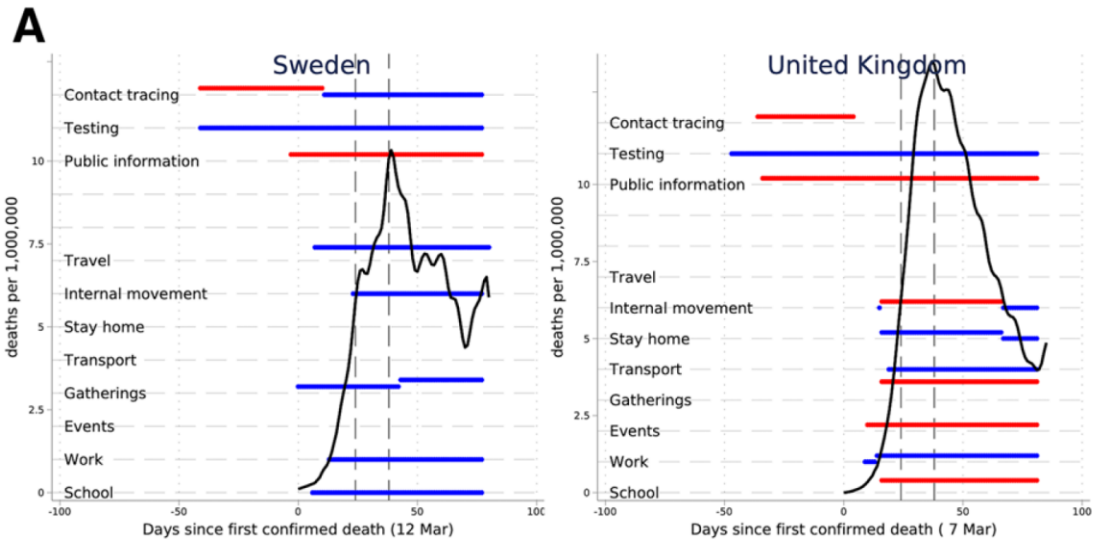


FIGURE 1 LEGEND: The comparison shows the generally more severe restrictions (shown as horizontal red lines) in the UK (with more red lines, for longer) than those deployed in Sweden. Many interventions were in use simultaneously, especially so in the UK where in general there were more restrictive measures enacted, for longer, especially stay-at-home and school closure orders - derived from [24].

There is through a wealth of evidence of the profound harms experienced by many especially vulnerable or disadvantaged children from these measures, arising in part from the chaotic and disorganised manner in which these actions were undertaken in the UK (the unfavourable opinion taken directly from an official report. [25]). Once again, the Hume *et al*. meta-analysis [23] was able to show harms much more confidently than any putative benefits: reduced educational achievements, increased obesity rates, increased anxiety and other mental health disorders, and truancy. Of course, as pointed out already, school closures were accompanied by many other measures which could (and most likely did) impinge negatively on children's wellbeing. Specific data for the UK and Sweden are surprisingly hard to find, though harms in the UK have been very well described on many occasions – both in the UK Press [26, 27] but also in official reviews and reports [28]. From the EPI report cited [28], the following passage is relevant:

'*The review found evidence for COVID-related impacts from school closures in the UK in the following areas:*

- *on children's learning*
- *on children's mental health*
- *from children's increased exposure to risk factors at home*
- *on children's physical health and nutrition*

Effects on children living in poverty were most pronounced, partly as a result of the important role schools play in keeping children fed and looking after their basic welfare needs. Children living in poverty were also least likely to have good digital access, sufficient room to study at home, or access to outside space.

Some studies recorded gains as well as losses. The available evidence was not clear on the depth of harms in the different areas, or how swiftly they might repair as schools reopened.'

One recent Swedish study of annualised change in word decoding and reading (and other

performance metrics) for Swedish children [29] did not show a "pandemic loss" in 2020/2021, which is encouraging and this was true also for the more socially challenged disadvantaged children.

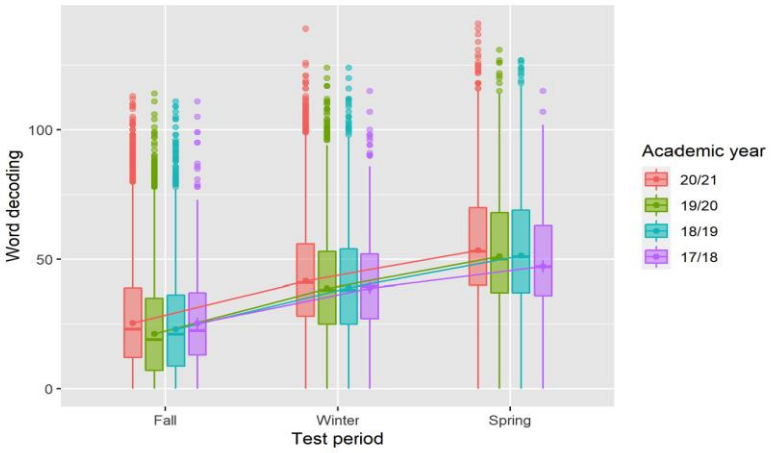


Fig. 1. Longitudinal data showing first grade students' unadjusted word decoding scores, (n = 10,878).

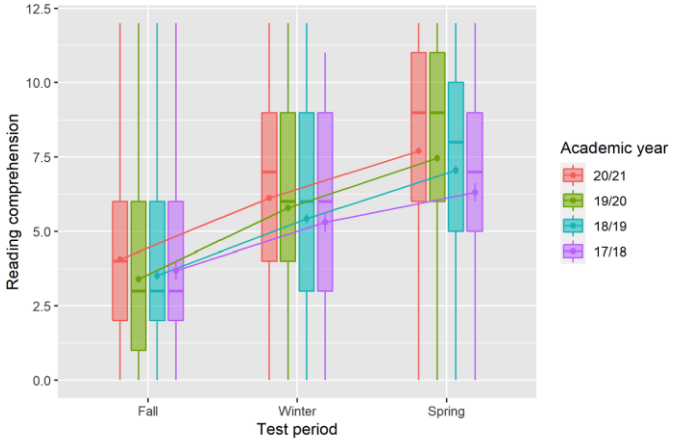


Fig. 2. Longitudinal data showing first grade students' unadjusted reading comprehension scores,(n = 10,878).

FIGURES 2a and 2b
LEGEND: No impact from the pandemic was seen on Swedish children's word recognition/decoding (Figure 2a) or comprehension (2b) over the pandemic period. Derived from [29]
By contrast, in the UK, "SATS" scores give a composite measure of educational attainment, and these fell in the pandemic, and have yet to recover or exceed pre-pandemic levels [30]

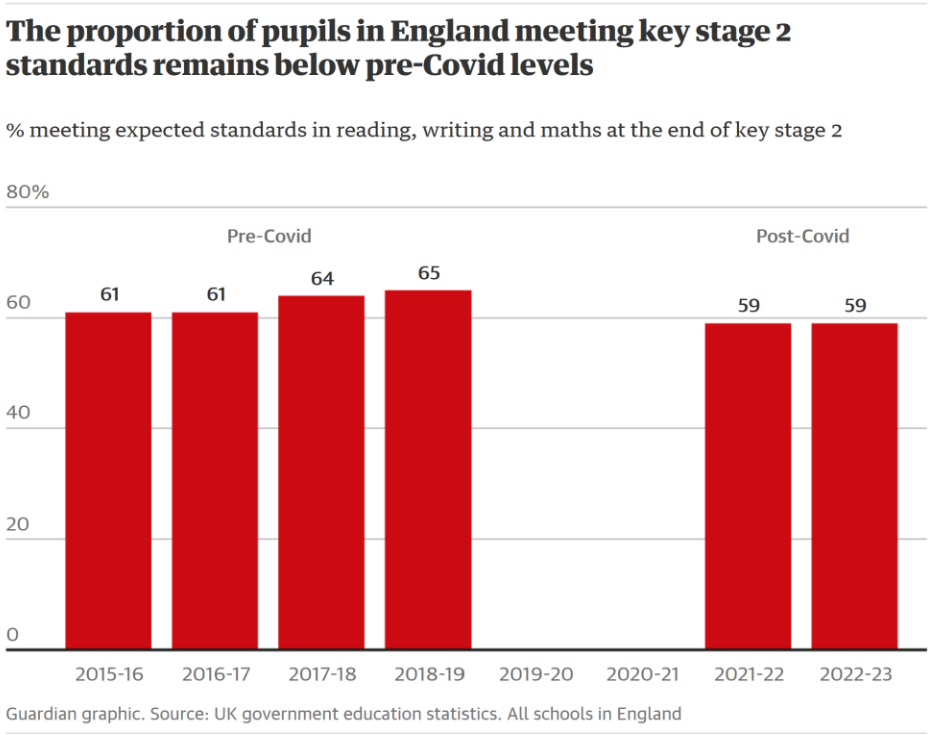


FIGURE 3
LEGEND: The Standard Assessment Tests (SATs) educational scores in the UK from 2015 to 2023 showing lower SATS score in 2021-2023 than in the previous 6 year period, derived from.[30]

Impact of Measures taken - Teachers and other Professionals:

In both the UK and in Sweden, there is no specific information on teachers' health or death rates, but no data are available from either country to suggest that the actions taken in Sweden constituted a special risk to schoolteachers, or that teachers in the UK were uniquely protected. Most of the risk, if not all of it, for contracting COVID-19 for teachers in both countries would have come from interactions in society more broadly and the "attack rate" for individuals will have closely followed their innate risk, the societal spread of COVID-19 at the time, their vaccination status (once vaccinations had started), and the extent to which individuals practiced the recommended NPIs.

There is also no available evidence that children in Sweden were at greater risk of primary COVID-19 infection, or severe reactions to or deaths from the infection, than was the case in other countries [31] highly controversial though that Swedish paper was within Sweden and further afield. [32] A paper was recently published by Odd et al [33] which clearly shows that *overall during the pandemic there were significantly fewer deaths in UK children taken as a whole*. In this cohort study there was a significant reduction in all-cause child mortality during the first year of the COVID-19 pandemic (2020-2021), which returned to close to pre-pandemic levels the following year (2021-2022). However, *there was a net reduction in deaths despite this, with 4% fewer deaths during the 3-year period than would have been expected from the 2019 to 2020 risks*. The reductions were largest in rural areas and in children younger than 10 years likely because of fewer serious respiratory infections (other than COVID-19). It is also important to high-light that while many dozens of children died directly from COVID-19 during the same time period, the overall impact of the pandemic and the measures taken was for a modest net reduction in children's mortality, overall. Further data support the broad points made [34, 35] though because of different definitions, testing protocols and frequencies, and many other considerations, a detailed and accurate inter-country comparison is all but impossible to find. In all countries there were small numbers of particularly younger children who had an acute multi-inflammatory syndrome (see Table Two, and the PIMS-TS column for numbers involved). The issues of viral persistence, and long-COVID, remain concerns in all populations studied, but, as with other comparisons, different methodological approaches, definitions, and variable data gathering protocols once again militate against a detailed and robust international comparison on these matters. These key questions deserve prioritisation in future research strategies.

What is however much clearer from UK and from many other country reports is the harms that shutting schools down over a prolonged period of time led to [36]. These are displayed in terms of educational outputs in Figure 3 (and the lack of change in Swedish educational outputs over the same time period in Figure 2a and 2b). Of course, the outputs are not precisely calibrated, but it is the lack of a drop in educational attainment in Sweden, compared to the UK, which is the main point. Iceland, which mandated severe educational curtailment, also saw a sharp fall in educational standards, and measured harms.

Truancy (unresolved even after 3 years), self-harm, drug-abuse, loss of social skills, mental illnesses (depression, anxiety), falling educational standards (see previous paragraph - reading age and mathematics) have all been chronicled, allied to a suspension of school inspection regimes, and a collapse in the annual exam-related awarding of educational grades (moving from examination-derived objectivity to reliance exclusively on teacher-based subjective assessments of submitted work). There are limited available data from Swedish children in the Swedish educational system, but these data do not suggest a similar degree of educational disturbance and distress. It is also clear from the earlier work presented above that any net 'societal benefit' from closing schools is hard to find or to quantify with precision, while the harms caused are obvious. It is of course invidious to talk about harming one section of society the better to protect another, especially knowing that *if timely and appropriate initial interventions had been put in place in the UK more generally, the possible small benefit to closing schools would likely have disappeared.*

Vaccination of adults and children against COVID-19:

A second area of focus for this paper is the issue of childhood vaccinations against COVID, where once again there was a major difference in health policy between the UK and Sweden.

The startlingly rapid development and deployment of effective COVID-19 vaccines from December 2020 onwards significantly underpinned the global fight-back against the pandemic.[10] However, the vaccines have had little impact on infection rates, or infectivity (as this would require oro-nasal administration and heightened local immunity), but did and still do provide robust defences against severe illness and death, especially in older populations where previously these outcomes were the most feared, and were the driver for the at-times highly restrictive nature of the measures imposed on all society.

Testing of the vaccines was both rapid and thorough, though such vaccines were released under emergency authorisation, *the net benefit to humanity has been huge, with many millions of lives saved while allowing a gradual return towards societal normalcy*. One of the major challenges to the vaccination programme has been waning of both post-infectious as well as post-vaccination immunity, but also, increased antigenic drift in the virus requiring regular "tweaks" to its manufacture, rather as we see with the annual influenza vaccination campaigns. But the risk-benefit equation for children, who suffer least from severe COVID-19 consequences, is much more nuanced, especially so when, for example, COVID-19 vaccine induced myocarditis is a disease seen predominantly in very-low-COVID-risk adolescent males.[37]

In the UK the Joint Committee on Vaccination and Immunisation (JCVI) advised Ministers in Government about the correct use of health-related vaccines. The JCVI decided in September 2021 that there was no overall case to be made for vaccinating UK children. Of course, the UK government then instructed the UK Chief Medical Officers to examine this same issue, and they, under predictably heavy political pressure, made a weak case for allowing children at large to be vaccinated, on the grounds that vaccinated pupils might sicken less often or for a shorter period, than non-vaccinated children at school, and thus have less disruption to their education.[38-40]

The evidence that might support this aspirational assertion that by vaccinating children there would be some educational payback remains very weak and deficient unfortunately. It is more likely that the motivation for pushing vaccination in the UK was there had been a realisation about just how detrimental the school-closure programme had been, and so a concerted push was mounted to try to keep schools open and functioning, no matter what. In Sweden, scarred as they were by the post vaccination narcolepsy debacle arising from the "preventive" vaccination of children against swine flu (overseen by Dr Anders Tegnell in 2009/10), there was no appetite from FoHM for the encouragement or mandation of vaccination of children under the age of 15, when such children were themselves at a miniscule risk themselves of suffering COVID-19 related harms, and vaccinations themselves had no impact on viral transmissibility. Indeed, in only the 15-17 year

olds in Sweden was there any appreciable vaccination achieved (see Figure 5 below).

In more detail, the advice published in several documents across 2021 and 2022 [38-40] from the JCVI in the UK was as follows:
'*Most children aged 5 to 11 have asymptomatic or mild disease following infection with SARS-CoV-2. Some may experience post-COVID-19 symptoms lasting longer than a few days. Children aged 5 to 11 years who are not in a COVID-19 clinical risk group are at extremely low risk of developing severe COVID-19 disease. Of those admitted to hospital over the last few weeks comprising the Omicron wave, the average length of hospital stay was 1 to 2 days. A proportion of these admissions were for precautionary reasons.*

It is estimated that over 85% of all children aged 5 to 11 will have had prior SARS-CoV-2 infection by the end of January 2022, with roughly half of these infections due to the Omicron variant. Natural immunity arising from prior infection will contribute towards protection against future infection and severe disease.

Vaccination of children aged 5 to 11 who are not in a clinical risk group is anticipated to prevent a small number of hospitalisations and intensive care admissions in this population and would provide short-term protection against non-severe infection (asymptomatic and symptomatic infection that does not require hospital-based care). The extent of these impacts is highly uncertain. They are closely related to future levels of infection in the population in the period following vaccination; these in turn are influenced by the timing, size and severity of any future waves of infection, and the characteristics of any new variants that may dominate future waves of infection. Vaccination is commonly associated with systemic and local reactions (such as headache, fatigue and local arm pain) which typically resolve within 1 to 3 days.

Overall, the committee agreed that the potential health benefits of vaccination [would be] greater than the potential health risks when not including the opportunity costs of a programme to vaccinate all children aged 5 to 11 due to this being part of a pandemic response. The impact of vaccination on school absences was indeterminate; the balance between school absences due to reactions following vaccination versus school absences avoided due to prevention of infection is highly influenced by the uncertain timing of any future wave of infection and of the vaccination programme. In particular, school absences are affected by whether an infection wave falls within the period of good protection against non-severe infection provided by the vaccine, and whether vaccination occurs during school term time or holiday periods.'

Some modelling by JCVI tried to estimate the potential benefits of infant vaccinations, the better to inform their subsequent recommendation:

LEGEND
Table TWO taken from the JCVI publications cited [38-40] - Prevented cases in 5 to 11 year olds, per million vaccine courses and number needed to vaccinate to prevent one case

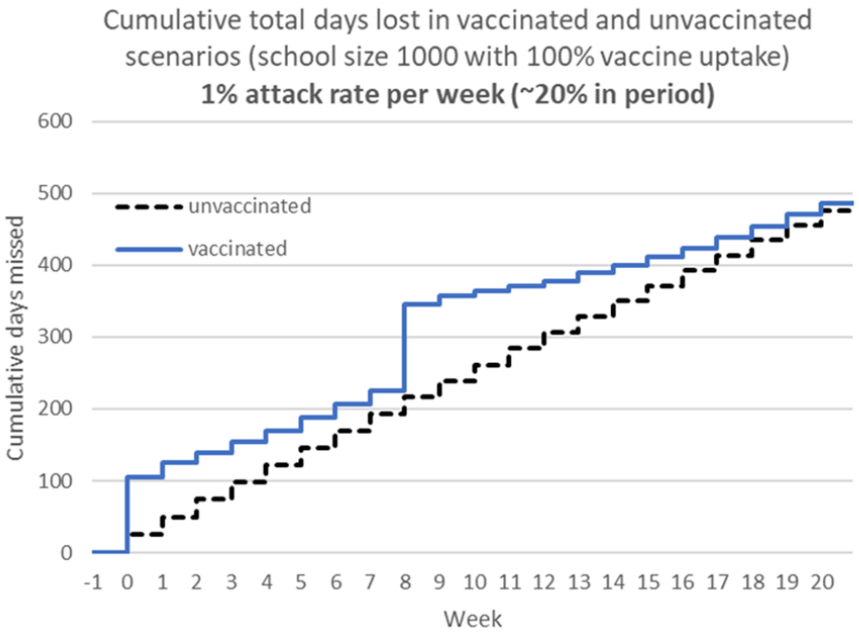
Scenario	**Measure**	**PIMS-TS (hospitalisations/ ICU admissions)**	**Hospitalisations due to acute COVID-19**	**ICU admissions due to acute COVID-19**
More severe future wave*	Prevented per million courses of 2 doses	58	98	3.0
More severe future wave*	Number needed to vaccinate to prevent 1 case	17,000	10,300	340,000
Less severe future wave**	Prevented per million courses of 2 doses	10	17	0.5
Less severe future wave**	Number needed to vaccinate to prevent 1 case	95,000	58,000	1,900,000

*More severe: may be a wave due to a variant with disease severity similar to a pre-Omicron variant; in a population with a lower level of natural immunity provided by previous infection.
**Less severe: may be a wave due to a variant with disease severity similar to Omicron; in a population with a higher level of natural immunity provided by previous infection.

Overall JCVI considered that the benefits of vaccination in preventing school absences were indeterminate (see their figure 1, reproduced here as Figure 4). These estimates were considered sensitive to:

- timing of vaccination - vaccination over weekends or in school holiday periods would reduce the amount of school absences due to adverse reactions following vaccination
- prevailing isolation policies - a set duration of isolation regardless of symptoms (for example, the '5-day isolation rule') likely increases the amount of school absences due to infection. Conversely, a relaxation of this policy might reduce the amount of school absences due to infection as many children aged 5 to 11 years experience very mild, or no symptoms.

Figure 4 taken from the JCVI publications cited [38-40] from the 2021/2 JCVI reports on vaccination and children's health – Cumulative school days lost due to vaccination and infection – high incidence scenario*



*assumptions: 1% attack rate per week with '5-day isolation rule' in place and vaccinations occur during school term-time'

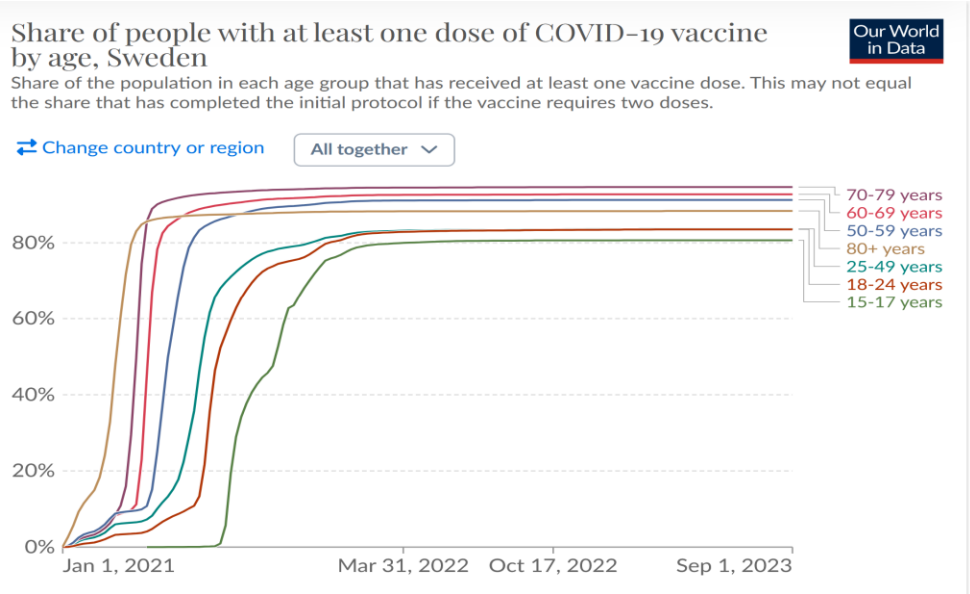


FIGURE 5 LEGEND: Derived from [41] – age and time breakdown of extent of vaccination of Swedes aged 15 years and over. Vaccination (as in the UK) took place by age cohorts, with significant uptake (> 70%) in those aged 15 and above by March 2022.

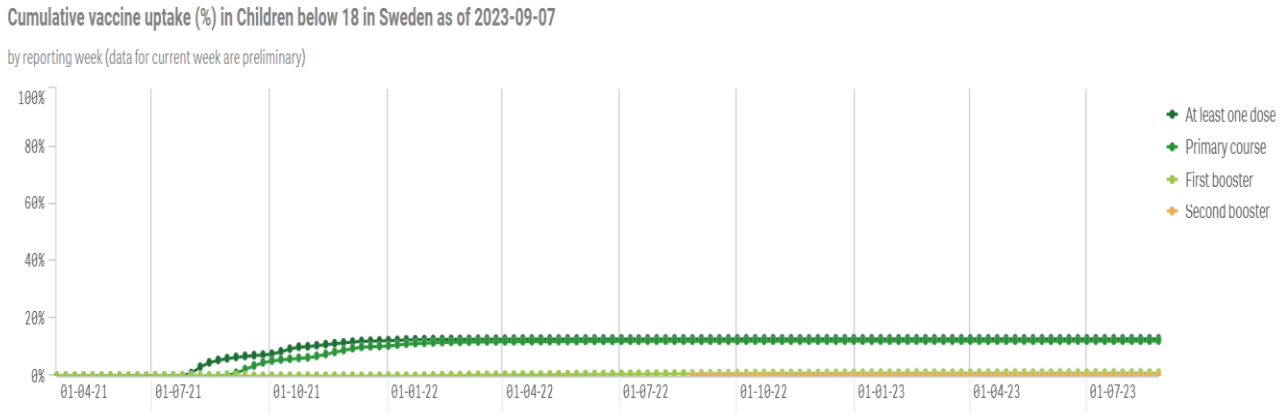


FIGURE 6 LEGEND: derived from [41] – barely 15% of Swedish children under 18 years of age have been vaccinated for COVID-19 (up to July 2023).

From June 2023, there is now no possibility of healthy children aged under 12 having a COVID vaccination in Sweden, Denmark and the UK. It is though noteworthy that the uptake in different countries of vaccination of children has been dramatically different (quite unlike what is seen for adult vaccination – EU vaccination patterns are clearly shown by examining ECDC data which we show as Figures 5,6,7 and 8). Overall, most countries have not vaccinated many children under 11 years of age, though there are some notable exceptions, including Austria, Croatia, Denmark (especially), Greece and Portugal. Equally, some global jurisdictions have started now (Q4 2023) firmly to recommend vaccinating everyone from the age of 6 months up albeit under emergency authorisation [which seems idiosyncratic, at best, given that there is now no healthcare emergency]: e.g. USA, Canada, Australia, Singapore, meaning that these countries *would potentially see nearly all of their citizens immunised*.

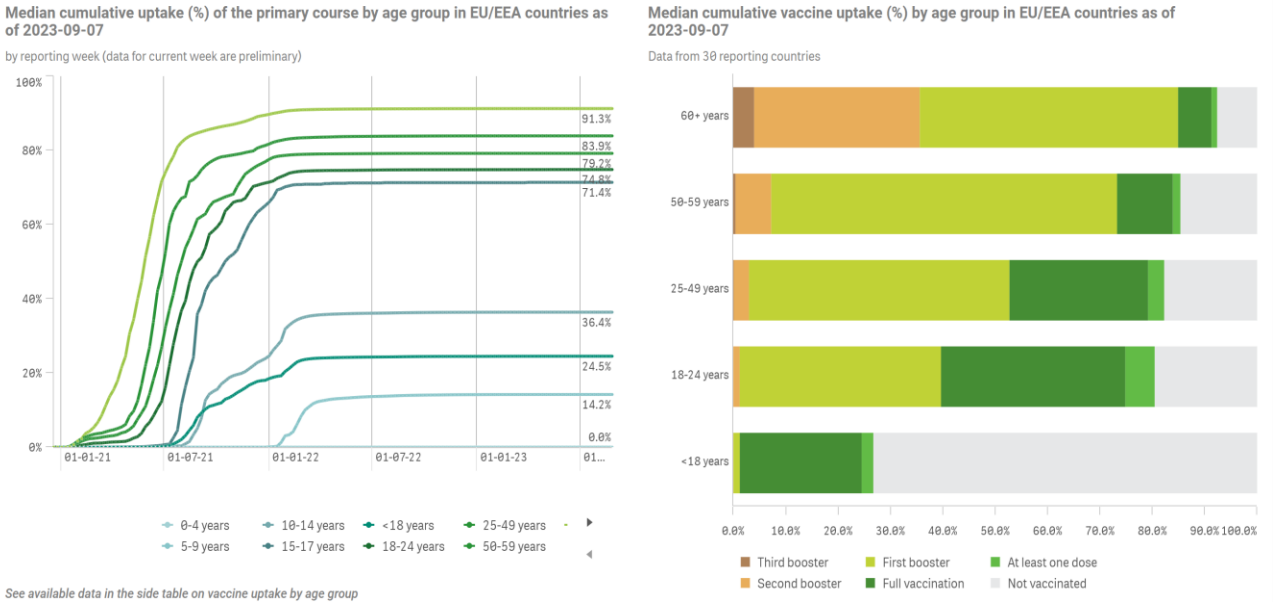


FIGURE 7 LEGEND: Median cumulative uptake (%) of the primary vaccination course by age group in the EU/EEA areas. Vaccination in the < 18 year old groups is markedly lower than the rates seen in adults. Derived from [40]

Cumulative uptake (%) of the primary course by age group in EU/EEA countries as of 2023-09-07

Country	60+ years	50-59 years	25-49 years	18-24 years	<18 years	15-17 years	10-14 years	5-9 years	0-4 years
Austria	92.0%	83.9%	78.7%	78.6%	31.5%	74.7%	45.3%	22.5%	1.9%
Belgium	100.0%	91.1%	84.2%	82.3%	31.4%	-	-	-	-
Bulgaria	38.5%	39.1%	33.6%	28.7%	2.3%	-	-	-	-
Croatia	77.3%	71.7%	58.8%	46.8%	4.7%	19.6%	3.8%	0.3%	-
Cyprus	92.8%	86.7%	83.7%	74.7%	20.9%	59.3%	32.9%	8.3%	0.0%
Czechia	86.0%	77.2%	66.4%	69.8%	20.3%	63.1%	31.9%	5.2%	0.0%
Denmark	100.0%	93.7%	86.2%	83.8%	35.4%	83.8%	52.4%	19.8%	0.0%
Estonia	81.6%	75.4%	68.2%	72.8%	16.8%	-	-	-	-
Finland	95.4%	90.9%	84.0%	81.3%	35.7%	84.5%	57.3%	12.6%	-
France	91.1%	91.8%	89.2%	90.2%	28.1%	-	-	-	-
Germany	91.4%	-	-	-	30.6%	-	-	-	-
Greece	89.8%	83.0%	78.2%	72.7%	25.3%	54.4%	33.3%	15.8%	-
Hungary	81.9%	74.8%	66.0%	54.8%	24.4%	-	-	-	-
Iceland	100.0%	93.3%	86.4%	88.0%	43.4%	92.4%	71.2%	28.7%	-
Ireland	100.0%	100.0%	90.1%	88.7%	32.3%	82.3%	46.8%	17.4%	0.1%
Italy	94.0%	90.0%	85.5%	90.5%	50.8%	-	-	-	-
Latvia	77.4%	82.5%	80.9%	83.2%	21.4%	69.5%	34.7%	2.4%	0.0%
Liechtenstein	86.6%	76.8%	71.0%	72.8%	22.7%	71.4%	32.8%	5.9%	-
Lithuania	78.2%	80.9%	80.1%	77.7%	16.7%	59.8%	24.7%	2.6%	0.0%
Luxembourg	91.2%	84.8%	77.7%	74.8%	33.7%	82.7%	57.3%	16.8%	-
Malta	97.3%	90.4%	93.0%	92.8%	45.1%	-	-	-	-
Netherlands	96.5%	80.8%	69.5%	63.9%	15.0%	59.6%	13.2%	1.3%	0.0%
Norway	97.5%	94.3%	87.0%	87.9%	13.4%	-	-	-	-
Poland	76.1%	69.5%	61.2%	58.7%	24.6%	54.7%	38.0%	17.6%	0.2%
Portugal	99.1%	94.9%	91.3%	88.2%	48.6%	85.7%	74.3%	33.5%	0.0%
Romania	46.8%	56.0%	51.4%	49.9%	6.9%	-	-	-	-
Slovakia	69.9%	62.5%	54.2%	55.6%	12.1%	41.4%	17.5%	3.2%	0.0%
Slovenia	76.7%	70.2%	57.2%	58.9%	10.9%	-	-	-	-
Spain	96.7%	88.4%	79.2%	73.4%	47.2%	79.2%	75.9%	32.3%	-
Sweden	92.5%	90.5%	81.4%	79.6%	12.1%	76.0%	-	-	-

FIGURE 8 LEGEND: The current remarkable differences in COVID-19 vaccination for different age groups in different EU countries can be seen from perusal of the ECDC EU COVID database and the cumulative vaccine uptake at different age bands. Vaccinations in subjects aged < 18 years are shown as a red box. There is a noteworthy difference in the policy towards childhood (under age 15) vaccination comparing Sweden (12%) and Denmark (35%). Derived from [41]

The explanation/rationale for this aggressive policy in some jurisdictions in offering to vaccinate everyone over the age of 6 months is not clear (and is not provided), though some have suggested that long-COVID might be less common using this approach.[42] A recent research letter in JAMA from the Kaiser Permanente group in California suggested that very young infants might be less likely to attend hospitals with acute respiratory challenges if they had been vaccinated, but the evidence presented is strikingly weak, and is also clearly heavily conflicted.[43]

How best to understand the net impact of COVID-19 on society?

Calibrating the impact of COVID-19 on society has mainly focussed on deaths, whether due exclusively to or mainly from COVID-19. These fatalities are of incredible and lasting importance, and, are a more objective measure than are some of the other COVID-19 sequelae. The overwhelming reliance on mortality exemplifies the McNamara principle [44] namely that we measure most often what is the easiest thing to discover or register, in this case, death, but this does not always guarantee that the most insightful parameters are used. Accordingly it is really necessary in the round to get a richer picture of the impact on society of a pandemic like COVID-19. This can be approached by also taking account of ITU admissions, hospitalisations in general, days taken off work, loss of employment, wealth, education and of course short- and longer-term impacts on a population's mental as well as physical health.. Consequential degradation of the functions of basic services (such as routine or emergency non-COVID healthcare) can also obviously impact upon net outcomes. For example, health service breakdown as now endemic in the NHS, with over 7.8 million people currently awaiting health treatment in England alone (well over 10 million if you take the whole UK), and thus many thousands of cancer and heart patients will be dying unnecessarily due to delayed diagnosis and treatment.[45]

It is hard to establish a simple "trade-off" formula between these different outcomes, and this in the end is precisely where national politicians must make those calls, but an evaluation of a pandemic that relies exclusively on counting body-bags is but a superficial one. There will be unpalatable choices to be made – how hard to try to save certain groups in society – and to what extent the protection of one group (in the case of COVID-19, the elderly) might translate into harms for the rest of society. In the case of COVID-19 its unprecedented propensity to cause most health damage to the older groups in society while

leaving most younger people less affected or not affected, places a very clear lens on how we can evaluate and prioritise these different outcomes in different groups within society. This has been at the heart of the debate between the "let it rip" advocates versus the "zero COVID" zealots. This is also why the discussion on mortality has moved on from directly attributable COVID deaths to "net mortality" or loss of life years [46] – excess deaths due to a variety of other factors with agency during the COVID-19 epidemic. In this regard, the latest tally suggests that Sweden has fared much better than the UK did, and broadly in line with its Nordic peers [47]. See Figure 9.

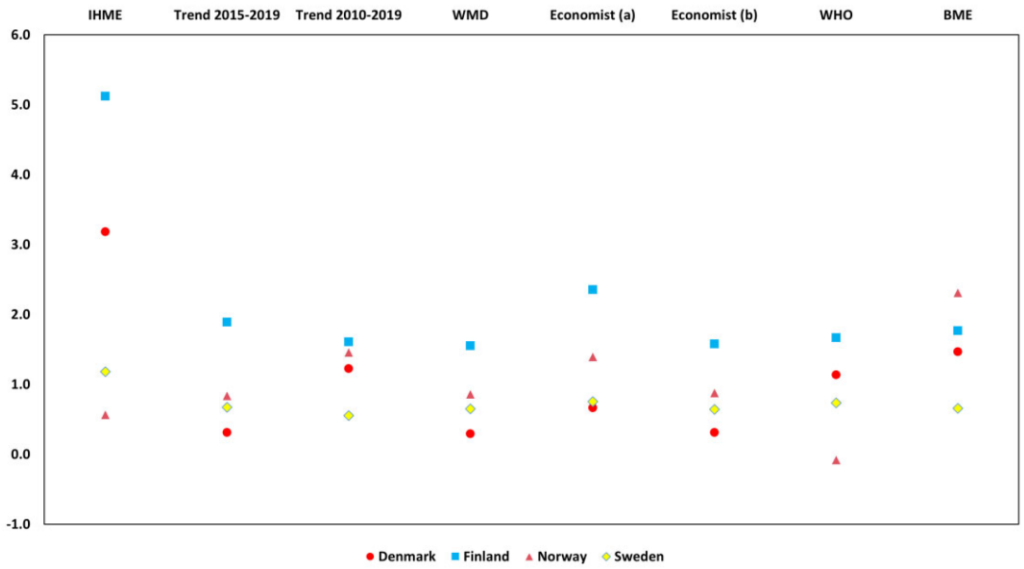


Figure 2 Estimated excess deaths divided by official COVID-19 deaths for 2020 and 2021. Economist (a) and (b) refer to the model with and without January and February 2020 included when estimating expected deaths (Iceland is not shown due to large uncertainty in the small crude death numbers). IHME, Institute for Health Metrics and Evaluation; WMD, World Mortality Dataset; WHO, World Health Organization; BME, Bayesian Model Ensemble

FIGURE 9 LEGEND: Derived from Fig 2 [47]. A comparison of annualised excess mortality in the Nordics. Sweden's performance across a range of different methodological estimates for excess mortality was very much in the range of the other Nordic countries, despite suffering a much more lethal first wave outcome. Overall, the Nordic countries, despite their striking differences in pandemic mitigation strategies, all fared much better than did the rest of the EU, especially Eastern Europe, where poor healthcare and vaccination hesitancy rendered the death toll far higher than it might have been.

Conclusions:

It is not the purpose of this paper to designate a "winner" and a "loser" between the two countries compared, or indeed between any number of countries for which there are data. The different mitigatory policies were applied in the UK and in Sweden in good faith and with good intent; even though inevitably some harms were caused by these policies, these harms were not, we believe, ever caused deliberately. Rather, the purpose of this paper is to rehearse the pros and cons of various choices presenting themselves in the face of an acute severe infectious threat and thus how best to make choices when the next pandemic strikes, and how that decision-making needs to be richer and more sophisticated than the projected need for body bags.

Our work here foregrounds the huge challenges faced in trying to calibrate, at speed and with incomplete information, a pandemic response that is not too draconian, and yet, not too lax. The Swedes have a conceptual word for this, one which defies glib translation – namely *lagom* ("just enough, just the right amount"). In the matter of education and overall societal well-being, while Sweden had failed its older population, Sweden did not fail its infant and younger populations in the heat of the pandemic, as education for those aged under 18 continued as best it could in as normal fashion as possible. In the UK however, where disproportionately heavy-handed "catch-all" population measures were enacted in a "too much, too late" way because of an abrupt pandemic policy pivot, insufficient thought had been given to timely and appropriate mitigation measures. The extraordinary insight provided by the UK COVID-19 inquiry into the chaotic infighting which characterised much the UK's central decision-making helps to explain why the

choices made were so often the wrong ones at the wrong time. [48]

Sweden decided at a political level very early on that children's education had a high national priority, high enough to retain it despite the viral maelstrom which engulfed their country and so many others. The UK decided in a near panic that for an unknown - at best marginal - possible benefit in slowing viral spread – education in person for those under 18 years of age must be sacrificed; the school closures policy was a relic of the 2011 UK influenza pandemic plan, and not nearly so relevant to the COVID-19 challenge. If there had been any sensible prior planning for how to enact such an eventuality, the chaotic and seemingly random manner in which this was then done in the UK, and the attendant harms, might have been avoided.

The vaccination issue is interesting. Swedish authorities decided that the use of novel if safe vaccines in very low risk populations such as children could not be justified (Dr Anders Tegnell, personal communication, 2023). This caution perhaps arose because of the narcolepsy side-effects seen in Sweden and Finland after the swine flu vaccination programme of 2009/2010. In the UK, we decided to sit on the fence, but in practice, few UK children under the age of 15 received a COVID-19 vaccine unless it was for clear immune-incompetency reasons. Some countries (not part of this paper) have recommended that everyone aged over 6 months receive an updated COVID-19 vaccine (CDC, Canada, Australia, Singapore), whereas in Sweden and Denmark (and effectively, the UK) the focus remains on building up an immunity barrier comprising natural infections together with the vaccination programme for those at the highest risk of harms (though Denmark has been much keener than Sweden to vaccinate children aged under 15 years). The current ongoing Swedish plans do not include or foresee the widespread vaccination of children.

We must note that in Sweden throughout the pandemic the Swedish Health Agency FoHM advised government about health policy acting as a lead-agency way lead also supported by other agencies (Dr Anders Tegnell, personal communication, 2023). Constitutionally the Swedish government is typically expected to follow that lead agency advice (effectively, an 'instruction'). While it is possible for a Swedish government to reject or defy Swedish Health Authority recommendations (as was seen in neighbouring Denmark and its corresponding Health Authority advice in March 2020), it would inevitably raise considerable constitutional tensions, and potentially be subject to judicial review. In the UK, despite so many claims from politicians to be "following the science", in reality 'political considerations' were much more likely to impinge upon the choice about timing and severity of the implementation of pandemic mitigation measures, as foregrounded, in graphically-depressing detail, by the UK's ongoing COVID-19 inquiry. [48] National differences in constitutional arrangements, decision-making, accountability and where power lay definitely were relevant to the development of the different mitigatory systems put in place as policy, though this important aspect, as with so many others, has not yet been analysed sufficiently. How different countries are equipped to deal with civil and military contingencies can differ surprisingly, and it will not be unexpected that this will be relevant to the success of national pandemic responses. These weighty matters are worthy of more detailed consideration by constitutional legal experts, civil contingency authorities, politicians, and others: systems after all tend to produce the outcomes for which they are designed.

Unfortunately, in a pandemic, like in a war, there is so often just a basket of very unpalatable choices with which leaders are presented. Such choices still have to be made at pace. More a case of "pick your poison" than "first do no harm". In the future when faced with new pandemic crises, we must surely regard as unconscionable and inexcusable any repeat of the lack of foregrounding of children's health needs, welfare and wellbeing which characterised the UK's COVID-19 pandemic response?

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