Lineages report for CAMB

This report gives summaries of UK specific lineages sequenced by CAMB for week 2020-06-05. There are time lags due to batching, curation and analysis, the most recently sampled sequence is 2020-05-30. The analysis (eg time since last sample) is therefore undertaken from this date. 1162 sequences in the UK from the sequencing centre CAMB have been included in this analysis.

A few notes: the size of a lineage may be due to a low amount of transmission of this lineage, but it is likely also that it just hasn't been sampled as frequently, especially for newer lineages. It's also important to realise that these lineages are *estimates* of how we think the virus is spreading in the UK after being introduced from abroad, as the low evolutionary rate of the virus makes it difficult to separate lineages with certainty.

The minimum number of introductions is 457 and the maximum is 586

Sequences which were replicates or too error-prone were removed from this analysis.

420 are lineages which only contained five sequences or fewer, and so have been left out of visualisation in the interests of clarity

Furthermore, those sequences which haven't been sampled in the last month are not shown.

Of the 26 that remain: 14 are pending extinction, ie last seen three weeks ago. 6 lineages have gone quiet, ie haven't been seen this week. 6 lineages have been continuously circulating.

The following table contains information about the ten largest lineages lineages and the number of sequences the dataset. Information about other lineages is found in the appendix, along with the raw data for all of the other figures.

Each entry is the count of sequences from each lineage in each country, with the percentage of the total sequences from that lineage that this count represents.

"Activity score" is calculated by taking the average gap between sampling for each lineage, and dividing it by the number of days since the lineage was last sampled. Therefore the higher the number, the more active the lineage is. If the score is above 1, then it has been sampled *more* recently than expected given its average gap size. We might interpret this as an increase in activity. If the score is below 1, it has been sampled *less* recently than expect given its average gap size, so we might interpret this as a decrease in activity.

The global lineages are correct as of the data release on 2020-05-19

It is written to "summary_files" as "lineage_summary.tsv" for further use, and the full list of lineages is available in the same directory as "all_lineages.csv"

Lineage name	England	Date range	Total sequences	Global lineage	Time since last sample (days)	Activity score
UK5	93 (100.0%)	Mar-15, May-30	93	B.1.1.1	0	active today
UK167	29 (100.0%)	Apr-01, May-21	29	B.1.66	9	0.1984
UK26	27 (100.0%)	Apr-05, May-18	27	B.1.1.3	12	0.1378
UK128	27 (100.0%)	Apr-09, May-27	27	B.1.1	3	0.6154
UK113	26 (100.0%)	Apr-09, May-30	26	B.1.1	0	active today
UK57	25 (100.0%)	Apr-05, Apr-28	25	B.1.1	32	0.0299
UK565	21 (100.0%)	Mar-31, May-13	21	B.1.1	17	0.1265
UK2464	21 (100.0%)	Mar-17, May-11	21	B.1.p11	19	0.1447
UK371	21 (100.0%)	Apr-10, May-19	21	B.1.1	11	0.1773
UK494	20 (100.0%)	Mar-20, May-04	20	B.1.p11	26	0.0911

These data is represented in the figure one. Note that the number of sequences is likely to be due more to differing sampling efforts in different regions, rather than genuine differences in numbers of cases.

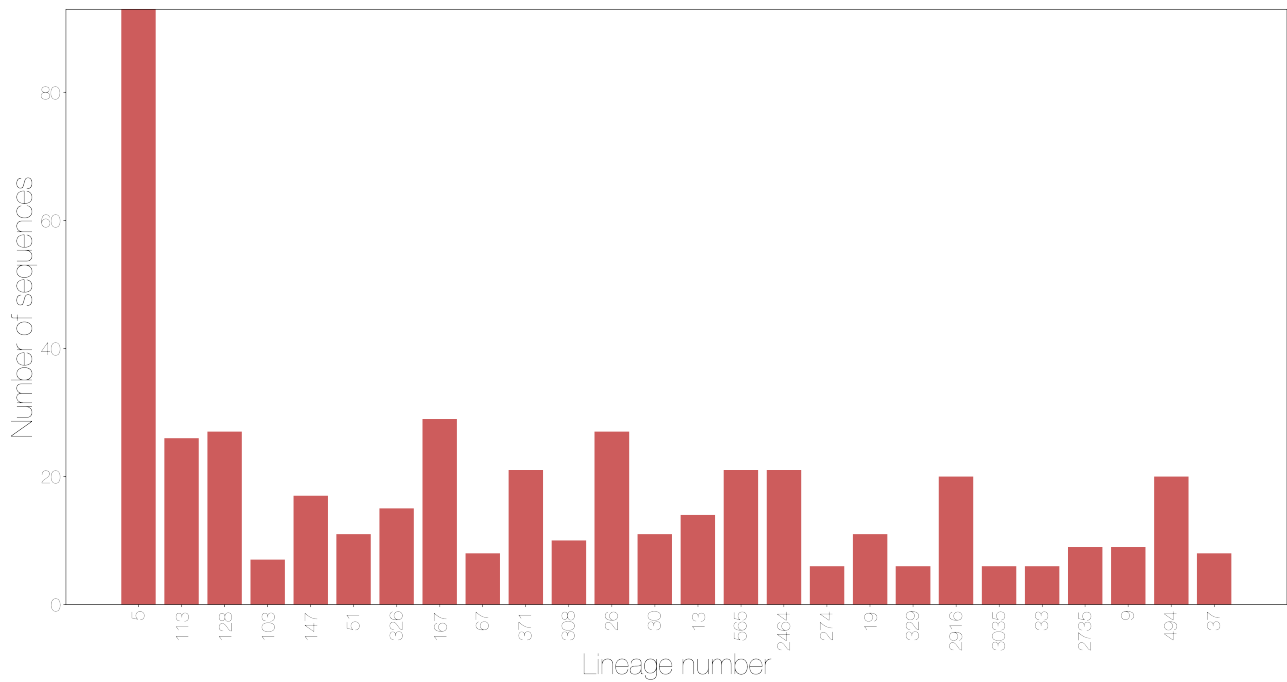The raw data for this bar chart are in the table above.

Figure 1: Number of sequences sampled in a lineage by country

Different sequencing centres have different delays in turn around from receipt of samples to submission of sequence data. This will affect all of the figures shown after this if lineages have geographical variation, as some regions have less up to date data.

`The lag for this sequencing centre is 6 days`

The relative growth and decline of the ten most sampled lineages in terms of number of counties they are present in is shown in figure three.

Figure 2: Lineages by number of adm2 regions present by epiweek
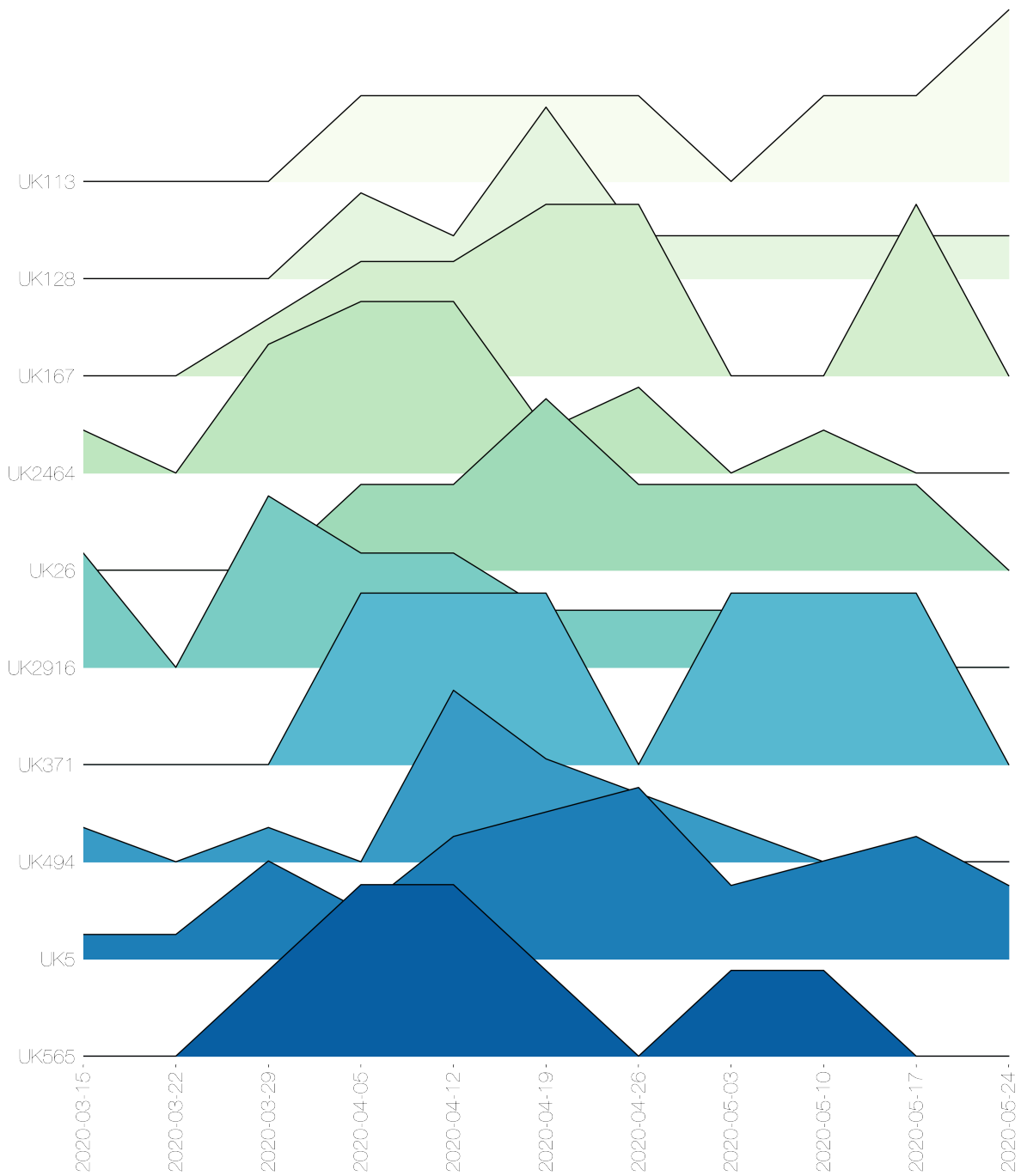
These lineages are shown on the timeline. Each line represents the length of the cluster, from oldest to most recent sampling date. The dots are sized by the number of sequences taken on that date, and again are colour coded by country. The raw data has been written to a summary file.
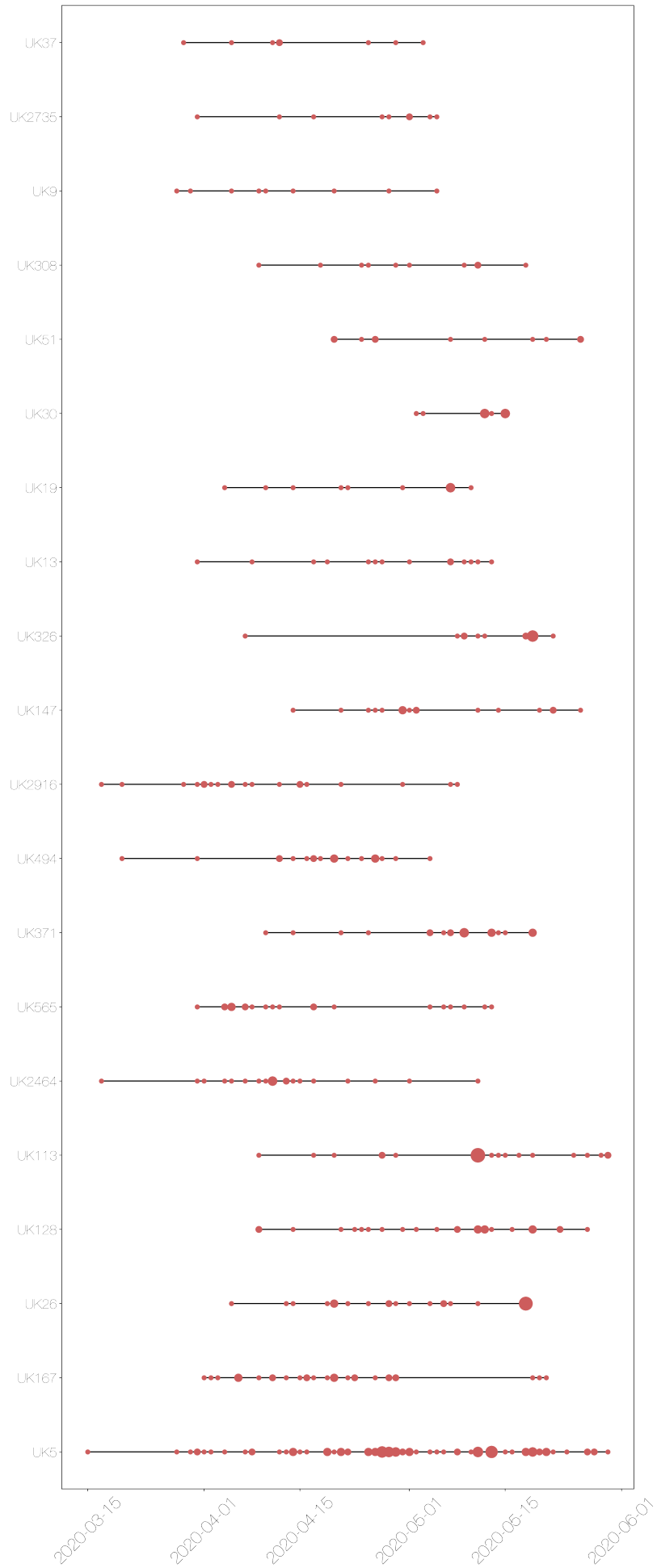
Figure 3: Timeline of lineages, sized by number of sequences from each country.

The date of first sequence in the cluster is shown in figure five for every cluster with date information.
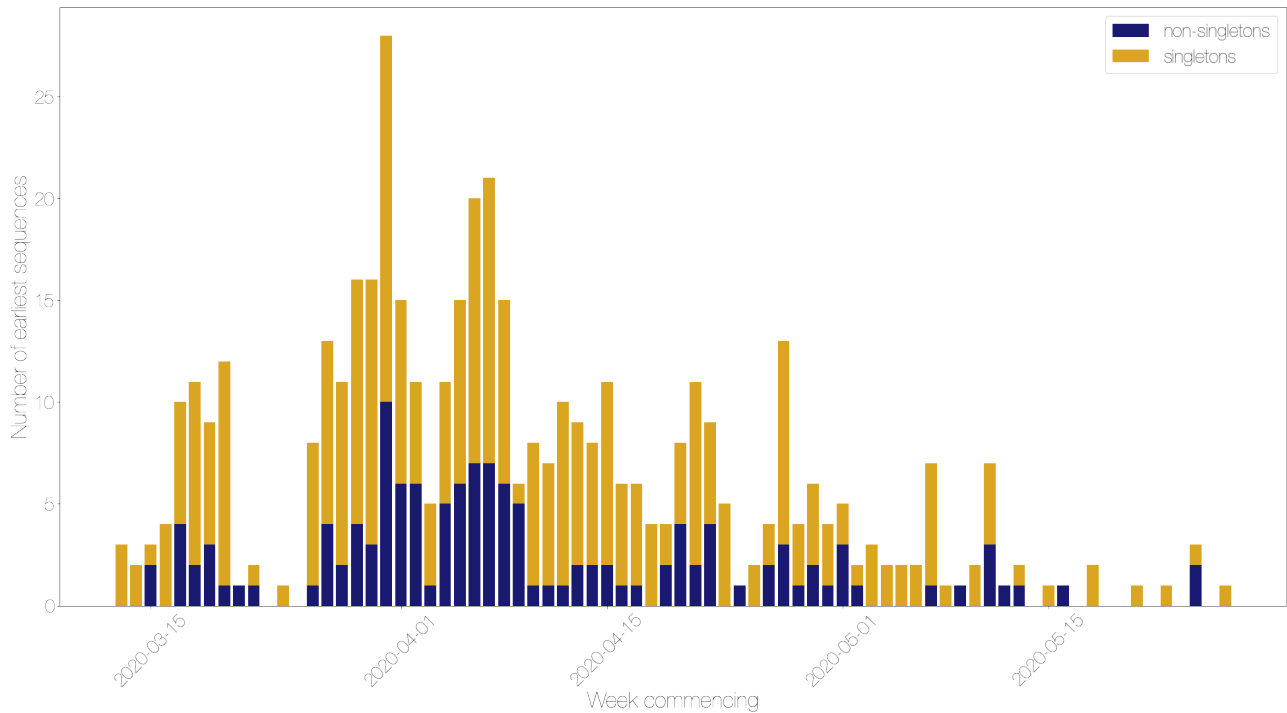
Figure 4: Lineage starts per week, split by singletons and non-singletons

For comparison, here is a plot of the day that every sequence was taken, coloured by country. Note that sequences without dates were not included.
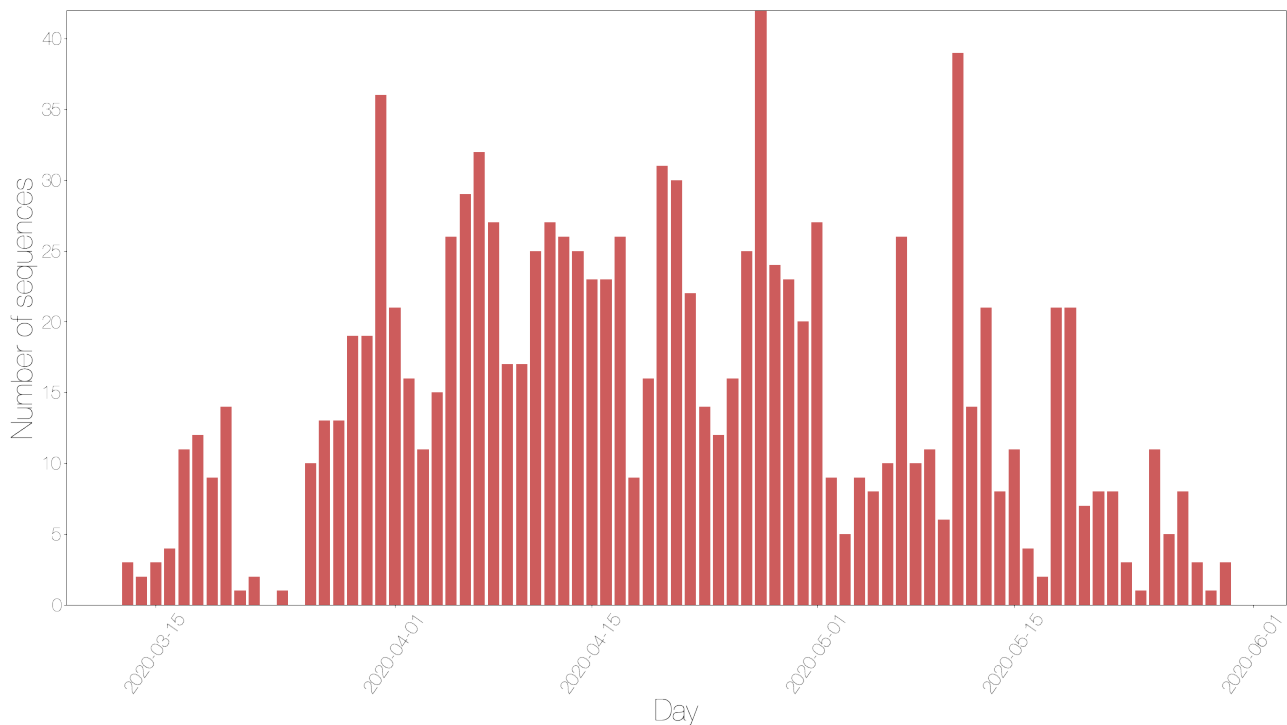
Figure 5: Sequences taken on each day by country

The map shows the number of sequences sampled in each admin2 region in the UK. The colour scale is the same for all four countries, but with different underlying base colours.

`There are 29 sequences without enough geographical information to map`

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from this centre.
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Number of sequences
- 0-10
- 10-50
- 50-100
- 100-150
- 150-200
- 250-300
- 300-400
- No sequences yet

Figure 6: Map showing the number of sequences sampled by adm2 region

Other results modules for UK lineage analysis can be added in here if required.

Appendix

Below are the raw data tables for each of the figures in the report.

Table S1 Description of all lineages that have been circulating in the last month, and have more than 5 sequences.

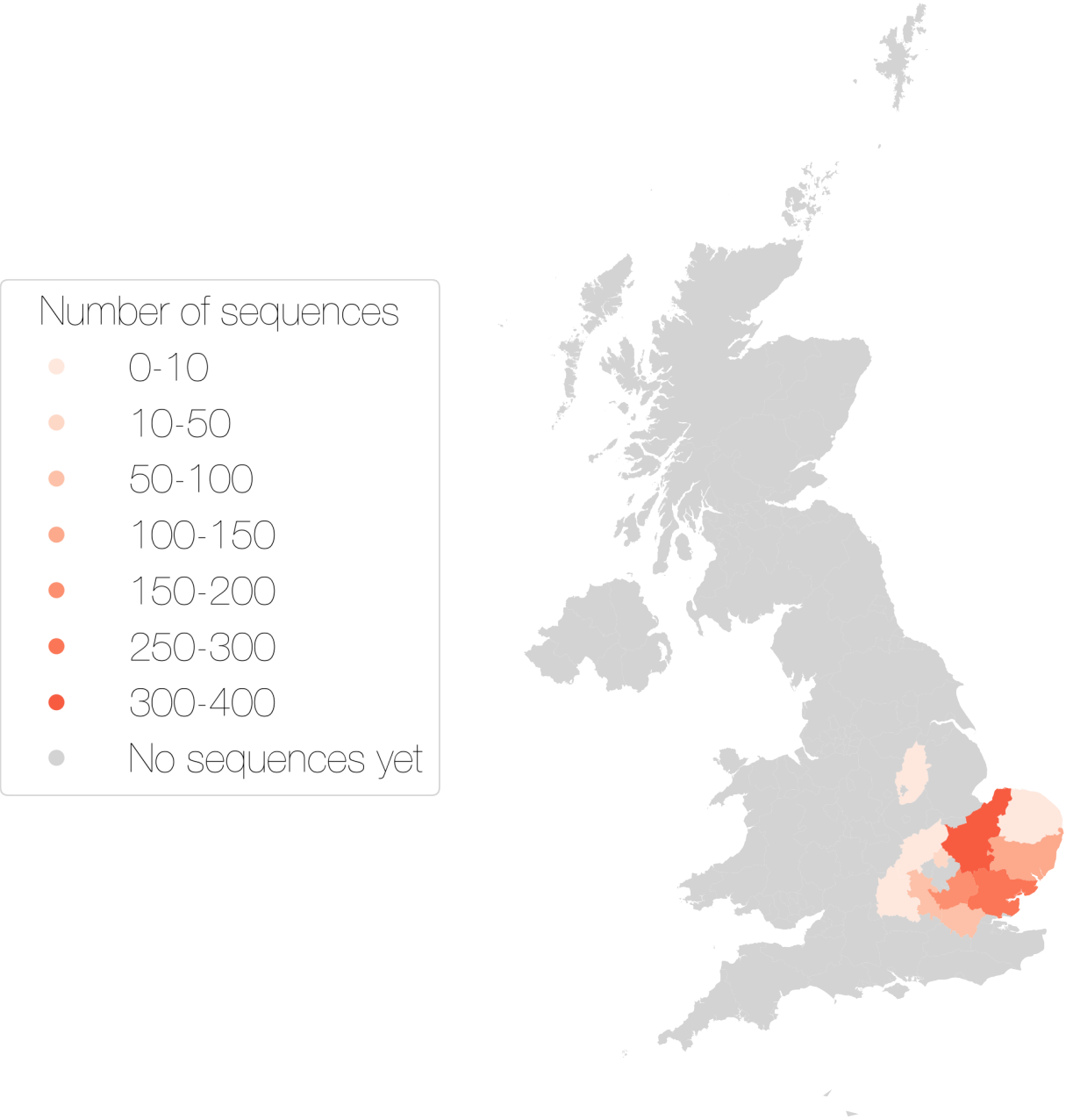| Lineage name	England	Date range	Total sequences	Global lineage	Time since last sample (days)	Activity score
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UK26	27 (100.0%)	Apr-05, May-18	27	B.1.1.3	12	0.1378
UK128	27 (100.0%)	Apr-09, May-27	27	B.1.1	3	0.6154
UK113	26 (100.0%)	Apr-09, May-30	26	B.1.1	0	active today
UK57	25 (100.0%)	Apr-05, Apr-28	25	B.1.1	32	0.0299
UK565	21 (100.0%)	Mar-31, May-13	21	B.1.1	17	0.1265
UK2464	21 (100.0%)	Mar-17, May-11	21	B.1.p11	19	0.1447
UK371	21 (100.0%)	Apr-10, May-19	21	B.1.1	11	0.1773
UK494	20 (100.0%)	Mar-20, May-04	20	B.1.p11	26	0.0911
UK2916	20 (100.0%)	Mar-17, May-08	20	B.1	22	0.1244
UK147	17 (100.0%)	Apr-14, May-26	17	B.1.1	4	0.6562
UK1849	15 (100.0%)	Apr-07, Apr-20	15	B.1.1	40	0.0232
UK326	15 (100.0%)	Apr-07, May-22	15	B.1.1.10	8	0.4018
UK13	14 (100.0%)	Mar-31, May-13	14	B.1.1	17	0.1946
UK5672	12 (100.0%)	Mar-22, Apr-29	12	B.2	31	0.1114
UK30	11 (100.0%)	May-02, May-15	11	B.1.1	15	0.0867
UK19	11 (100.0%)	Apr-04, May-10	11	B.1	20	0.18
UK51	11 (100.0%)	Apr-20, May-26	11	B.1.36	4	0.9
UK308	10 (100.0%)	Apr-09, May-18	10	B.1.1	12	0.3611
UK183	10 (100.0%)	Apr-06, Apr-23	10	B.1.1	37	0.0511
UK180	10 (100.0%)	Mar-30, Apr-29	10	B.1.1	31	0.1075
UK2735	9 (100.0%)	Mar-31, May-05	9	B.1.1	25	0.175
UK9	9 (100.0%)	Mar-28, May-05	9	B.1.13	25	0.19
UK5214	8 (100.0%)	Apr-07, Apr-27	8	B.1.1	33	0.0866
UK67	8 (100.0%)	Apr-22, May-21	8	B.1.1	9	0.4603

Lineage name	England	Date range	Total sequences	Global lineage	Time since last sample (days)	Activity score
UK37	8 (100.0%)	Mar-29, May-03	8	B.1.30	27	0.1852
UK31	7 (100.0%)	Mar-30, Apr-28	7	B.1	32	0.151
UK220	7 (100.0%)	Mar-27, Apr-11	7	B.1.1	49	0.051
UK103	7 (100.0%)	Apr-07, May-27	7	B.1.1	3	2.7778
UK36	7 (100.0%)	Mar-30, Apr-15	7	B.1	45	0.0593
UK33	6 (100.0%)	Apr-05, May-08	6	B.1.1	22	0.3
UK329	6 (100.0%)	Apr-22, May-09	6	B.1.1	21	0.1619
UK2913	6 (100.0%)	Apr-04, Apr-27	6	B.1.p11	33	0.1394
UK3035	6 (100.0%)	Apr-02, May-08	6	B.1	22	0.3273
UK274	6 (100.0%)	Mar-19, May-11	6	B.3	19	0.5579

Table S2 Raw data for figure two showing lags between the most recent sequence and current date for each sequencing centre

	Centre	Lag in days
0	CAMB	6

Table S3 Raw data for figure three showing the number of admin2 regions a lineage is present in over time

Week commencing	UK5	UK167	UK26	UK128	UK113	UK2464	UK565	UK371	UK494	UK2916
2020-03-15	1	0	0	0	0	1	0	0	1	2
2020-03-22	1	0	0	0	0	0	0	0	0	0
2020-03-29	4	1	0	0	0	3	1	0	1	3
2020-04-05	2	2	1	2	1	4	2	1	0	2
2020-04-12	5	2	1	1	1	4	2	1	5	2
2020-04-19	6	3	2	4	1	1	1	1	3	1
2020-04-26	7	3	1	1	1	2	0	0	2	1
2020-05-03	3	0	1	1	0	0	1	1	1	1
2020-05-10	4	0	1	1	1	1	1	1	0	0
2020-05-17	5	3	1	1	1	0	0	1	0	0
2020-05-24	3	0	0	1	2	0	0	0	0	0

Table S4 is not appropriate for this report and so has been omitted.

Table S5 Raw data for figure five showing when lineages started per day, divided by singletons and non-singletons

Day	Number of singleton starts	Number of non-singleton starts	Total
2020-03-13	3	0	3
2020-03-14	2	0	2
2020-03-15	1	2	3
2020-03-16	4	0	4
2020-03-17	6	4	10
2020-03-18	9	2	11
2020-03-19	6	3	9
2020-03-20	11	1	12
2020-03-21	0	1	1
2020-03-22	1	1	2
2020-03-24	1	0	1
2020-03-26	7	1	8
2020-03-27	9	4	13
2020-03-28	9	2	11
2020-03-29	12	4	16
2020-03-30	13	3	16
2020-03-31	18	10	28
2020-04-01	9	6	15
2020-04-02	5	6	11
2020-04-03	4	1	5
2020-04-04	6	5	11
2020-04-05	9	6	15
2020-04-06	13	7	20
2020-04-07	14	7	21
2020-04-08	9	6	15
2020-04-09	1	5	6
2020-04-10	7	1	8
2020-04-11	6	1	7
2020-04-12	9	1	10
2020-04-13	7	2	9
2020-04-14	6	2	8
2020-04-15	9	2	11
2020-04-16	5	1	6
2020-04-17	5	1	6
2020-04-18	4	0	4
2020-04-19	2	2	4
2020-04-20	4	4	8
2020-04-21	9	2	11
2020-04-22	5	4	9
2020-04-23	5	0	5
2020-04-24	0	1	1
2020-04-25	2	0	2
2020-04-26	2	2	4
2020-04-27	10	3	13
2020-04-28	3	1	4
2020-04-29	4	2	6
2020-04-30	3	1	4
2020-05-01	2	3	5
2020-05-02	1	1	2
2020-05-03	3	0	3
2020-05-04	2	0	2
2020-05-05	2	0	2
2020-05-06	2	0	2
2020-05-07	6	1	7
2020-05-08	1	0	1
2020-05-09	0	1	1
2020-05-10	2	0	2

Day	Number of singleton starts	Number of non-singleton starts	Total
2020-05-11	4	3	7
2020-05-12	0	1	1
2020-05-13	1	1	2
2020-05-15	1	0	1
2020-05-16	0	1	1
2020-05-18	2	0	2
2020-05-21	1	0	1
2020-05-23	1	0	1
2020-05-25	1	2	3
2020-05-27	1	0	1

Table S6 Raw data for figure six showing the number of sequences taken over time.

Day	England
2020-03-13	3
2020-03-14	2
2020-03-15	3
2020-03-16	4
2020-03-17	11
2020-03-18	12
2020-03-19	9
2020-03-20	14
2020-03-21	1
2020-03-22	2
2020-03-24	1
2020-03-26	10
2020-03-27	13
2020-03-28	13
2020-03-29	19
2020-03-30	19
2020-03-31	36
2020-04-01	21
2020-04-02	16
2020-04-03	11
2020-04-04	15
2020-04-05	26
2020-04-06	29
2020-04-07	32
2020-04-08	27
2020-04-09	17
2020-04-10	17
2020-04-11	25
2020-04-12	27
2020-04-13	26
2020-04-14	25
2020-04-15	23
2020-04-16	23
2020-04-17	26
2020-04-18	9
2020-04-19	16
2020-04-20	31
2020-04-21	30
2020-04-22	22
2020-04-23	14
2020-04-24	12
2020-04-25	16
2020-04-26	25
2020-04-27	42
2020-04-28	24
2020-04-29	23
2020-04-30	20
2020-05-01	27
2020-05-02	9
2020-05-03	5
2020-05-04	9
2020-05-05	8
2020-05-06	10
2020-05-07	26
2020-05-08	10
2020-05-09	11
2020-05-10	6

Day	England
2020-05-11	39
2020-05-12	14
2020-05-13	21
2020-05-14	8
2020-05-15	11
2020-05-16	4
2020-05-17	2
2020-05-18	21
2020-05-19	21
2020-05-20	7
2020-05-21	8
2020-05-22	8
2020-05-23	3
2020-05-24	1
2020-05-25	11
2020-05-26	5
2020-05-27	8
2020-05-28	3
2020-05-29	1
2020-05-30	3

Table S7 Raw data for the figure seven with the number of sequences assigned to each admin2 region.

Admin2	Country	Number of sequences	Sequence group
BEDFORDSHIRE	England	35	10-50
BUCKINGHAMSHIRE	England	57	50-100
CAMBRIDGESHIRE	England	373	300-400
ESSEX	England	268	250-300
GREATER LONDON	England	83	50-100
HERTFORDSHIRE	England	177	150-200
NORFOLK	England	5	1-10
NORTHAMPTONSHIRE	England	3	1-10
NOTTINGHAMSHIRE	England	1	1-10
OXFORDSHIRE	England	1	1-10
SUFFOLK	England	130	100-150