

Outbreak of SARS-CoV-2 in a Children's Nursery in the United Kingdom

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Background: Early Years' Settings (EYSs) provide childcare and education for children 0–5 years old. They remained fully open in England during the third National lockdown when other educational settings were only open for selected children. EYSs are generally considered to be low-risk settings for transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Methods: An observational study describing a large outbreak of SARS-CoV-2 within an EYS in Cambridgeshire, United Kingdom.

Results: Overall 45 cases of SARS-CoV-2 were identified; 24 adults (71% of staff members) and 21 children (25% of nursery attendees). One case was identified as the alpha variant (B.1.1.7 [VOC-20-DEC-01]). One staff member became critically unwell.

Conclusions: Transmission of SARS-CoV-2 occurred quickly, with a high attack rate; likely a consequence of a variant with enhanced transmissibility and an inability of the setting to adhere to infection control measures.

Key Words: SARS-CoV-2, outbreak, children, early years, nursery

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In the third English National Lockdown, Early Years Settings (EYSs, for young children from 0 to 5 years) remained fully open to all children, unlike educational settings for older ages that were only opened to vulnerable children and children of critical workers. Although cohort studies from around the world describe overall low rates of transmission in educational settings,^{1–6} bigger outbreaks have occurred: individual outbreaks in EYSs with overall attack rates for children/staff of 35%¹ and 26%⁶ are described within 2 reported cohorts.

This study aims to:

- Describe an outbreak of SARS-CoV-2 in an EYS in the UK with a high attack rate.

METHODS

Outbreak Detection and Public Health Response

The nursery is in a small village in Cambridgeshire. During December 2020, it had 34 members of staff and 83 children between 6 weeks and 5 years of age were attending. Children were grouped by age and looked after in separate areas (bubbles/cohorts of up to 25 children) of the nursery. At the time of the outbreak, there was no mixing of children between bubbles whilst attending the nursery; however, some staff worked across more than one bubble.

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The Local Authority Early Years team received notification that a member of staff and a child had tested positive for SARS-CoV-2 on December 13, 2020. Due to increasing numbers of cases (n = 16 positive tests on December 14, 2020), the nursery was immediately closed for all staff and children.

An incident management team (IMT) meeting was convened on December 15, 2020, attended by representatives from the nursery, the Local Authority Early Years, Public Health, Health and Safety teams and a consultant from the Public Health England Health Protection Team. This meeting included detailed review of current case numbers and infection control practices at the nursery.

Case Definition

Cases are defined as those reporting a positive SARS-CoV-2 PCR test; most tests were acquired through national testing routes, available for those with the following symptoms; new continuous cough, fever or anosmia/ageusia. No mass asymptomatic testing of the nursery took place; however, one child who tested positive was tested as part of a research study.

Data Collection

The nursery manager collected names of cases (with positive PCR tests for SARS-CoV-2), symptoms with date of onset, severity of illness and date of test prospectively.

Genomic Studies

At the time of the outbreak, identification of the alpha, B.1.1.7, variant was largely undertaken by monitoring a proxy S gene target failure (SGTF).⁷ Only a proportion of SARS-CoV-2 PCR samples sent from symptomatic cases were analyzed for the SGTF. To investigate whether any of the cases linked to the nursery setting were the newly emerging alpha variant, Public Health England colleagues were asked to determine which samples had been tested as part of routine surveillance for this variant.

RESULTS

Cases

The index case (a member of staff) did not have the classic symptoms of high temperature, cough or anosmia/ageusia associated with SARS-CoV-2 when she attended the nursery on December 8, 2020; however, she was unwell with symptoms of a common cold. She did not attend the setting again that week, subsequently developing a cough and fever. She took a postal test for SARS-CoV-2 on December 11, 2020 which was reported as positive on the December 14, 2020. Figure 1 shows the epidemiologic curve of staff and children at the nursery displaying compatible symptoms of SARS-CoV-2 (or the date of their positive test if asymptomatic) in December 2020.

This shows that the infection spread very rapidly through the setting. The infection seemed to spread predominantly to members of staff initially and subsequently to children at the nursery. Infection spread throughout the nursery to all the childcare bubbles and involved staff covering all the childcare areas, including the

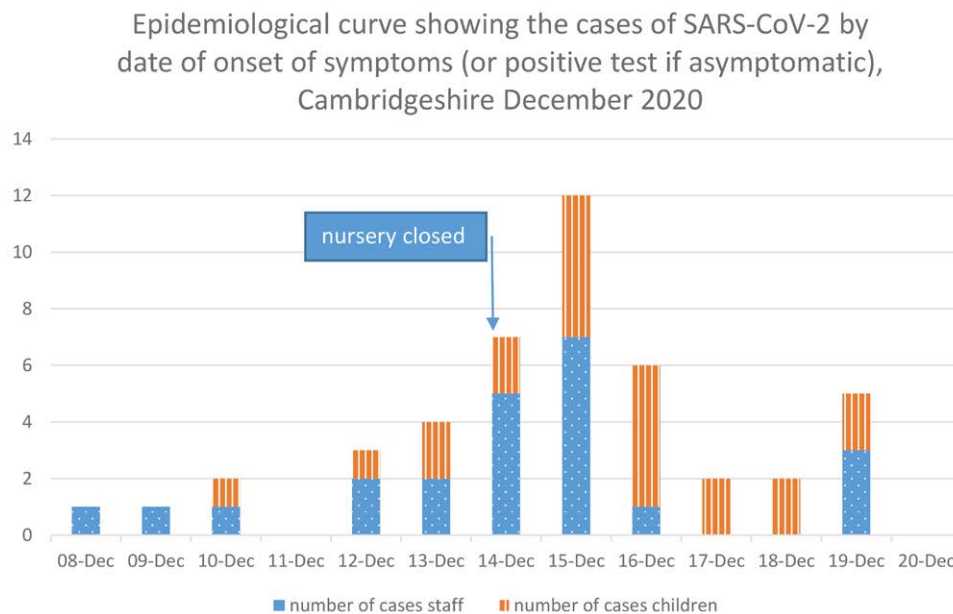


FIGURE 1. Number of cases (presentation of symptoms or positive test) per day.

breakfast club as well as staff working in the kitchen and office areas. In total, 24 adults and 21 children were linked to this outbreak, with an attack rate of 71% for staff and 25% for children.

Symptoms

Figure 2 shows the symptoms reported by cases. The children's symptoms were reported by parents and over half had no symptoms. Although some adults reported cough, anosmia/ageusia or fever, there was a range of other symptoms reported including headache, sore throat and cold or flu-like symptoms.

Two of the members of staff received hospital treatment, including one who developed severe disease and required mechanical ventilation.

Table 1 shows the distribution of positive tests by age group categories.

Genomics

Only one of the positive tests linked to the nursery was selected randomly for routine surveillance purposes by PHE for testing of SGTF and found to have it, suggesting the alpha variant, B.1.1.7. None of the other tests underwent genetic analysis or were tested for SGTF.

Outbreak Management

Investigation by the IMT found that the following practices within the nursery likely to have contributed to transmission in the setting:

- Shared staff areas with poor ventilation: staff room small with insufficient space for social distancing
- Staff breaks simultaneously, leading to congregation of staff in shared spaces for prolonged periods.
- Links between staff and children; some staff shared accommodation or transport to work. Some staff's children attended the nursery setting.
- In large part, the different groups of children (bubbles), had dedicated members of staff. However, there was some cross over between areas to facilitate staff breaks.

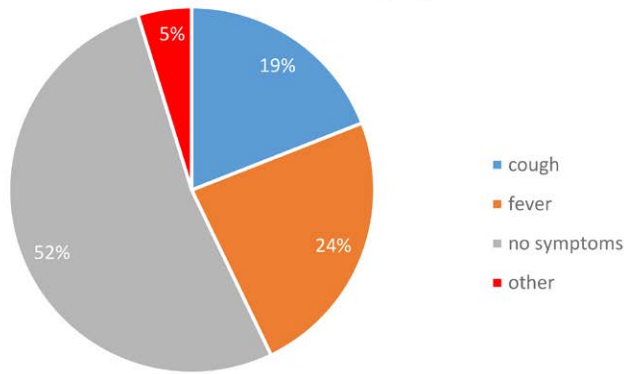
CONCLUSION

This report describes an outbreak of SARS CoV-2 in an educational setting for young children in the UK. The outbreak occurred before the widespread vaccination of the UK adult population and spread extensively to one-quarter of attending children and 71% of employees. One case was identified as being infected with the alpha variant (B.1.1.7) and it is likely that this accounted for the whole outbreak. This became the main variant in the UK until June 2021 when the even more transmissible delta variant (B.1.617.2 [VOC-21APR-02]) became dominant.⁸ Infection spread rapidly with a short incubation period and a predominance of atypical symptoms in adults.

The attack rate was lower for children than adults at the nursery; however, there is uncertainty around the numbers given there was no universal testing. Except for one child identified as positive through a concurrent research study, tests were only accessible with one of the classic symptoms of coronavirus disease 2019 (COVID-19) infection, continuous cough, pyrexia and anosmia/ageusia. However, some adults and children were tested who reported no symptoms to the nursery manager, despite the fact they accessed testing through national routes. It is very probable that cases went unrecognized from the setting; there may have been reluctance to test young children and children may have been more likely to be asymptomatic and/or not able to report symptoms than adults. The outbreak occurred during a period of high community transmission; case rates in Cambridgeshire were >200 per 100,000 people.⁹ We are unable to rule out the influence of multiple seeding events from the community; however, the IMT concluded that direct transmission within the setting is likely to be the main source of infection.

EYSs are diverse in their accommodation in the UK and it is likely that many are in buildings not readily adaptable to levels of ventilation or spatial requirements to assist infection prevention. Staff to staff transmission likely accounted for much of the initial spread of infection, driven by exposure in poorly ventilated, small shared spaces. It is likely that other workplaces, including some healthcare settings and care homes, share similar spatial and environmental challenges.

Children's reported main symptoms



Adult's reported main symptoms

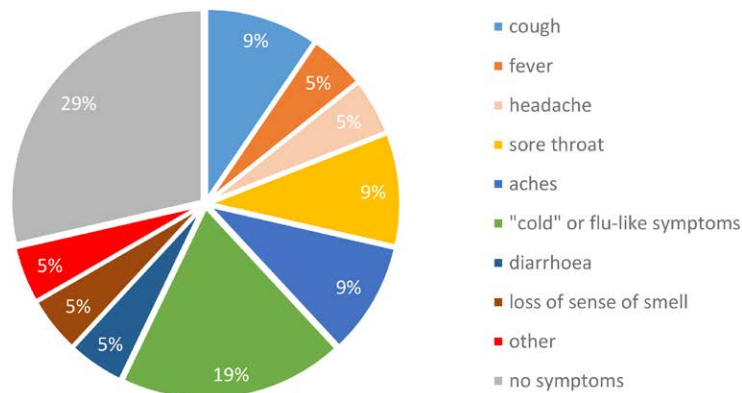


FIGURE 2. Symptoms experienced by staff and children.

It is difficult to see how this outbreak could have been better contained given the testing routes available in December 2020, the setting was closed immediately upon receipt of the first test results. However, access to regular asymptomatic testing for EY staff, as has been subsequently available in the UK, may have allowed quicker identification of cases and led to earlier self-isolation, contact tracing and reduced transmission.

In the UK, only a limited number of children are currently being offered vaccination, consistent with advice from the Joint

Committee on Vaccination and Immunisation.^{10,11} Despite high levels of vaccination in the adult population, there were over 1000 reported outbreaks per week in EYs in July 2021,¹² associated with the Delta variant. The full impact of the adult vaccination program on transmission within EYs in the UK is yet to be determined and it seems likely that other infection control measures will still have an important role in preventing outbreaks. This report demonstrates the importance of prompt isolation and testing for people with possible symptoms of SARS-CoV-2.

TABLE 1. Positive Case Numbers and Symptoms in Children by Age Category

Child's Age Group in yrs*	Number of Cases	Total Number of Children	Attack Rate (%)	Number of Children With at least One Symptom† (Percentage of Cases)
0–1	4	9	44	3 (75%)
1–2	5	16	31	3 (60%)
2–3	11	35	31	2 (18%)
3–4	1	23	4	1 (100%)
Total	21	83	25	9 (43%)

*Children were looked after by academic year age group in the EYS. The 2- to 3-year-old children were divided into 2 groups.

†Symptom defined as continuous cough, fever or anosmia/ageusia (one of which is usually required to be present to gain access to SARS-CoV-2 testing in the UK).

EYS indicates Early Years' Setting; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

REFERENCES

1. Macartney K, Quinn HE, Pillsbury AJ, et al; NSW COVID-19 Schools Study Team. Transmission of SARS-CoV-2 in Australian educational settings: a prospective cohort study. *Lancet Child Adolesc Health*. 2020;4:807–816.
2. Yung CF, Kam KQ, Nadua KD, et al. Novel coronavirus 2019 transmission risk in educational settings. *Clin Infect Dis*. 2021;72:1055–1058.
3. Heavey L, Casey G, Kelly C, et al. No evidence of secondary transmission of COVID-19 from children attending school in Ireland, 2020. *Euro Surveill*. 2020;25:2000903.
4. Yoon Y, Kim KR, Park H, et al. Stepwise school opening and an impact on the epidemiology of COVID-19 in the children. *J Korean Med Sci*. 2020;35:e414.
5. Ehrhardt J, Ekinci A, Krehl H, et al. Transmission of SARS-CoV-2 in children aged 0 to 19 years in childcare facilities and schools after their reopening in May 2020, Baden-Württemberg, Germany. *Euro Surveill*. 2020;25:2001587.
6. Ismail SA, Saliba V, Lopez Bernal J, et al. SARS-CoV-2 infection and transmission in educational settings: a prospective, cross-sectional analysis of infection clusters and outbreaks in England. *Lancet Infect Dis*. 2021;21:344–353.
7. Public Health England. Investigation of novel SARS CoV-2 variant: technical briefing 5. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/959426/Variant_of_Concern_VOC_202102_01_Technical_Briefing_5.pdf. Accessed September 10, 2021.
8. Public Health England. SARS-CoV-2 variants of concern and variants under investigation in England. Technical briefing 13. 2021. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/990339/Variants_of_Concern_VOC_Technical_Briefing_13_England.pdf. Accessed September 10, 2021.
9. Department of Health and Social Care. East of England: lower tier local authority watchlist- epidemiological charts. 2020. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/948481/East_of_England_epidemiological_charts_2020-12-28.pdf. Accessed September 10, 2021.
10. Department of Health and Social Care. JCVI statement on COVID-19 vaccination of children and young people aged 12 to 17 years. 2021. Available at: <https://www.gov.uk/government/publications/jcvi-statement-august-2021-covid-19-vaccination-of-children-and-young-people-aged-12-to-17-years/jcvi-statement-on-covid-19-vaccination-of-children-and-young-people-aged-12-to-17-years-4-august-2021>. Accessed August 22, 2021.
11. Department of Health and Social Care. JCVI statement on COVID-19 vaccination of children aged 12 to 15 years. 2021. Available at: <https://www.gov.uk/government/publications/jcvi-statement-september-2021-covid-19-vaccination-of-children-aged-12-to-15-years/jcvi-statement-on-covid-19-vaccination-of-children-aged-12-to-15-years-3-september-2021>. Accessed September 10, 2021.
12. Ofsted. Transparency data: Reported coronavirus (COVID-19) notifications by registered early years and childcare settings. Updated June 1, 2021. Available at: https://www.gov.uk/government/publications/reported-coronavirus-covid-19-cases-by-registered-early-years-and-childcare-settings?utm_medium=email&utm_campaign=govuk-notifications&utm_source=51274807-2b68-415e-ab07-3b197081f2e5&utm_content=daily. Accessed September 10, 2021.