

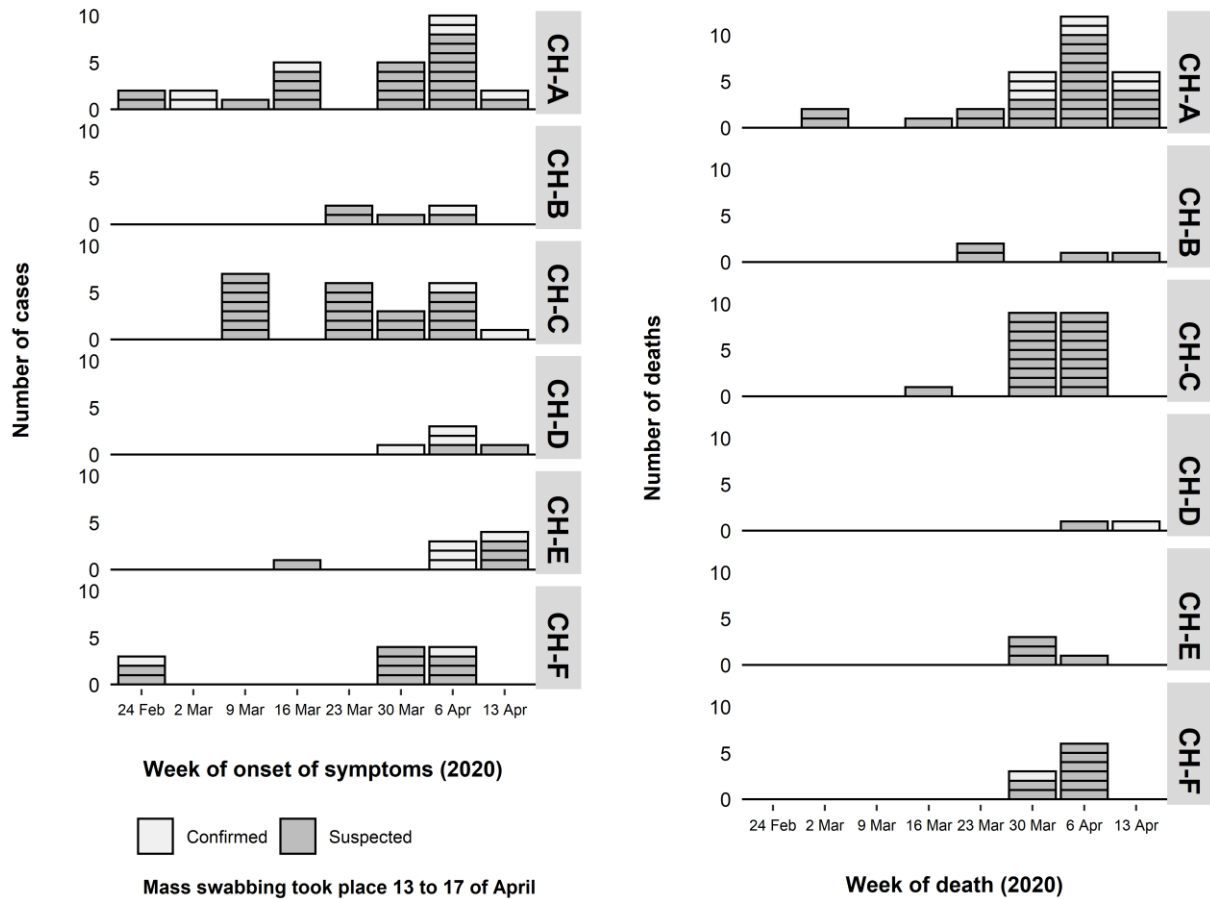
# **INVESTIGATION OF SARS-CoV-2 OUTBREAKS IN SIX CARE HOMES IN LONDON, APRIL 2020**

The London Care Home Investigation

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## **SUPPLEMENT INFORMATION**

**Supplement Figure S1:** Epidemic curves for the 6 London care homes with a COVID-19 outbreak that were investigated by Public Health England. Testing across the six care homes took place during the weekend ending 12 April 2020. The vertical column denotes the number of COVID-19 confirmed (orange), suspected (blue) and fatal (grey) cases among residents



**Supplement Table S2: Summary of infection prevention and control advice**

<b>General infection prevention and control advice</b>	
<b>Hand hygiene</b>	Reinforce education of staff and visitors about hand and respiratory hygiene and display PHE posters widely. Ensure PHE infection control policies are up to date, read and followed by all staff. Ensure liquid soap and disposable paper towels are available at each sink, and alcohol-based hand rub (at least 70%) is in every room/communal area, and stocks are adequately maintained. If it is not possible to have alcohol hand rub in rooms/communal areas, consider providing staff with individual containers.
<b>Personal protective equipment (PPE)</b>	Ensure that PPE is available, i.e. disposable gloves, aprons, and splash proof surgical masks, plus eye protection for procedures that may generate splashback. Ensure PPE is changed between residents (masks and eyewear can be sessional). PPE should be worn for all care activities regardless of whether residents have a suspected/confirmed case.
<b>Linen and waste</b>	Ensure linen management and clinical waste disposal systems are in place, including foot operated bins. Guidance on linen and waste handling is provided by PHE.
<b>Environmental cleaning</b>	Enhanced cleaning in home during outbreak e.g. 2 hourly cleaning in communal areas that are not closed. Clean surfaces, and high touch areas frequently (e.g. door handles). Clean common equipment between residents, e.g. hoists, aids, baths, showers. Maintain adequate levels of equipment in anticipation of increased cleaning (e.g. disposable cloths, mop heads, detergent, etc).
<b>Staffing</b>	Allocate a separate staff cohort to support residents with symptoms. Avoid, where possible allocating agency staff to this task. Any staff who have recovered from confirmed COVID-19 should be allocated to this. Staff should be advised not to rotate within groups of care homes.
<b>Visitors</b>	Any visitors should be limited to only essential persons, i.e. main carer. Discourage visits by children. Family and friends should be advised not to visit care homes, except next of kin in exceptional situations such as end of life. Healthcare visits should be restricted to those that are essential. Advise any visiting health professionals of an outbreak and rearrange non-urgent visits to the home.
<b>Transfers</b>	Transfer of residents to hospital or other institutions should be avoided unless clinically necessary/medical emergency and, if possible, advised by the GP. If transfer is required, transport services (including emergency ambulances) and the receiving hospital/setting should be made aware of any suspected outbreak in the home, and/or if the resident is a suspected case BEFORE transfer.
<b>Closure</b>	Discuss any potential closure to new admissions to the affected area/care home during an outbreak. However, with heightened bed pressures across the health and care sector, decisions around closure are not straight-forward. Where providers consider there to be imminent risks to the continuity of care, e.g. potential closure of a service, they should raise this with the Local Authority (Social Care commissioner) without delay.
<b>For symptomatic or confirmed cases</b>	
<b>Residents</b>	Isolate residents for 14 days from the onset of symptoms, or date of test if asymptomatic. <ul style="list-style-type: none"> <li>• Cases should be isolated in their bedroom</li> <li>• Discourage use of communal areas</li> <li>• If communal areas remain open, advise that chairs should be 2 metres apart- magazines, books and games to be removed</li> </ul>

	<ul style="list-style-type: none"> <li>Avoid the use of fans that re-circulate the air</li> </ul>
<b>Staff</b>	<p>Self-isolate for 7 days after onset of symptoms or date of test if asymptomatic.</p> <p>Household members should self-isolate for 14 days. If they develop symptoms, they should isolate for 7 days from the date of symptom onset.</p> <p>Staff members who have completed 7 days isolation and no longer have symptoms do not require a negative test before returning to work</p>

**Source:**

**Adapted from:**

Public Health England. Winter-readiness information for London care homes. 2018.

**Reference:**

Department of Health and Social Care. *Admission and Care of Residents during COVID-19 Incident in a Care Home*. Published 2 April 2020. <https://www.gov.uk/government/publications/coronavirus-covid-19-admission-and-care-of-people-in-care-homes>

Public Health England. *How to work safely in care homes*. <https://www.gov.uk/government/publications/covid-19-how-to-work-safely-in-care-homes>

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<https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control/covid-19-personal-protective-equipment-ppe>

**Supplement Table S3: Summary of the six care homes by type and infection control measures in place at time of investigation**

Care Home	Care home type	Layout of care home	Room types	Infection Control
<u>A</u>	Nursing & end of life care	5 floors	Single occupancy rooms with ensuite	Staff did not have full PPE. They had gloves & aprons but no face masks for 3 weeks
<u>B</u>	Nursing and Dementia care	2 floors, 21 general nursing, 26 dementia	Single occupancy rooms with ensuite	Staff were using PPE for care duties regardless of residents' symptoms. No issues with PPE stock
<u>E</u>	Nursing	Layout: 3 floors; ground floor 9 bedded unit, middle floor 18 bedded unit, top floor 18 bedded unit	Single occupancy rooms with ensuite	Staff using PPE for all the residents; increased cleaning of touch surfaces, hoists etc. since first case confirmed
<u>E</u>	½ nursing, ½ residential for dementia	4 floors: units 2 nursing, 2 residential	Single occupancy rooms with ensuite	PPE regardless of symptoms of residents, keeping all residents in isolation as much as possible.
<u>C</u>	Residential & Nursing	Distributed over 3 floors	Single occupancy rooms with ensuite	Adequate PPE and linen and waste management systems in place; closed to admissions and transfers
<u>D</u>	Nursing Care Home	3 floors; currently most people staying in their rooms with social distancing in room	Single ensuite rooms for all but 3 residents who were sharing a room	Rigorous infection prevention and control measures already in place. All staff were using PPE throughout the care home

PPE (aprons, gloves, surgical masks and visors); IPC = infection control measures in place

**Supplement Table S4: Live virus isolation among asymptomatic and symptomatic residents and staff, according to timing of symptom onset**

RESIDENTS	STAFF
<b>Post-symptomatic</b> -7 days (1/1 positive) -6 days (1/1 positive) -4 days (1/1 positive) -3 days (0/1 positive) -1 days (0/1 positive)	<b>Post-symptomatic</b> -13 days (0/1 positive) -9 days (0/2 positive) -7 days (1/1 positive) -6 days (0/1 positive) -4 days (1/1 positive) -2 day (1/1 positive)
<b>Pre-symptomatic</b> +1 days (0/1 positive) +9 days (0/1 positive) +11 days (1/2 positive) +13 days (1/1 positive)	<b>Pre-symptomatic</b> +2 day (0/1 positive) +4 days (1/1 positive) +6 days (1/1 positive)
<b>Symptomatic</b> -15 days (0/1 positive) -12 days (1/2 positive) -11 days (1/2 positive) -10 days (0/1 positive) -9 days (0/1 positive) -8 days (0/1 positive) -7 days (1/2 positive) -6 days (0/3 positive) -4 days (0/1 positive) -2 days (1/1 positive) 0 days (1/1 positive)	<b>Symptomatic</b> -10 days (0/1 positive) -9 days (0/1 positive) -5 days (1/1 positive) -4 days (1/1 positive) -3 days (0/1 positive)
<b>Asymptomatic</b> 5/17 (29.4%) positive	<b>Asymptomatic</b> 2/6 (33.3%) positive

**Supplement Table S5: Live virus isolation by RT-PCR cycle threshold (Ct) values among asymptomatic and symptomatic residents and staff, according to timing of symptom onset.** Numbers in parenthesis for residents and staff indicate timing of symptom onset from the day of testing (x denotes symptom onset date not available)

Ct Value	RESIDENTS	STAFF
<b>&lt;20</b> (2/2 positive, 100%)	<b>2 POSITIVE</b> Pre-symptomatic (11) Symptomatic (-12)	-
<b>20 to &lt;25</b> (14/17 positive, 82.4%)	<b>10 POSITIVE</b> 2 Asymptomatic 3 Symptomatic (-11, -7, -2) 3 Post-symptomatic (-4, -6, -7) 2 Pre-symptomatic (9, 13)  <b>2 NEGATIVE</b> 1 Asymptomatic 1 Symptomatic (-7)	<b>4 POSITIVE</b> 2 Asymptomatic 1 symptomatic (-5) 1 post-symptomatic (-4)  <b>1 NEGATIVE</b> Asymptomatic
<b>25 to &lt;30</b> (6/15 positive, 40.0%)	<b>2 POSITIVE</b> 1 Asymptomatic 1 Symptomatic (0)  <b>8 NEGATIVE</b> 2 Asymptomatic 3 Symptomatic (-6, -10, -15) 3 Pre-symptomatic (1, 11, X)	<b>4 POSITIVE</b> 1 Asymptomatic 1 Symptomatic (-4) 1 Post-symptomatic (-7) 1 Pre-symptomatic (+6)  <b>5 NEGATIVE</b> 5 Asymptomatic
<b>30 to &lt;35</b> (9/53 positive, 17.0%)	<b>5 POSITIVE</b> 4 Asymptomatic 1 Pre-symptomatic (x)  <b>21 NEGATIVE</b> 10 Asymptomatic 8 Symptomatic (-4, -6, -6, -8, -9, -11, -12, X) 2 Post-symptomatic (-3, -1) 1 Pre-symptomatic (2)	<b>4 POSITIVE</b> 2 Asymptomatic 1 Post-symptomatic (-2) 1 Pre-symptomatic (+4)  <b>23 NEGATIVE</b> 14 Asymptomatic 4 Symptomatic (-3, -6, -9, -10) 4 Post-symptomatic (-9, -9, -13)

**Supplement Data S6. Whole genome sequence analysis of SARS-CoV-2 strains causing an outbreak in 6 London Care Homes**

Care home	Number samples tried	Number sequences derived	Staff	Residents
Care home A	55	21	8	13
Care home B	14	7	0	7
Care home F	21	13	5	8
Care home E	19 (one duplicate)	13	4	9
Care home C	26	11	2	9
Care home D	47	34	12	22

**Table S6a. SARS-CoV-2 strains selected for whole genome sequencing by care homes**

All 158 PCR positive samples were used for WGS analysis. Of these, 99 yielded sequence sufficient for WGS analysis distributed amongst all the care homes; 31/99 from staff and 68/99 from residents. Sequences were aligned using mafft (version 7.310), manually curated and a phylogenetic tree was built using IQtree (version 2.04). This phylogenetic tree (**Figure 3 in the manuscript**) was coloured to indicate care home of origin and annotated to indicate sequences derived from staff members and sequences from residents who had died. In order to place care home derived sequences within a comprehensive background of SARS-CoV2 genomes from within the UK, care home sequences were identified within the COG consortium maximum likelihood phylogeny containing 27,768 sequences (tree included as **Supplement Figure S6b** below).

Phylogenetic analysis indicated the presence of informal clusters from Care homes A, B, D, E present in both the phylogeny from care home sequences ((**Figure 2 in the manuscript**) and within the large background dataset (**Supplement Figure S6c**). The largest cluster (care home D) contained 28 sequences of which 15 sequences exhibited zero SNPs difference and the maximum distance between sequences was three SNPs. The presence of clusters containing care home sequences, that did not contain background sequences and were distinct from that background, provided good evidence for introduction and subsequent spread of a SARS-CoV2 strain in a care home setting.

Each of the six care homes contained SARS-CoV-2 genomes from lineages B.1 and B.2 and the distance between sequences in the large cluster (n. 28) in care home D (lineage B.2.1) and the sequences in lineage B.1 was 13 - 18 SNPs. This provides good evidence for multiple introductions of the virus into care home settings. The placement of sequences in the phylogeny indicated that care home A exhibited three distinct sequence clusters along with six singletons, potentially representing up to nine separate introductions.

There were ten sequences that had a 0 SNP distance between them which were from three different care homes. However, these sequences were part of a large clade of sequences within the B.1 lineage (n. > 5,500). Comparison of these sequences with the background data showed that the care home sequences did not form a discrete cluster (**Supplement Figure S6d**). Some lineage B.1 sequences that were not from care homes were also identical to the ten sequences from the three different care homes. It is therefore possible that identical viruses were introduced from other settings into all three homes separately, instead of being transferred from home to home. This observation means that genomics can neither exclude nor confirm that the cases in separate homes were linked.

All care home clusters of SARS-CoV-2 genomes included at least one staff member, apart from those from the care home with no PCR positive staff. Other than this observation, there was no genetic







**Supplemental S6c. Image take from COG Consortium phylogeny of 27768 SARS-CoV-2 genomes.** The taxa labelled in light blue are a cluster of sequences from Care home D, The cluster of taxa in dark blue are sequences from Care home E. In both examples the informal cluster of sequences derived from care home settings is retained in the presence of a large background



**Supplement Table S7. Potential strategies for prevention of COVID-19 in care home**

<ul style="list-style-type: none"><li>• <b><u>Prevention is fundamental</u></b> to controlling outbreaks in care homes by reducing introduction of SARS-CoV2, increasing infection prevention control (IPC) and early detection of COVID-19 cases in Care homes.</li><li>• <b><u>Ensure early testing of unwell residents</u></b> including those with atypical COVID-19 symptoms (drowsiness, reduced appetite, lethargy and fatigue)</li><li>• <b><u>Limit close contact between residents</u></b> along with immediate isolation of residents as soon as a single case is suspected</li><li>• <b><u>Ensure residents are isolated for 14 days after a known high-risk exposure</u></b> (e.g. admission to hospital), consider intermediate care and other local support to minimise risk of introduction into the home.</li><li>• <b><u>Test Staff</u></b> (any staff, not just carers) who are unwell with any symptoms, typical or atypical and ensure that they are negative for SARS-CoV-2 and asymptomatic (other viruses can cause similar illnesses) before they enter care home</li><li>• <b><u>Exclude SARS-CoV-2 positive staff for 7 days</u></b> from work, irrespective of whether symptomatic or asymptomatic at the time of testing</li><li>• Avoid where possible, <b><u>agency staff</u></b> and ensure they get appropriate IPC training before they enter the care home</li><li>• <b><u>Wider testing in the care home during the early detection of an outbreak</u></b>: test all (including staff) those in contact with unwell resident including staff – this may be one part or one floor or the whole care home (residents and staff). The same principle applies for testing staff and residents who have been in contact with symptomatic staff</li><li>• <b><u>Enhanced cleaning of high touch surfaces</u></b> and hand hygiene before and after every resident contact</li><li>• Rigorous and systematic testing policy for staff and residents, with particular attention to <b><u>infection control measures for visitors, new residents</u></b> and <b><u>movement of residents and staff from other facilities</u></b>.</li></ul>
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