

Collateral impact of COVID-19

Nagakumar, Prasad; Chadwick, Ceri-Louise; Bush, Andrew; Gupta, Atul

DOI:

[10.1007/s00431-021-03963-x](https://doi.org/10.1007/s00431-021-03963-x)

License:

Creative Commons: Attribution (CC BY)

Document Version

Publisher's PDF, also known as Version of record

Citation for published version (Harvard):

Nagakumar, P, Chadwick, C-L, Bush, A & Gupta, A 2021, 'Collateral impact of COVID-19: why should children continue to suffer?', *European Journal of Pediatrics*, vol. 180, no. 6, pp. 1975-1979.
<https://doi.org/10.1007/s00431-021-03963-x>

[Link to publication on Research at Birmingham portal](#)

General rights

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

Take down policy

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact UBIRA@lists.bham.ac.uk providing details and we will remove access to the work immediately and investigate.



Collateral impact of COVID-19: why should children continue to suffer?

Prasad Nagakumar^{1,2} · Ceri-Louise Chadwick³ · Andrew Bush⁴ · Atul Gupta^{5,6}

Received: 29 December 2020 / Revised: 19 January 2021 / Accepted: 22 January 2021 / Published online: 13 February 2021
© The Author(s) 2021

Abstract

The COVID-19 pandemic caused by SARS-COV-2 virus fortunately resulted in few children suffering from severe disease. However, the collateral effects on the COVID-19 pandemic appear to have had significant detrimental effects on children affected and young people. There are also some positive impacts in the form of reduced prevalence of viral bronchiolitis. The new strain of SARS-COV-2 identified recently in the UK appears to have increased transmissibility to children. However, there are no large vaccine trials set up in children to evaluate safety and efficacy. In this short communication, we review the collateral effects of COVID-19 pandemic in children and young people. We highlight the need for urgent strategies to mitigate the risks to children due to the COVID-19 pandemic.

What is Known:

- Children and young people account for <2% of all COVID-19 hospital admissions
- The collateral impact of COVID-19 pandemic on children and young people is devastating
- Significant reduction in influenza and respiratory syncytial virus (RSV) infection in the southern hemisphere

What is New:

- The public health measures to reduce COVID-19 infection may have also resulted in near elimination of influenza and RSV infections across the globe
- A COVID-19 vaccine has been licensed for adults. However, large scale vaccine studies are yet to be initiated although there is emerging evidence of the new SARS-COV-2 strain spreading more rapidly through young people.
- Children and young people continue to bear the collateral effects of COVID-19 pandemic

Keywords COVID-19 · Children and young people · Vaccine · Mental health

Communicated by Peter de Winter

✉ Atul Gupta
atul.gupta@kcl.ac.uk

Prasad Nagakumar
p.nagakumar@nhs.net

Ceri-Louise Chadwick
ceri-louise.chadwick@nhs.net

Andrew Bush
a.bush@rbht.nhs.uk

¹ Paediatric Respiratory Medicine, Department of Paediatric Respiratory Medicine, Birmingham Women's and Children's Hospital NHS Foundation Trust, Steelhouse Lane, Birmingham B4 6NH, UK

² Birmingham Acute Care Research, Institute of Inflammation and Aging, University of Birmingham, Birmingham, UK

³ Paediatric Respiratory Registrar, Department of Paediatric Respiratory Medicine, Birmingham Women's and Children's Hospital NHS Foundation Trust, Steelhouse Lane, Birmingham B4 6NH, UK

⁴ Paediatrics and Paediatric Respiriology, Imperial College & Consultant Paediatric Chest Physician, Royal Brompton Harefield NHS Foundation Trust, Sydney Street, London SW3 6NP, UK

⁵ Paediatric Respiratory Medicine, Department of Paediatric Respiratory Medicine, King's College Hospital, London & King's College London, Denmark Hill, London SE5 9RS, UK

⁶ Institute for Women's and Children's Health, King's College London, London, UK

Children and young people (CYP) account for <2% of the COVID-19 infections caused by the SARS-CoV-2 virus [1]. Although the numbers are smaller than in adults, severe COVID-19 and deaths have been noted in children with COVID-19 infection [2]. Long-term consequences of COVID-19 have also been reported in CYP. Also, the Paediatric Multisystem Inflammatory Syndrome Temporally associated with COVID-19 (PIMS-TS) has resulted in some very sick CYP being admitted to intensive care units. As the pandemic continues, wider direct and collateral effects are becoming apparent. The collateral effects of COVID-19 have resulted in devastating impacts on children's health and well-being due to missed education, healthcare delivery, mental health, and social consequences [3].

Impact on winter respiratory viruses—a silver lining of the COVID-19 pandemic

Lower respiratory tract infections are a leading cause of morbidity and mortality around the world. There are more than 2.38 million deaths a year from pneumonia or bronchiolitis making it the sixth leading cause of mortality in all ages and the leading cause amongst those under 5 [4]. Viral respiratory illnesses result in a large proportion of high dependency and intensive care admissions during the winter months and those with underlying medical conditions are particularly vulnerable. There are minimal existing measures to prevent such viral infections, apart from palivizumab (not licensed over age 2 years and only given to high-risk children, who actually are the minority of those admitted) influenza vaccines and Tamiflu.

The incidence of RSV and influenza in children and young people was significantly reduced during 2020. Southern hemisphere data shows a reduction in peak incidence of RSV from around 30% to zero [5] (Fig. 1a). Public Health England data shows a similar reduction in the UK with influenza reduced by 90% and RSV infection rates also close to zero [6] (Fig. 1b) in children and adults. There may be a later peak incidence this year but early data are encouraging that this will be significantly lower than previous years (Fig. 1a).

Reduced social interaction, frequent hand washing, the use of facemasks in public places, and reduced atmospheric pollution may have reduced winter virus infection rates [7]. Are public health measures responsible for the impressive reduction in viral LRTI and infection irrespective of geography, socio-economic status, and comorbidities? It is intriguing to note that despite increased isolation of SARS-CoV-2 in children during December in England, the rates of RSV and influenza infection rates remained extremely low [8] (Fig. 1c). Whatever the cause of such significant reduction, there are important lessons to learn for the future. Will the policymakers, politicians, and the general public be willing

to continue these public health measures following the COVID-19 pandemic? And if so, to what extent are these measures sustainable? If respiratory virus infections can be reduced, this will reduce demands on health services. The impact of reduced incidence of viral infections on viral wheeze and later asthma is yet to be quantified. Public awareness and legislation have resulted in significant changes in population behaviour and collateral beneficial effects of COVID on the impact of other winter viruses.

Safeguarding and mental health implications

The effects of social distancing measures, chronic isolation, cessation of usual activities, and employment are expected to result in an increase in mental health disorders and substance misuse in adults. Furthermore, alcohol sales have increased by 31.4% and calls to the National Domestic Abuse Helpline have increased by approximately 50% since social distancing measures were introduced [9].

The Children's Commissioner for England has highlighted the detrimental effect on the mental health of CYP. Changes to external support provided by health, social, and education services and isolation from support networks in wider society is to the detriment of identifying and monitoring CYP at risk of harm. These services need enhanced funding to support young people during these difficult times.

Vaccine

Children and young people have been in the firing line of uncertainty throughout the COVID-19 pandemic. The UK has approved three vaccines effective against SARS-CoV-2 for use in adults and more vaccines will likely follow soon. The COVID-19 vaccine studies in adults have moved at a lightning speed from trial set up to regulatory approval. Initial trials in 12–17-year-olds have commenced but the process for children and young people is lagging behind and there appears to be no perceived urgency in initiating vaccine studies in children. In contrast, there are 70 studies in adults still evaluating hydroxychloroquine in adult COVID-19 patients [10]. Children in secondary schools have been identified as a significant source for transmission of COVID-19 infection in the UK, probably related to the new variant known as B.1.1.7. The preliminary data show this variant to be associated with no increase in hospitalisations in children. Younger age groups have played an integral role in the success of previous vaccination programmes. The imperatives for immunising children include the prevention of severe forms of COVID (acute respiratory and PIMS-TS) and to prevent transmission both to other children and likely to adults.

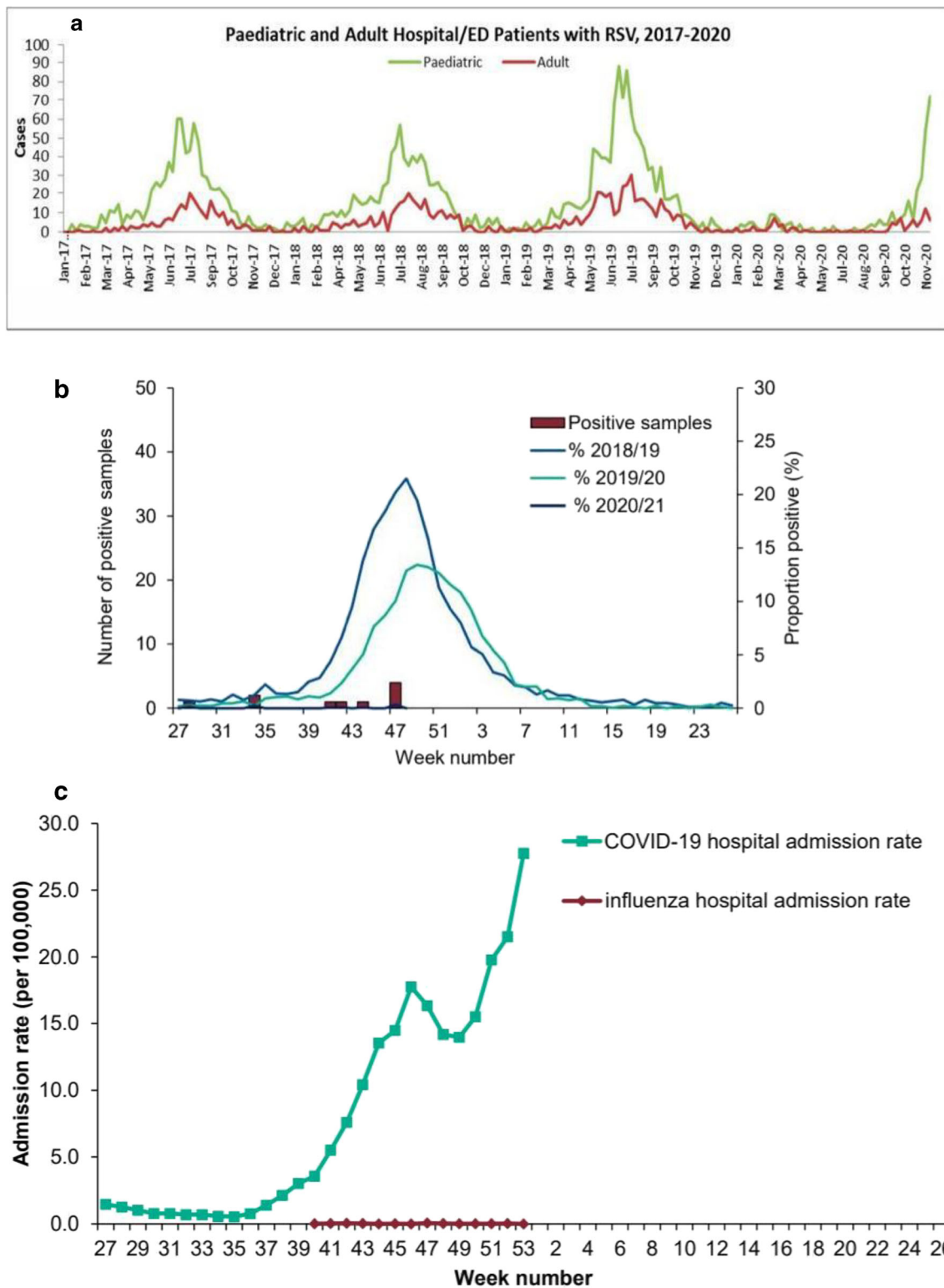


Fig. 1 **a** Time series data from Western Australia showing significant reduction in respiratory syncytial virus infection in children and adults in 2020 winter (June–August) but increased infection rate in spring (September–November). **b** No influenza cases in England in end of November (week 48, brown bars). Data form the Public Health England national Influenza and COVID19 surveillance report

comparing data from 2020 to 2019 and 2018. Data includes both children and adults. **c** No influenza hospital admissions in England in December 2020 despite significant COVID-19 hospital admission rate. Data from the Public Health England surveillance report includes both adults and children

It is important we act quickly with efficient and safe target groups to expand the use of vaccination and ensure that children and young people are not left behind. However, the safety of the vaccines in children should obviously be determined first.

We have an opportunity and a responsibility to act now and act effectively to avoid long-term disastrous and devastating effects on CYP health and welfare. The voice of CYP must be heard by the public and the policymakers and their education, mental well-being, and health should have the highest priority.

Abbreviations COVID-19, Coronavirus disease 2019; LRTI, Lower respiratory tract infection; CYP, Children and young people

Authors' contributions PN, AB, and AG conceptualized the idea. All authors contributed equally to the manuscript.

Availability of data and material N/A.

Code availability N/A.

Declarations

Ethics approval N/A.

Consent to participate N/A.

Consent for publication N/A.

Conflict of interest The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Docherty AB, Harrison EM, Green CA et al (2020) Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study. *BMJ* 369:m1985
- Harman K, Verma A, Cook J, Radia T, Zuckerman M, Deep A, Dhawan A, Gupta A (2020) Ethnicity and COVID-19 in children with comorbidities. *Lancet Child Adolesc Health* 4:e24–e25
- de Winter JP, de Winter D, Bollati V, Milani GP (2020) A safe flight for children through COVID-19 disaster: keeping our mind open! *Eur J Pediatr* 179:1175–1177
- Naghavi M, Abajobir AA, Abbafati C, Abbas KM, Abd-Allah F, Abera SF, Aboyans V, Adetokunboh O, Afshin A, Agrawal A, Ahmadi A, Ahmed MB, Aichour AN, Aichour MTE, Aichour I, Aiyar S, Alahdab F, al-Aly Z, Alam K, Alam N, Alam T, Alene KA, al-Eyadhy A, Ali SD, Alizadeh-Navaei R, Alkaabi JM, Alkerwi A', Alla F, Allebeck P, Allen C, al-Raddadi R, Alsharif U, Altirkawi KA, Alvis-Guzman N, Amare AT, Amini E, Ammar W, Amoako YA, Anber N, Andersen HH, Andrei CL, Androudi S, Ansari H, Antonio CAT, Anwari P, Ärnlöv J, Arora M, Artaman A, Aryal KK, Asayesh H, Asgedom SW, Atey TM, Avila-Burgos L, Avokpaho EFG, Awasthi A, Babalola TK, Bacha U, Balakrishnan K, Barac A, Barboza MA, Barker-Collo SL, Barquera S, Barregard L, Barrero LH, Baune BT, Bedi N, Beghi E, Béjot Y, Bekele BB, Bell ML, Bennett JR, Bensenor IM, Berhane A, Bernabé E, Betsu BD, Beuran M, Bhatt S, Biadgilign S, Bienhoff K, Bikbov B, Bisanzio D, Bourne RRA, Breitborde NJK, Bulto LNB, Bumgarner BR, Butt ZA, Cahuana-Hurtado L, Cameron E, Campuzano JC, Car J, Cárdenas R, Carrero JJ, Carter A, Casey DC, Castañeda-Orjuela CA, Catalá-López F, Charlson FJ, Chibueze CE, Chimed-Ochir O, Chisumpa VH, Chitcheer AA, Christopher DJ, Ciobanu LG, Cirillo M, Cohen AJ, Colombara D, Cooper C, Cowie BC, Criqui MH, Dandona L, Dandona R, Dargan PI, das Neves J, Davitoiu DV, Davletov K, de Courten B, Defo BK, Degenhardt L, Deiparine S, Deribe K, Deribew A, Dey S, Dicker D, Ding EL, Djalalinia S, Do HP, Doku DT, Douwes-Schultz D, Driscoll TR, Dubey M, Duncan BB, Echko M, el-Khatib ZZ, Ellingsen CL, Enayati A, Ermakov SP, Erskine HE, Eskandarieh S, Esteghamati A, Estep K, Farinha CSS, Faro A, Farzadfar F, Feigin VL, Fereshtehnejad SM, Fernandes JC, Ferrari AJ, Feyissa TR, Filip I, Finegold S, Fischer F, Fitzmaurice C, Flaxman AD, Foigt N, Frank T, Fraser M, Fullman N, Fürst T, Furtado JM, Gakidou E, Garcia-Basteiro AL, Gebre T, Gebregers GB, Gebrehiwot TT, Gebremichael DY, Geleijnse JM, Genova-Maleras R, Gesesew HA, Gething PW, Gillum RF, Giref AZ, Giroud M, Giussani G, Godwin WW, Gold AL, Goldberg EM, Gona PN, Gopalani SV, Gouda HN, Goulart AC, Griswold M, Gupta R, Gupta T, Gupta V, Gupta PC, Haagsma JA, Hafezi-Nejad N, Hailu AD, Hailu GB, Hamadeh RR, Hambisa MT, Hamidi S, Hammami M, Hancock J, Handal AJ, Hankey GJ, Hao Y, Harb HL, Hareri HA, Hassanvand MS, Havmoeller R, Hay SI, He F, Hedayati MT, Henry NJ, Heredia-Pi IB, Herteliu C, Hoek HW, Horino M, Horita N, Hosgood HD, Hostiuc S, Hotez PJ, Hoy DG, Huynh C, Iburg KM, Ikeda C, Ileanu BV, Irenso AA, Irvine CMS, Islam SMS, Jacobsen KH, Jahanmehr N, Jakovljevic MB, Javanbakht M, Jayaraman SP, Jeemon P, Jha V, John D, Johnson CO, Johnson SC, Jonas JB, Jürisson M, Kabir Z, Kadel R, Kahsay A, Kamal R, Karch A, Karimi SM, Karimkhani C, Kasaeian A, Kassaw NA, Kassebaum NJ, Katikireddi SV, Kawakami N, Keiyoro PN, Kemmer L, Kesavachandran CN, Khader YS, Khan EA, Khang YH, Khoja ATA, Khosravi MH, Khosravi A, Khubchandani J, Kiadaliri AA, Kieling C, Kievlan D, Kim YJ, Kim D, Kimokoti RW, Kinfu Y, Kissoon N, Kivimaki M, Knudsen AK, Kopec JA, Kosen S, Koul PA, Koyanagi A, Kulikoff XR, Kumar GA, Kumar P, Kutz M, Kyu HH, Lal DK, Lalloo R, Lambert TLN, Lan Q, Lansingh VC, Larsson A, Lee PH, Leigh J, Leung J, Levi M, Li Y, Li Kappe D, Liang X, Liben ML, Lim SS, Liu PY, Liu A, Liu Y, Lodha R, Logroscino G, Lorkowski S, Lotufo PA, Lozano R, Lucas TCD, Ma S, Macarayan ERK, Maddison ER, Magdy Abd el Razek M, Majdan M, Majdzadeh R, Majeed A, Malekzadeh R, Malhotra R, Malta DC, Manguerra H, Manyazewal T, Mapoma CC, Marczak LB, Markos D, Martinez-Raga J, Martins-Melo FR, Martopullo I, McAlinden C, McGaughey M, McGrath JJ, Mehata S, Meier T, Meles KG, Memiah P, Memish ZA, Mengesha MM, Mengistu DT, Menota BG, Mensah GA, Meretoja TJ, Meretoja A, Millea A, Miller TR, Minnig S, Mirarefin M, Mirrahimov EM, Misganaw A, Mishra

- SR, Mohamed IA, Mohammad KA, Mohammadi A, Mohammed S, Mokdad AH, Mola GLD, Mollenkopf SK, Molokhia M, Monasta L, Montañez JC, Montico M, Mooney MD, Moradi-Lakeh M, Moraga P, Morawska L, Morozoff C, Morrison SD, Mountjoy-Venning C, Mruts KB, Muller K, Murthy GVS, Musa KI, Nachega JB, Naheed A, Naldi L, Nangia V, Nascimento BR, Nasher JT, Natarajan G, Negoi I, Ngunjiri JW, Nguyen CT, Nguyen QL, Nguyen TH, Nguyen G, Nguyen M, Nichols E, Ningrum DNA, Nong VM, Noubiap JJN, Ogbo FA, Oh IH, Okoro A, Olagunju AT, Olsen HE, Olusanya BO, Olusanya JO, Ong K, Opio JN, Oren E, Ortiz A, Osman M, Ota E, PA M, Pacella RE, Pakhale S, Pana A, Panda BK, Panda-Jonas S, Papachristou C, Park EK, Patten SB, Patton GC, Paudel D, Paulson K, Pereira DM, Perez-Ruiz F, Perico N, Pervaiz A, Petzold M, Phillips MR, Pigott DM, Pinho C, Plass D, Pletcher MA, Polinder S, Postma MJ, Pourmalek F, Purcell C, Qorbani M, Quintanilla BPA, Radfar A, Rafay A, Rahimi-Movaghar V, Rahman MHU, Rahman M, Rai RK, Ranabhat CL, Rankin Z, Rao PC, Rath GK, Rawaf S, Ray SE, Rehm J, Reiner RC, Reitsma MB, Remuzzi G, Rezaei S, Rezai MS, Rokni MB, Ronfani L, Roshandel G, Roth GA, Rothenbacher D, Ruhago GM, SA R, Saadat S, Sachdev PS, Sadat N, Safdarian M, Safi S, Safiri S, Sagar R, Sahathevan R, Salama J, Salamati P, Salomon JA, Samy AM, Sanabria JR, Sanchez-Niño MD, Santomauro D, Santos IS, Santric Milicevic MM, Sartorius B, Satpathy M, Schmidt MI, Schneider IJC, Schulhofer-Wohl S, Schutte AE, Schwebel DC, Schwendicke F, Sepanlou SG, Servan-Mori EE, Shackelford KA, Shahrzaz S, Shaikh MA, Shamsipour M, Shamsizadeh M, Sharma J, Sharma R, She J, Sheikhbahaei S, Shey M, Shi P, Shields C, Shigematsu M, Shiri R, Shirude S, Shiue I, Shoman H, Shrima MG, Sigfusdottir ID, Silpakit N, Silva JP, Singh JA, Singh A, Skiadaresi E, Sliagar A, Smith DL, Smith A, Smith M, Sobaih BHA, Soneji S, Sorensen RJD, Soriano JB, Sreeramareddy CT, Srinivasan V, Stanaway JD, Stathopoulou V, Steel N, Stein DJ, Steiner C, Steinke S, Stokes MA, Strong M, Strub B, Subart M, Sufiyan MB, Sunguya BF, Sur PJ, Swaminathan S, Sykes BL, Tabarés-Seisdedos R, Tadakamadla SK, Takahashi K, Takala JS, Talongwa RT, Tarawneh MR, Tavakkoli M, Taveira N, Tegegne TK, Tehrani-Banihashemi A, Temsah MH, Terkawi AS, Thakur JS, Thamsuwan O, Thankappan KR, Thomas KE, Thompson AH, Thomson AJ, Thrift AG, Tobe-Gai R, Topor-Madry R, Torre A, Tortajada M, Towbin JA, Tran BX, Troeger C, Truelsen T, Tsoi D, Tuzcu EM, Tyrovolas S, Ukwaja KN, Undurraga EA, Updike R, Uthman OA, Uzochukwu BSC, van Boven JFM, Vasankari T, Venketasubramanian N, Violante FS, Vlassov VV, Vollset SE, Vos T, Wakayo T, Wallin MT, Wang YP, Weiderpass E, Weintraub RG, Weiss DJ, Werdecker A, Westerman R, Whetter B, Whiteford HA, Wijeratne T, Wiyongse CS, Woldeyes BG, Wolfe CDA, Woodbrook R, Workicho A, Xavier D, Xiao Q, Xu G, Yaghoubi M, Yakob B, Yano Y, Yaseri M, Yimam HH, Yonemoto N, Yoon SJ, Yotebieng M, Younis MZ, Zaidi Z, Zaki MES, Zegeye EA, Zenebe ZM, Zerfu TA, Zhang AL, Zhang X, Zipkin B, Zodpey S, Lopez AD, Murray CJL (2017) Global, regional, and national age-sex specific mortality for 264 causes of death, 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet* 390:1151–1210
5. Yeoh DK, Foley DA, Minney-Smith CA et al (2020) The impact of COVID-19 public health measures on detections of influenza and respiratory syncytial virus in children during the 2020 Australian winter. *Clin Infect Dis* Published Online First. <https://doi.org/10.1093/cid/ciaa1475>
 6. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945502/Weekly_Flu_and_COVID-19_report_w51_FINAL.pdf. Accessed 20 Dec 2020
 7. Chu DK, Akl EA, Duda S, Solo K, Yaacoub S, Schünemann HJ, Chu DK, Akl EA, el-harakeh A, Bognanni A, Lotfi T, Loeb M, Hajizadeh A, Bak A, Izcovich A, Cuello-Garcia CA, Chen C, Harris DJ, Borowiack E, Chamseddine F, Schünemann F, Morgano GP, Muti Schünemann GEU, Chen G, Zhao H, Neumann I, Chan J, Khabsa J, Hneiny L, Harrison L, Smith M, Rizk N, Giorgi Rossi P, AbiHanna P, el-khoury R, Stalteri R, Baldeh T, Piggott T, Zhang Y, Saad Z, Khamis A, Reinap M, Duda S, Solo K, Yaacoub S, Schünemann HJ (2020) Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *Lancet* 395:1973–1987
 8. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/950424/Weekly_Flu_and_COVID-19_report_w1_FINAL.PDF. Accessed 11 Jan 2021
 9. The impact of COVID-19 on child abuse in the UK. <https://learning.nspcc.org.uk/research-resources/2020/social-isolation-risk-child-abuse-during-and-after-coronavirus-pandemic>. Accessed 20 Dec 2020
 10. Clinical Trials Register. <https://www.clinicaltrialsregister.eu/ctr-search/search?query=covid-19>. Accessed 20 Dec 2020
- Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.