

THE LANCET

Respiratory Medicine

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Chadeau-Hyam M, Wang H, Eales O, et al. SARS-CoV-2 infection and vaccine effectiveness in England (REACT-1): a series of cross-sectional random community surveys. *Lancet Respir Med* 2022; published online Jan 24. [https://doi.org/S2213-2600\(21\)00542-7](https://doi.org/S2213-2600(21)00542-7).

Supplementary Information:

SARS-CoV-2 infection and vaccine effectiveness in England (REACT-1): a series of cross-sectional random community surveys

*Corresponding authors: Paul Elliott and Christl A Donnelly, p.elliott@imperial.ac.uk, c.donnelly@imperial.ac.uk School of Public Health, Imperial College London, Norfolk Place, London, W2 1PG

Supplementary Table 1. Comparison of the characteristics of participants in round 13 and round 14 of REACT-1 study consenting to their data being linked to their NHS record and those who did not. Comparing proportions within each category using a chi-squared test yielded p-values <0.001 for all categories. We also report odds ratios from logistic models for linkage status (as binary outcome), all statistically significant with p-value<0.001.

		Full population		Not linked		Linked		OR
Gender	Male	87,821	44.18%	11,051	42.67%	76,770	44.41%	Ref
	Female	110,933	55.81%	14,846	57.32%	96,087	55.59%	0.93 (0.91, 0.96)
	Unknown	6	0.00%	1	0.00%	5	0.00%	0.72 (0.08, 6.16)
Age	35-44	23,994	12.07%	3,480	13.44%	20,514	11.87%	Ref
	05-12	13,452	6.77%	2,113	8.16%	11,339	6.56%	0.91 (0.86, 0.97)
	13-17	10,350	5.21%	2,364	9.13%	7,986	4.62%	0.57 (0.54, 0.61)
	18-24	5,569	2.80%	844	3.26%	4,725	2.73%	0.95 (0.88, 1.03)
	25-34	15,262	7.68%	2,429	9.38%	12,833	7.42%	0.90 (0.85, 0.95)
	45-54	32,631	16.42%	3,997	15.43%	28,634	16.56%	1.22 (1.16, 1.28)
	55-64	39,656	19.95%	4,220	16.29%	35,436	20.50%	1.42 (1.36, 1.49)
	65-74	38,149	19.19%	4,121	15.91%	34,028	19.69%	1.40 (1.33, 1.47)
	75+	19,697	9.91%	2,330	9.00%	17,367	10.05%	1.26 (1.20, 1.34)
Region	South East	34,815	17.52%	4,327	16.71%	30,488	17.64%	Ref
Employment type	North East	9,051	4.55%	1,076	4.15%	7,975	4.61%	1.05 (0.98, 1.13)
	North West	23,931	12.04%	3,145	12.14%	20,786	12.02%	0.94 (0.89, 0.99)
	Yorkshire and The Humber	19,437	9.78%	2,390	9.23%	17,047	9.86%	1.01 (0.96, 1.07)
	East Midlands	17,255	8.68%	2,025	7.82%	15,230	8.81%	1.07 (1.01, 1.13)
	West Midlands	20,091	10.11%	2,604	10.05%	17,487	10.12%	0.95 (0.90, 1.00)
	East of England	22,966	11.55%	2,757	10.65%	20,209	11.69%	1.04 (0.99, 1.09)
	London	29,483	14.83%	5,009	19.34%	24,474	14.16%	0.69 (0.66, 0.72)
	South West	21,731	10.93%	2,565	9.90%	19,166	11.09%	1.06 (1.01, 1.12)
	Other worker	76,314	38.40%	10,230	39.50%	66,084	38.23%	Ref
	Health care or care home worker	15,378	7.74%	1,727	6.67%	13,651	7.90%	1.22 (1.16, 1.29)
	Other essential/key worker	28,954	14.57%	3,239	12.51%	25,715	14.88%	1.23 (1.18, 1.28)
	Not full-time, part-time, or self-employed	73,945	37.20%	9,569	36.95%	64,376	37.24%	1.04 (1.01, 1.07)
	Unknown	4,169	2.10%	1,133	4.37%	3,036	1.76%	0.41 (0.39, 0.45)
	Ethnic group	White	173,460	87.27%	20,623	79.63%	152,837	88.42%
Asian		11,322	5.70%	2,334	9.01%	8,988	5.20%	0.52 (0.50, 0.55)
Black		3,983	2.00%	927	3.58%	3,056	1.77%	0.44 (0.41, 0.48)
Mixed		3,577	1.80%	593	2.29%	2,984	1.73%	0.68 (0.62, 0.74)
Other		2,078	1.05%	417	1.61%	1,661	0.96%	0.54 (0.48, 0.60)
Unknown		4,340	2.18%	1,004	3.88%	3,336	1.93%	0.45 (0.42, 0.48)
Household size	1	32,169	16.18%	4,077	15.74%	28,092	16.25%	Ref
	2	76,331	38.40%	8,976	34.66%	67,355	38.96%	1.09 (1.05, 1.13)
	3	34,437	17.33%	4,621	17.84%	29,816	17.25%	0.94 (0.90, 0.98)
	4	38,482	19.36%	5,588	21.58%	32,894	19.03%	0.85 (0.82, 0.89)
	5	12,344	6.21%	1,839	7.10%	10,505	6.08%	0.83 (0.78, 0.88)
	6+	4,997	2.51%	797	3.08%	4,200	2.43%	0.76 (0.70, 0.83)
COVID case contact	No	159,401	80.20%	20,029	77.34%	139,372	80.63%	Ref
	Yes, contact with a confirmed/tested COVID-19 case	6,887	3.46%	836	3.23%	6,051	3.50%	1.04 (0.97, 1.12)
	Yes, contact with a suspected COVID-19 case	2,133	1.07%	250	0.97%	1,883	1.09%	1.08 (0.95, 1.24)
	Unknown	30,339	15.26%	4,783	18.47%	25,556	14.78%	0.77 (0.74, 0.79)
Symptom status	No symptoms	139,457	70.16%	17,615	68.02%	121,842	70.49%	Ref
	Classic COVID symptoms	7,899	3.97%	871	3.36%	7,028	4.07%	1.17 (1.09, 1.25)
	Other symptoms	21,196	10.66%	2,649	10.23%	18,547	10.73%	1.01 (0.97, 1.06)
	Unknown	30,208	15.20%	4,763	18.39%	25,445	14.72%	0.77 (0.75, 0.80)

Supplementary Table 2. Unweighted and weighted prevalence of swab-positivity and median N-gene Ct values between individuals with different methods of swab test collection in round 14.

	Negatives	Positives	Total	Unweighted prevalence	Weighted prevalence	Median N-gene Ct value*	P-value**
Post	53,428	394	53,822	0.73% (0.66%, 0.81%)	0.80% (0.72%, 0.90%)	28.9 (27.9, 29.9)	ref
Courier	46,335	370	46,705	0.79% (0.71%, 0.88%)	0.85% (0.76%, 0.96%)	28.0 (27.0, 29.0)	0.06

* 95% Confidence intervals in the median were estimated using quantile regression

**P-values were calculated using the two-sided Wilcoxon test and are relative to the distribution of Ct values in individuals that sent their test via post

Supplementary Table 3. Unweighted and weighted prevalence of swab-positivity from REACT-1 across rounds 1 to 14

Round	Tested swabs	Positive swabs	Unweighted prevalence (95% CI)	Weighted prevalence (95% CI)	First sample	Last sample
1	120,620	159	0.13% (0.11%, 0.15%)	0.16% (0.13%, 0.19%)	01/05/20	01/06/20
2	159,199	123	0.08% (0.06%, 0.09%)	0.09% (0.07%, 0.11%)	19/06/20	07/07/20
3	162,821	54	0.03% (0.02%, 0.04%)	0.04% (0.03%, 0.05%)	24/07/20	11/08/20
4	154,325	137	0.09% (0.07%, 0.11%)	0.13% (0.10%, 0.15%)	20/08/20	08/09/20
5	174,949	824	0.47% (0.44%, 0.50%)	0.60% (0.55%, 0.71%)	18/09/20	05/10/20
6	160,175	1,732	1.08% (1.03%, 1.13%)	1.30% (1.21%, 1.39%)	16/10/20	02/11/20
7	168,181	1,299	0.77% (0.73%, 0.82%)	0.94% (0.87%, 1.01%)	13/11/20	03/12/20
8	167,642	2,282	1.36% (1.31%, 1.42%)	1.57% (1.49%, 1.66%)	06/01/21	22/01/21
9	165,456	689	0.42% (0.39%, 0.45%)	0.49% (0.44%, 0.55%)	04/02/21	23/02/21
10	140,844	227	0.16% (0.14%, 0.18%)	0.20% (0.17%, 0.23%)	11/03/21	30/03/21
11	127,408	115	0.09% (0.07%, 0.11%)	0.10% (0.08%, 0.13%)	15/04/21	03/05/21
12*	108,911	135	0.12% (0.10%, 0.15%)	0.15% (0.12%, 0.18%)	20/05/21	07/06/21
13	98,233	527	0.54% (0.49%, 0.58%)	0.63% (0.57%, 0.69%)	24/06/21	12/07/21
14**	100,527	764	0.76% (0.71%, 0.82%)	0.83% (0.76%, 0.89%)	09/09/21	27/09/21***

* Sampling strategy changed for round 12 and subsequent rounds. Unweighted prevalence is not directly comparable with previous rounds

** Sample handling changed in round 14. Prevalence is not directly comparable with previous rounds

*** 509 (including 9 positive) samples (<0.5%) were received 28-30 Sept 2021 and are included in round 14

Supplementary Table 4. Weighted prevalence of swab-positivity from participants aged 18 years and over by vaccination status and age group using the linked dataset from round 13 and round 14 of REACT-1.

		Age Group								
		18-34		35-54		55-64		65+		
	N*	Prevalence (%)	Prop (%)	Prevalence (%)	Prop (%)	Prevalence (%)	Prop (%)	Prevalence (%)	Prop (%)	Prevalence (%)
Unvaccinated	22,437	1.76% (1.60% , 1.95%)	56.40%	1.66% (1.17% , 2.35%)	27.30%	1.33% (0.79% , 2.23%)	8.53%	0.93% (0.27% , 3.10%)	7.77%	0.25% (0.03% , 1.76%)
1 dose	14,386	0.77% (0.64% , 0.93%)	36.61%	0.84% (0.59% , 1.20%)	58.97%	0.64% (0.48% , 0.85%)	2.68%	0.84% (0.26% , 2.71%)	1.74%	0.30% (0.04% , 2.13%)
2 doses < 3 months	62,920	0.35% (0.31% , 0.40%)	10.97%	0.42% (0.28% , 0.65%)	34.21%	0.50% (0.41% , 0.61%)	23.82%	0.29% (0.21% , 0.39%)	31.00%	0.20% (0.15% , 0.28%)
2 doses 3-6 months	68,676	0.55% (0.50% , 0.61%)	4.38%	0.60% (0.35% , 1.02%)	25.37%	0.90% (0.77% , 1.06%)	27.47%	0.56% (0.46% , 0.68%)	42.78%	0.33% (0.27% , 0.40%)
2 doses > 6 months	4,429	0.52% (0.33% , 0.78%)	7.28%	0.79% (0.25% , 2.48%)	26.98%	0.49% (0.21% , 1.11%)	20.38%	0.52% (0.19% , 1.37%)	45.37%	0.47% (0.25% , 0.89%)

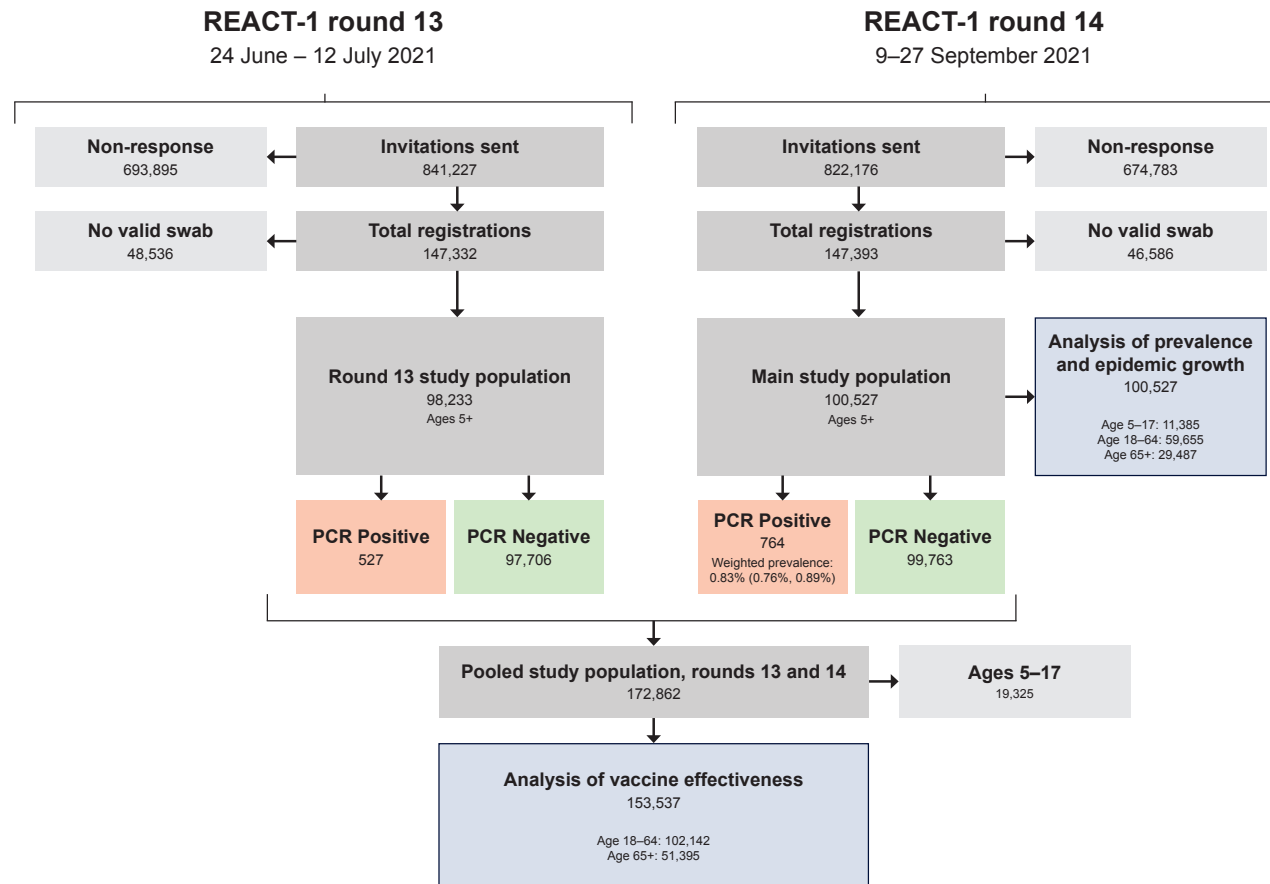
* A total of N=14 participants had missing dates in the linked data set.

Supplementary Table 5. Proportion of each Delta sub-lineage detected in 475 (62.1%) positive samples from round 14.

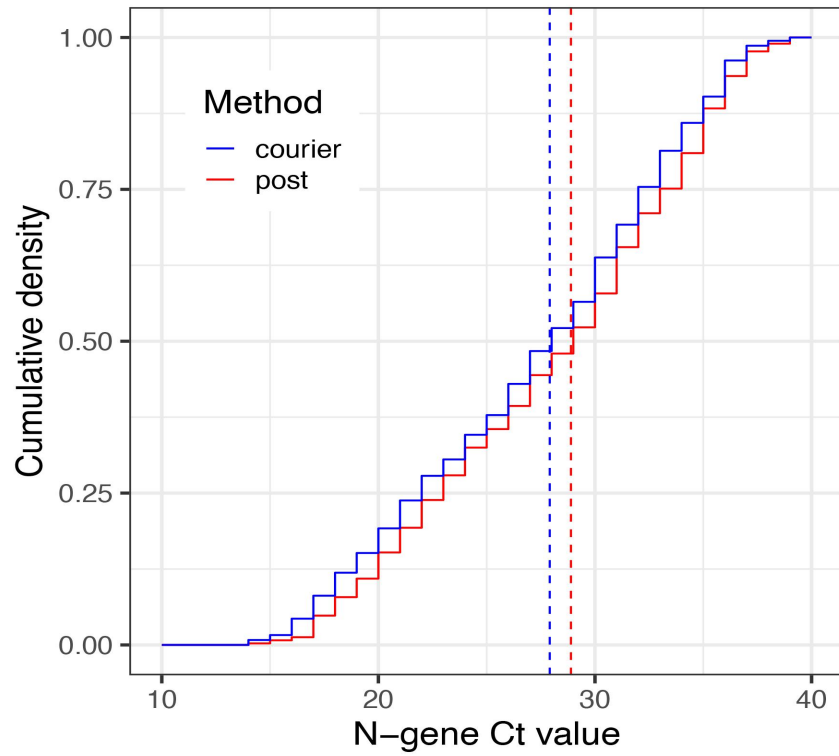
Sub-lineage	N	Proportion (95% confidence Interval)
B.1.617.2 (Delta/Sub-lineage not known)	129	0.272 (0.234, 0.313)
AY.26	13	0.027 (0.016, 0.046)
AY.3	1	0.002 (0.000, 0.012)
AY.4	292	0.615 (0.570, 0.657)
AY.4.1	7	0.015 (0.007, 0.030)
AY.5	19	0.040 (0.026, 0.062)
AY.6	8	0.017 (0.009, 0.033)
AY.9	2	0.004 (0.001, 0.015)
AY.33	1	0.002 (0.000, 0.012)
AY.36	1	0.002 (0.000, 0.012)
AY.11	1	0.002 (0.000, 0.012)
AY.20	1	0.002 (0.000, 0.012)

* One Delta variant detected with the E484K mutation

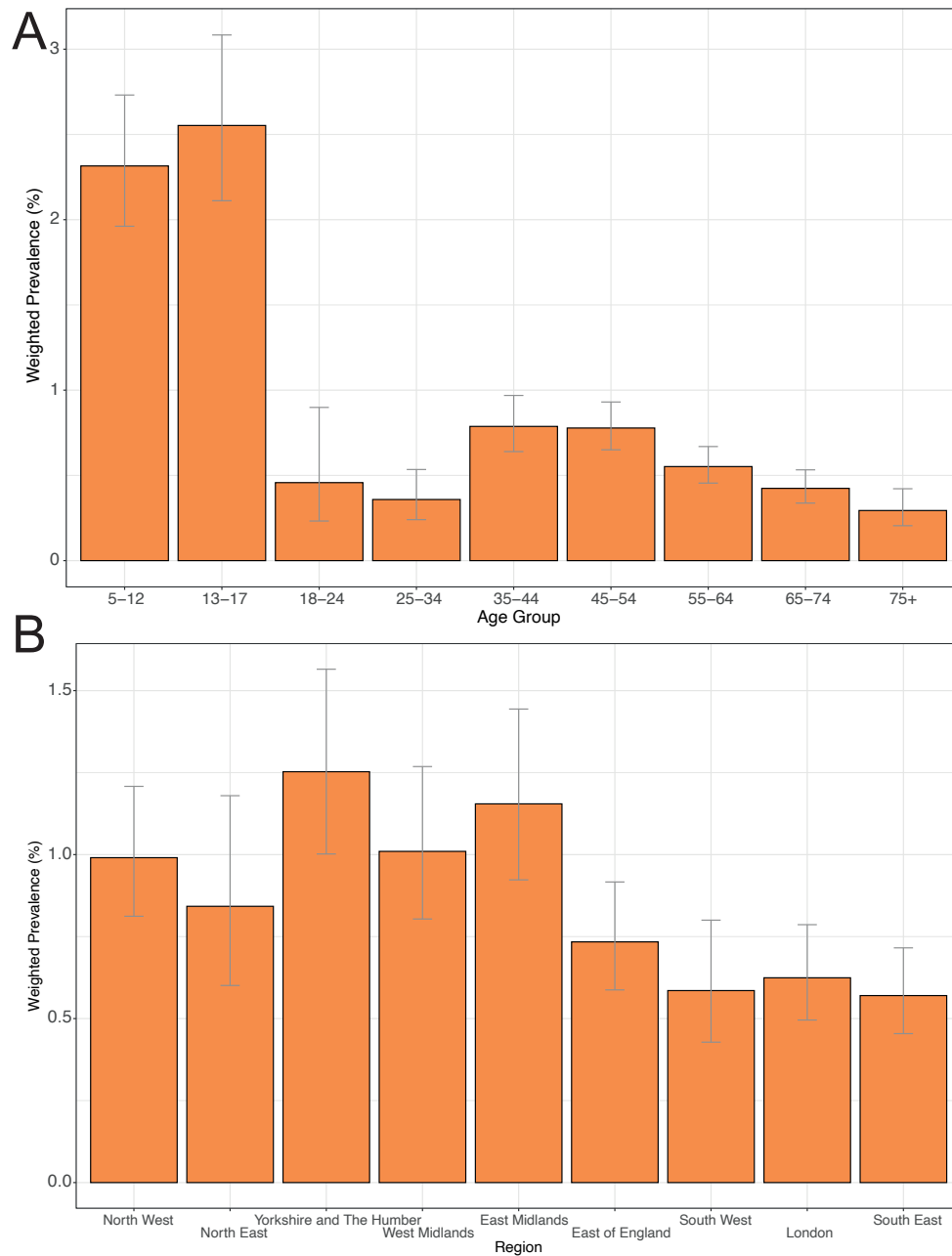
** 22 Delta variants detected with the Y145H mutation (8 in B.1.617.2, 14 in AY.4 sub-lineages)



Supplementary Figure 1. Overview of REACT-1 study rounds 13 and 14 and of our analytical plan.



Supplementary Figure 2. Distribution of N-gene Ct values, by method used in collecting swab tests from participants, for all positive samples. Cumulative distribution of all N-gene Ct values for those whose swab test was collected by courier (blue) and those who sent their swab test in the post (red).



Supplementary Figure 3. Weighted prevalence of swab-positivity in round 14 by (A) age group and (B) region. Bars show the prevalence point estimates, and the vertical lines represent the 95% credible intervals.

The COVID-19 Genomics UK (COG-UK) consortium

June 2021 V.1

Funding acquisition, Leadership and supervision, Metadata curation, Project administration, Samples and logistics, Sequencing and analysis, Software and analysis tools, and Visualisation:

Dr Samuel C Robson PhD ^{13, 84}

Funding acquisition, Leadership and supervision, Metadata curation, Project administration, Samples and logistics, Sequencing and analysis, and Software and analysis tools:

Dr Thomas R Connor PhD ^{11, 74} and Prof Nicholas J Loman PhD ⁴³

Leadership and supervision, Metadata curation, Project administration, Samples and logistics, Sequencing and analysis, Software and analysis tools, and Visualisation:

Dr Tanya Golubchik PhD ⁵

Funding acquisition, Leadership and supervision, Metadata curation, Samples and logistics, Sequencing and analysis, and Visualisation:

Dr Rocio T Martinez Nunez PhD ⁴⁶

Funding acquisition, Leadership and supervision, Project administration, Samples and logistics, Sequencing and analysis, and Software and analysis tools:

Dr David Bonsall PhD ⁵

Funding acquisition, Leadership and supervision, Project administration, Sequencing and analysis, Software and analysis tools, and Visualisation:

Prof Andrew Rambaut DPhil ¹⁰⁴

Funding acquisition, Metadata curation, Project administration, Samples and logistics, Sequencing and analysis, and Software and analysis tools:

Dr Luke B Snell MSc, MBBS ¹²

Leadership and supervision, Metadata curation, Project administration, Samples and logistics, Software and analysis tools, and Visualisation:

Rich Livett MSc ¹¹⁶

Funding acquisition, Leadership and supervision, Metadata curation, Project administration, and Samples and logistics:

Dr Catherine Ludden PhD ^{20, 70}

Funding acquisition, Leadership and supervision, Metadata curation, Samples and logistics, and Sequencing and analysis:

Dr Sally Corden PhD ⁷⁴ and Dr Eleni Nastouli FRCPATH ^{96, 95, 30}

Funding acquisition, Leadership and supervision, Metadata curation, Sequencing and analysis, and Software and analysis tools:

Dr Gaia Nebbia PhD, FRCPATH ¹²

Funding acquisition, Leadership and supervision, Project administration, Samples and logistics, and Sequencing and analysis:

Ian Johnston BSc ¹¹⁶

Leadership and supervision, Metadata curation, Project administration, Samples and logistics, and Sequencing and analysis:

Prof Katrina Lythgoe PhD ⁵, Dr M. Estee Torok FRCP ^{19,20} and Prof Ian G Goodfellow PhD ²⁴

Leadership and supervision, Metadata curation, Project administration, Samples and logistics, and Visualisation:

Dr Jacqui A Prieto PhD ^{97,82} and Dr Kordo Saeed MD, FRCPath ^{97,83}

Leadership and supervision, Metadata curation, Project administration, Sequencing and analysis, and Software and analysis tools:

Dr David K Jackson PhD ¹¹⁶

Leadership and supervision, Metadata curation, Samples and logistics, Sequencing and analysis, and Visualisation:

Dr Catherine Houlihan PhD ^{96,94}

Leadership and supervision, Metadata curation, Sequencing and analysis, Software and analysis tools, and Visualisation:

Dr Dan Frampton PhD ^{94,95}

Metadata curation, Project administration, Samples and logistics, Sequencing and analysis, and Software and analysis tools:

Dr William L Hamilton PhD ¹⁹ and Dr Adam A Witney PhD ⁴¹

Funding acquisition, Samples and logistics, Sequencing and analysis, and Visualisation:

Dr Giselda Bucca PhD ¹⁰¹

Funding acquisition, Leadership and supervision, Metadata curation, and Project administration:

Dr Cassie F Pope PhD ^{40,41}

Funding acquisition, Leadership and supervision, Metadata curation, and Samples and logistics:

Dr Catherine Moore PhD ⁷⁴

Funding acquisition, Leadership and supervision, Metadata curation, and Sequencing and analysis:

Prof Emma C Thomson PhD, FRCP ⁵³

Funding acquisition, Leadership and supervision, Project administration, and Samples and logistics:

Dr Ewan M Harrison PhD ^{116,102}

Funding acquisition, Leadership and supervision, Sequencing and analysis, and Visualisation:

Prof Colin P Smith PhD ¹⁰¹

Leadership and supervision, Metadata curation, Project administration, and Sequencing and analysis:

Fiona Rogan BSc ⁷⁷

Leadership and supervision, Metadata curation, Project administration, and Samples and logistics:

Shaun M Beckwith MSc ⁶, Abigail Murray Degree ⁶, Dawn Singleton HNC ⁶, Dr Kirstine Eastick PhD, FRCPath ³⁷, Dr Liz A Sheridan PhD ⁹⁸, Paul Randell MSc, PgD ⁹⁹, Dr Leigh M Jackson PhD ¹⁰⁵, Dr Cristina V Ariani PhD ¹¹⁶ and Dr Sónia Gonçalves PhD ¹¹⁶

Leadership and supervision, Metadata curation, Samples and logistics, and Sequencing and analysis:

Dr Derek J Fairley PhD ^{3, 77}, Prof Matthew W Loose PhD ¹⁸ and Joanne Watkins MSc ⁷⁴

Leadership and supervision, Metadata curation, Samples and logistics, and Visualisation:

Dr Samuel Moses MD ^{25, 106}

Leadership and supervision, Metadata curation, Sequencing and analysis, and Software and analysis tools:

Dr Sam Nicholls PhD ⁴³, Dr Matthew Bull PhD ⁷⁴ and Dr Roberto Amato PhD ¹¹⁶

Leadership and supervision, Project administration, Samples and logistics, and Sequencing and analysis:

Prof Darren L Smith PhD ^{36, 65, 66}

Leadership and supervision, Sequencing and analysis, Software and analysis tools, and Visualisation:

Prof David M Aanensen PhD ^{14, 116} and Dr Jeffrey C Barrett PhD ¹¹⁶

Metadata curation, Project administration, Samples and logistics, and Sequencing and analysis:

Dr Dinesh Aggarwal MRCP^{20, 116, 70}, Dr James G Shepherd MBCHB, MRCP ⁵³, Dr Martin D Curran PhD ⁷¹ and Dr Surendra Parmar PhD ⁷¹

Metadata curation, Project administration, Sequencing and analysis, and Software and analysis tools:

Dr Matthew D Parker PhD ¹⁰⁹

Metadata curation, Samples and logistics, Sequencing and analysis, and Software and analysis tools:

Dr Catryn Williams PhD ⁷⁴

Metadata curation, Samples and logistics, Sequencing and analysis, and Visualisation:

Dr Sharon Glaysher PhD ⁶⁸

Metadata curation, Sequencing and analysis, Software and analysis tools, and Visualisation:

Dr Anthony P Underwood PhD ^{14, 116}, Dr Matthew Bashton PhD ^{36, 65}, Dr Nicole Pacchiarini PhD ⁷⁴, Dr Katie F Loveson PhD ⁸⁴ and Matthew Byott MSc ^{95, 96}

Project administration, Sequencing and analysis, Software and analysis tools, and Visualisation:

Dr Alessandro M Carabelli PhD ²⁰

Funding acquisition, Leadership and supervision, and Metadata curation:

Dr Kate E Templeton PhD ^{56, 104}

Funding acquisition, Leadership and supervision, and Project administration:

Dr Thushan I de Silva PhD ¹⁰⁹, Dr Dennis Wang PhD ¹⁰⁹, Dr Cordelia F Langford PhD ¹¹⁶ and John Sillitoe BEng ¹¹⁶

Funding acquisition, Leadership and supervision, and Samples and logistics:

Prof Rory N Gunson PhD, FRCPath ⁵⁵

Funding acquisition, Leadership and supervision, and Sequencing and analysis:

Dr Simon Cottrell PhD ⁷⁴, Dr Justin O'Grady PhD ^{75, 103} and Prof Dominic Kwiatkowski PhD ^{116, 108}

Leadership and supervision, Metadata curation, and Project administration:

Dr Patrick J Lillie PhD, FRCP ³⁷

Leadership and supervision, Metadata curation, and Samples and logistics:

Dr Nicholas Cortes MBCHB ³³, Dr Nathan Moore MBCHB ³³, Dr Claire Thomas DPhil ³³, Phillipa J Burns MSc, DipRCPath ³⁷, Dr Tabitha W Mahungu FRCPATH ⁸⁰ and Steven Liggett BSc ⁸⁶

Leadership and supervision, Metadata curation, and Sequencing and analysis:

Angela H Beckett MSc ^{13, 81} and Prof Matthew TG Holden PhD ⁷³

Leadership and supervision, Project administration, and Samples and logistics:

Dr Lisa J Levett PhD ³⁴, Dr Husam Osman PhD ^{70, 35} and Dr Mohammed O Hassan-Ibrahim PhD, FRCPATH ⁹⁹

Leadership and supervision, Project administration, and Sequencing and analysis:

Dr David A Simpson PhD ⁷⁷

Leadership and supervision, Samples and logistics, and Sequencing and analysis:

Dr Meera Chand PhD ⁷², Prof Ravi K Gupta PhD ¹⁰², Prof Alistair C Darby PhD ¹⁰⁷ and Prof Steve Paterson PhD ¹⁰⁷

Leadership and supervision, Sequencing and analysis, and Software and analysis tools:

Prof Oliver G Pybus DPhil ²³, Dr Erik M Volz PhD ³⁹, Prof Daniela de Angelis PhD ⁵², Prof David L Robertson PhD ⁵³, Dr Andrew J Page PhD ⁷⁵ and Dr Inigo Martincorena PhD ¹¹⁶

Leadership and supervision, Sequencing and analysis, and Visualisation:

Dr Louise Aigrain PhD ¹¹⁶ and Dr Andrew R Bassett PhD ¹¹⁶

Metadata curation, Project administration, and Samples and logistics:

Dr Nick Wong DPhil, MRCP, FRCPATH ⁵⁰, Dr Yusri Taha MD, PhD ⁸⁹, Michelle J Erkiert BA ⁹⁹ and Dr Michael H Spencer Chapman MBBS ^{116, 102}

Metadata curation, Project administration, and Sequencing and analysis:

Dr Rebecca Dewar PhD ⁵⁶ and Martin P McHugh MSc ^{56, 111}

Metadata curation, Project administration, and Software and analysis tools:

Siddharth Mookerjee MPH ^{38, 57}

Metadata curation, Project administration, and Visualisation:

Stephen Aplin ⁹⁷, Matthew Harvey ⁹⁷, Thea Sass ⁹⁷, Dr Helen Umpleby FRCP ⁹⁷ and Helen Wheeler ⁹⁷

Metadata curation, Samples and logistics, and Sequencing and analysis:

Dr James P McKenna PhD ³, Dr Ben Warne MRCP ⁹, Joshua F Taylor MSc ²², Yasmin Chaudhry BSc ²⁴, Rhys Izuagbe ²⁴, Dr Aminu S Jahun PhD ²⁴, Dr Gregory R Young PhD ^{36, 65}, Dr Claire McMurray PhD ⁴³, Dr Clare M McCann PhD ^{65, 66}, Dr Andrew Nelson PhD ^{65, 66} and Scott Elliott ⁶⁸

Metadata curation, Samples and logistics, and Visualisation:

Hannah Lowe MSc²⁵

Metadata curation, Sequencing and analysis, and Software and analysis tools:

Dr Anna Price PhD¹¹, Matthew R Crown BSc⁶⁵, Dr Sara Rey PhD⁷⁴, Dr Sunando Roy PhD⁹⁶ and Dr Ben Temperton PhD¹⁰⁵

Metadata curation, Sequencing and analysis, and Visualisation:

Dr Sharif Shaaban PhD⁷³ and Dr Andrew R Hesketh PhD¹⁰¹

Project administration, Samples and logistics, and Sequencing and analysis:

Dr Kenneth G Laing PhD⁴¹, Dr Irene M Monahan PhD⁴¹ and Dr Judith Heaney PhD^{95,96,34}

Project administration, Samples and logistics, and Visualisation:

Dr Emanuela Pelosi FRCPATH⁹⁷, Siona Silviera MSc⁹⁷ and Dr Eleri Wilson-Davies MD, FRCPATH⁹⁷

Samples and logistics, Software and analysis tools, and Visualisation:

Dr Helen Fryer PhD⁵

Sequencing and analysis, Software and analysis tools, and Visualization:

Dr Helen Adams PhD⁴, Dr Louis du Plessis PhD²³, Dr Rob Johnson PhD³⁹, Dr William T Harvey PhD^{53,42}, Dr Joseph Hughes PhD⁵³, Dr Richard J Orton PhD⁵³, Dr Lewis G Spurgin PhD⁵⁹, Dr Yann Bourgeois PhD⁸¹, Dr Chris Ruis PhD¹⁰², Áine O'Toole MSc¹⁰⁴, Marina Gourtovaia MSc¹¹⁶ and Dr Theo Sanderson PhD¹¹⁶

Funding acquisition, and Leadership and supervision:

Dr Christophe Fraser PhD⁵, Dr Jonathan Edgeworth PhD, FRCPATH¹², Prof Judith Breuer MD^{96,29}, Dr Stephen L Mitchell PhD¹⁰⁵ and Prof John A Todd PhD¹¹⁵

Funding acquisition, and Project administration:

Michaela John BSc¹⁰ and Dr David Buck PhD¹¹⁵

Leadership and supervision, and Metadata curation:

Dr Kavitha Gajee MBBS, FRCPATH³⁷ and Dr Gemma L Kay PhD⁷⁵

Leadership and supervision, and Project administration:

Prof Sharon J Peacock PhD^{20,70} and David Heyburn⁷⁴

Leadership and supervision, and Samples and logistics:

Katie Kitchman BSc³⁷, Prof Alan McNally PhD^{43,93}, David T Pritchard MSc, CSci⁵⁰, Dr Samir Dervisevic FRCPATH⁵⁸, Dr Peter Muir PhD⁷⁰, Dr Esther Robinson PhD^{70,35}, Dr Barry B Vipond PhD⁷⁰, Newara A Ramadan MSc, CSci, FIBMS⁷⁸, Dr Christopher Jeanes MBBS⁹⁰, Danni Weldon BSc¹¹⁶, Jana Catalan MSc¹¹⁸ and Neil Jones MSc¹¹⁸

Leadership and supervision, and Sequencing and analysis:

Dr Ana da Silva Filipe PhD⁵³, Dr Chris Williams MBBS⁷⁴, Marc Fuchs BSc⁷⁷, Dr Julia Miskelly PhD⁷⁷, Dr Aaron R Jeffries PhD¹⁰⁵, Karen Oliver BSc¹¹⁶ and Dr Naomi R Park PhD¹¹⁶

Metadata curation, and Samples and logistics:

Amy Ash BSc¹, Cherian Koshy MSc, CSci, FIBMS¹, Magdalena Barrow⁷, Dr Sarah L Buchan PhD⁷, Dr Anna Mantzouratou PhD⁷, Dr Gemma Clark PhD¹⁵, Dr Christopher W Holmes PhD¹⁶, Sharon

Campbell MSc¹⁷, Thomas Davis MSc²¹, Ngee Keong Tan MSc²², Dr Julianne R Brown PhD²⁹, Dr Kathryn A Harris PhD^{29,2}, Stephen P Kidd MSc³³, Dr Paul R Grant PhD³⁴, Dr Li Xu-McCrae PhD³⁵, Dr Alison Cox PhD^{38,63}, PINGLAWATHEE MADONA^{38,63}, Dr Marcus Pond PhD^{38,63}, Dr Paul A Randell MBBCh^{38,63}, Karen T Withell FIBMS⁴⁸, Cheryl Williams MSc⁵¹, Dr Clive Graham MD⁶⁰, Rebecca Denton-Smith BSc⁶², Emma Swindells BSc⁶², Robyn Turnbull BSc⁶², Dr Tim J Sloan PhD⁶⁷, Dr Andrew Bosworth PhD^{70,35}, Stephanie Hutchings⁷⁰, Hannah M Pymont MSc⁷⁰, Dr Anna Casey PhD⁷⁶, Dr Liz Ratcliffe PhD⁷⁶, Dr Christopher R Jones PhD^{79,105}, Dr Bridget A Knight PhD^{79,105}, Dr Tanzina Haque PhD, FRCPath⁸⁰, Dr Jennifer Hart MRCP⁸⁰, Dr Dianne Irish-Tavares FRCPath⁸⁰, Eric Witele MSc⁸⁰, Craig Mower BA⁸⁶, Louisa K Watson DipHE⁸⁶, Jennifer Collins BSc⁸⁹, Gary Eltringham BSc⁸⁹, Dorian Crudgington⁹⁸, Ben Macklin⁹⁸, Prof Miren Iturriza-Gomara PhD¹⁰⁷, Dr Anita O Lucaci PhD¹⁰⁷ and Dr Patrick C McClure PhD¹¹³

Metadata curation, and Sequencing and analysis:

Matthew Carlile BSc¹⁸, Dr Nadine Holmes PhD¹⁸, Dr Christopher Moore PhD¹⁸, Dr Nathaniel Storey PhD²⁹, Dr Stefan Rooke PhD⁷³, Dr Gonzalo Yebra PhD⁷³, Dr Noel Craine DPhil⁷⁴, Malorie Perry MSc⁷⁴, Dr Nabil-Fareed Alikhan PhD⁷⁵, Dr Stephen Bridgett PhD⁷⁷, Kate F Cook MSc⁸⁴, Christopher Fearn MSc⁸⁴, Dr Salman Goudarzi PhD⁸⁴, Prof Ronan A Lyons MD⁸⁸, Dr Thomas Williams MD¹⁰⁴, Dr Sam T Haldenby PhD¹⁰⁷, Jillian Durham BSc¹¹⁶ and Dr Steven Leonard PhD¹¹⁶

Metadata curation, and Software and analysis tools:

Robert M Davies MA (Cantab)¹¹⁶

Project administration, and Samples and logistics:

Dr Rahul Batra MD¹², Beth Blane BSc²⁰, Dr Moira J Spyer PhD^{30,95,96}, Perminder Smith MSc^{32,112}, Mehmet Yavus^{85,109}, Dr Rachel J Williams PhD⁹⁶, Dr Adhyana IK Mahanama MD⁹⁷, Dr Buddhini Samaraweera MD⁹⁷, Sophia T Girgis MSc¹⁰², Samantha E Hansford CSci¹⁰⁹, Dr Angie Green PhD¹¹⁵, Dr Charlotte Beaver PhD¹¹⁶, Katherine L Bellis^{116,102}, Matthew J Dorman¹¹⁶, Sally Kay¹¹⁶, Liam Prestwood¹¹⁶ and Dr Shavanthi Rajatileka PhD¹¹⁶

Project administration, and Sequencing and analysis:

Dr Joshua Quick PhD⁴³

Project administration, and Software and analysis tools:

Radoslaw Poplawski BSc⁴³

Samples and logistics, and Sequencing and analysis:

Dr Nicola Reynolds PhD⁸, Andrew Mack MPhil¹¹, Dr Arthur Morriss PhD¹¹, Thomas Whalley BSc¹¹, Bindi Patel BSc¹², Dr Iliana Georgana PhD²⁴, Dr Myra Hosmillo PhD²⁴, Malte L Pinckert MPhil²⁴, Dr Joanne Stockton PhD⁴³, Dr John H Henderson PhD⁶⁵, Amy Hollis HND⁶⁵, Dr William Stanley PhD⁶⁵, Dr Wen C Yew PhD⁶⁵, Dr Richard Myers PhD⁷², Dr Alicia Thornton PhD⁷², Alexander Adams BSc⁷⁴, Tara Annett BSc⁷⁴, Dr Hibo Asad PhD⁷⁴, Alec Birchley MSc⁷⁴, Jason Coombes BSc⁷⁴, Johnathan M Evans MSc⁷⁴, Laia Fina⁷⁴, Bree Gatica-Wilcox MPhil⁷⁴, Lauren Gilbert⁷⁴, Lee Graham BSc⁷⁴, Jessica Hey BSc⁷⁴, Ember Hilvers MPH⁷⁴, Sophie Jones MSc⁷⁴, Hannah Jones⁷⁴, Sara Kumziene-Summerhayes MSc⁷⁴, Dr Caoimhe McKerr PhD⁷⁴, Jessica Powell BSc⁷⁴, Georgia Pugh⁷⁴, Sarah Taylor⁷⁴, Alexander J Trotter MRes⁷⁵, Charlotte A Williams BSc⁹⁶, Leanne M Kermack MSc¹⁰², Benjamin H Foulkes MSc¹⁰⁹, Marta Gallis MSc¹⁰⁹, Hailey R Hornsby MSc¹⁰⁹, Stavroula F Louka MSc¹⁰⁹, Dr Manoj Pohare PhD¹⁰⁹, Paige Wolverson MSc¹⁰⁹, Peijun Zhang MSc¹⁰⁹, George MacIntyre-Cockett BSc¹¹⁵, Amy Trebes MSc¹¹⁵, Dr Robin J Moll PhD¹¹⁶, Lynne Ferguson MSc¹¹⁷, Dr Emily J Goldstein PhD¹¹⁷, Dr Alasdair Maclean PhD¹¹⁷ and Dr Rachael Tomb PhD¹¹⁷

Samples and logistics, and Software and analysis tools:

Dr Igor Starinskij MSc, MRCP ⁵³

Sequencing and analysis, and Software and analysis tools:

Laura Thomson BSc ⁵, Joel Southgate MSc ^{11,74}, Dr Moritz UG Kraemer DPhil ²³, Dr Jayna Raghvani PhD ²³, Dr Alex E Zarebski PhD ²³, Olivia Boyd MSc ³⁹, Lily Geidelberg MSc ³⁹, Dr Chris J Illingworth PhD ⁵², Dr Chris Jackson PhD ⁵², Dr David Pascall PhD ⁵², Dr Sreenu Vattipally PhD ⁵³, Timothy M Freeman MPhil ¹⁰⁹, Dr Sharon N Hsu PhD ¹⁰⁹, Dr Benjamin B Lindsey MRCP ¹⁰⁹, Dr Keith James PhD ¹¹⁶, Kevin Lewis ¹¹⁶, Gerry Tonkin-Hill ¹¹⁶ and Dr Jaime M Tovar-Corona PhD ¹¹⁶

Sequencing and analysis, and Visualisation:

MacGregor Cox MSci ²⁰

Software and analysis tools, and Visualisation:

Dr Khalil Abudahab PhD ^{14,116}, Mirko Menegazzo ¹⁴, Ben EW Taylor MEng ^{14,116}, Dr Corin A Yeats PhD ¹⁴, Afrida Mukaddas BTech ⁵³, Derek W Wright MSc ⁵³, Dr Leonardo de Oliveira Martins PhD ⁷⁵, Dr Rachel Colquhoun DPhil ¹⁰⁴, Verity Hill ¹⁰⁴, Dr Ben Jackson PhD ¹⁰⁴, Dr JT McCrone PhD ¹⁰⁴, Dr Nathan Medd PhD ¹⁰⁴, Dr Emily Scher PhD ¹⁰⁴ and Jon-Paul Keatley ¹¹⁶

Leadership and supervision:

Dr Tanya Curran PhD ³, Dr Sian Morgan FRCPath ¹⁰, Prof Patrick Maxwell PhD ²⁰, Prof Ken Smith PhD ²⁰, Dr Sahar Eldirdiri MBBS, MSc, FRCPath ²¹, Anita Kenyon MSc ²¹, Prof Alison H Holmes MD ^{38,57}, Dr James R Price PhD ^{38,57}, Dr Tim Wyatt PhD ⁶⁹, Dr Alison E Mather PhD ⁷⁵, Dr Timofey Skvortsov PhD ⁷⁷ and Prof John A Hartley PhD ⁹⁶

Metadata curation:

Prof Martyn Guest PhD ¹¹, Dr Christine Kitchen PhD ¹¹, Dr Ian Merrick PhD ¹¹, Robert Munn BSc ¹¹, Dr Beatrice Bertolusso Degree ³³, Dr Jessica Lynch MBChB ³³, Dr Gabrielle Vernet MBBS ³³, Stuart Kirk MSc ³⁴, Dr Elizabeth Wastnedge MD ⁵⁶, Dr Rachael Stanley PhD ⁵⁸, Giles Idle ⁶⁴, Dr Declan T Bradley PhD ^{69,77}, Dr Jennifer Poyner MD ⁷⁹ and Matilde Mori BSc ¹¹⁰

Project administration:

Owen Jones BSc ¹¹, Victoria Wright BSc ¹⁸, Ellena Brooks MA ²⁰, Carol M Churcher BSc ²⁰, Mireille Fragakis HND ²⁰, Dr Katerina Galai PhD ^{20,70}, Dr Andrew Jermy PhD ²⁰, Sarah Judges BA ²⁰, Georgina M McManus BSc ²⁰, Kim S Smith ²⁰, Dr Elaine Westwick PhD ²⁰, Dr Stephen W Attwood PhD ²³, Dr Frances Bolt PhD ^{38,57}, Dr Alisha Davies PhD ⁷⁴, Elen De Lacy MPH ⁷⁴, Fatima Downing ⁷⁴, Sue Edwards ⁷⁴, Lizzie Meadows MA ⁷⁵, Sarah Jeremiah MSc ⁹⁷, Dr Nikki Smith PhD ¹⁰⁹ and Luke Foulser ¹¹⁶

Samples and logistics:

Dr Themoula Charalampous PhD ^{12,46}, Amita Patel BSc ¹², Dr Louise Berry PhD ¹⁵, Dr Tim Boswell PhD ¹⁵, Dr Vicki M Fleming PhD ¹⁵, Dr Hannah C Howson-Wells PhD ¹⁵, Dr Amelia Joseph PhD ¹⁵, Manjinder Khakh ¹⁵, Dr Michelle M Lister PhD ¹⁵, Paul W Bird MSc, MRes ¹⁶, Karlie Fallon ¹⁶, Thomas Helmer ¹⁶, Dr Claire L McMurray PhD ¹⁶, Mina Odedra BSc ¹⁶, Jessica Shaw BSc ¹⁶, Dr Julian W Tang PhD ¹⁶, Nicholas J Willford MSc ¹⁶, Victoria Blakey BSc ¹⁷, Dr Veena Raviprakash MD ¹⁷, Nicola Sheriff BSc ¹⁷, Lesley-Anne Williams BSc ¹⁷, Theresa Feltwell MSc ²⁰, Dr Luke Bedford PhD ²⁶, Dr James S Cargill PhD ²⁷, Warwick Hughes MSc ²⁷, Dr Jonathan Moore MD ²⁸, Susanne Stonehouse BSc ²⁸, Laura Atkinson MSc ²⁹, Jack CD Lee MSc ²⁹, Dr Divya Shah PhD ²⁹, Adela Alcolea-Medina Clinical scientist ^{32,112}, Natasha Ohemeng-Kumi MSc ^{32,112}, John Ramble MSc ^{32,112}, Jasveen Sehmi MSc ^{32,112}, Dr Rebecca Williams BMBS ³³, Wendy Chatterton MSc ³⁴, Monika Pusok MSc ³⁴, William Everson MSc ³⁷, Anibolina Castigador IBMS HCPC ⁴⁴, Emily Macnaughton FRCPath ⁴⁴, Dr Kate El Bouzidi MRCP ⁴⁵, Dr Temi Lampejo FRCPath ⁴⁵, Dr Malur Sudhanva FRCPath ⁴⁵, Cassie Breen BSc ⁴⁷, Dr Graciela Sluga MD, MSc ⁴⁸, Dr Shazaad SY Ahmad MSc ^{49,70}, Dr Ryan P George PhD ⁴⁹, Dr Nicholas W Machin MSc ^{49,70}, Debbie

Binns BSc ⁵⁰, Victoria James BSc ⁵⁰, Dr Rachel Blacow MBChB ⁵⁵, Dr Lindsay Coupland PhD ⁵⁸, Dr Louise Smith PhD ⁵⁹, Dr Edward Barton MD ⁶⁰, Debra Padgett BSc ⁶⁰, Garren Scott BSc ⁶⁰, Dr Aidan Cross MBChB ⁶¹, Dr Mariyam Mirfenderesky FRCPath ⁶¹, Jane Greenaway MSc ⁶², Kevin Cole ⁶⁴, Phillip Clarke ⁶⁷, Nichola Duckworth ⁶⁷, Sarah Walsh ⁶⁷, Kelly Bicknell ⁶⁸, Robert Impey MSc ⁶⁸, Dr Sarah Wyllie PhD ⁶⁸, Richard Hopes ⁷⁰, Dr Chloe Bishop PhD ⁷², Dr Vicki Chalker PhD ⁷², Dr Ian Harrison PhD ⁷², Laura Gifford MSc ⁷⁴, Dr Zoltan Molnar PhD ⁷⁷, Dr Cressida Auckland FRCPath ⁷⁹, Dr Cariad Evans PhD ^{85,109}, Dr Kate Johnson PhD ^{85,109}, Dr David G Partridge FRCPath ^{85,109}, Dr Mohammad Raza PhD ^{85,109}, Paul Baker MD ⁸⁶, Prof Stephen Bonner PhD ⁸⁶, Sarah Essex ⁸⁶, Leanne J Murray ⁸⁶, Andrew I Lawton MSc ⁸⁷, Dr Shirelle Burton-Fanning MD ⁸⁹, Dr Brendan Al Payne MD ⁸⁹, Dr Sheila Waugh MD ⁸⁹, Andrea N Gomes MSc ⁹¹, Maimuna Kimuli MSc ⁹¹, Darren R Murray MSc ⁹¹, Paula Ashfield MSc ⁹², Dr Donald Dobie MBChB ⁹², Dr Fiona Ashford PhD ⁹³, Dr Angus Best PhD ⁹³, Dr Liam Crawford PhD ⁹³, Dr Nicola Cumley PhD ⁹³, Dr Megan Mayhew PhD ⁹³, Dr Oliver Megram PhD ⁹³, Dr Jeremy Mirza PhD ⁹³, Dr Emma Moles-Garcia PhD ⁹³, Dr Benita Percival PhD ⁹³, Megan Driscoll BSc ⁹⁶, Leah Ensell BSc ⁹⁶, Dr Helen L Lowe PhD ⁹⁶, Laurentiu Maftai BSc ⁹⁶, Matteo Mondani MSc ⁹⁶, Nicola J Chaloner BSc ⁹⁹, Benjamin J Cogger BSc ⁹⁹, Lisa J Easton MSc ⁹⁹, Hannah Huckson BSc ⁹⁹, Jonathan Lewis MSc, PgD, FIBMS ⁹⁹, Sarah Lowdon BSc ⁹⁹, Cassandra S Malone MSc ⁹⁹, Florence Munemo BSc ⁹⁹, Manasa Mutingwende MSc ⁹⁹, Roberto Nicodemi BSc ⁹⁹, Olga Podplomyk FD ⁹⁹, Thomas Somassa BSc ⁹⁹, Dr Andrew Beggs PhD ¹⁰⁰, Dr Alex Richter PhD ¹⁰⁰, Claire Cormie ¹⁰², Joana Dias MSc ¹⁰², Sally Forrest BSc ¹⁰², Dr Ellen E Higginson PhD ¹⁰², Mailis Maes MPhil ¹⁰², Jamie Young BSc ¹⁰², Dr Rose K Davidson PhD ¹⁰³, Kathryn A Jackson MSc ¹⁰⁷, Dr Lance Turtle PhD, MRCP ¹⁰⁷, Dr Alexander J Keeley MRCP ¹⁰⁹, Prof Jonathan Ball PhD ¹¹³, Timothy Byaruhanga MSc ¹¹³, Dr Joseph G Chappell PhD ¹¹³, Jayasree Dey MSc ¹¹³, Jack D Hill MSc ¹¹³, Emily J Park MSc ¹¹³, Arezou Fanaie MSc ¹¹⁴, Rachel A Hilson MSc ¹¹⁴, Geraldine Yaze MSc ¹¹⁴ and Stephanie Lo ¹¹⁶

Sequencing and analysis:

Safiah Afifi BSc ¹⁰, Robert Beer BSc ¹⁰, Joshua Maksimovic FD ¹⁰, Kathryn McCluggage Masters ¹⁰, Karla Spellman FD ¹⁰, Catherine Bresner BSc ¹¹, William Fuller BSc ¹¹, Dr Angela Marchbank BSc ¹¹, Trudy Workman HNC ¹¹, Dr Ekaterina Shelest PhD ^{13,81}, Dr Johnny Debebe PhD ¹⁸, Dr Fei Sang PhD ¹⁸, Dr Marina Escalera Zamudio PhD ²³, Dr Sarah Francois PhD ²³, Bernardo Gutierrez MSc ²³, Dr Tetyana I Vasylyeva DPhil ²³, Dr Flavia Flaviani PhD ³¹, Dr Manon Ragonnet-Cronin PhD ³⁹, Dr Katherine L Smollett PhD ⁴², Alice Broos BSc ⁵³, Daniel Mair BSc ⁵³, Jenna Nichols BSc ⁵³, Dr Kyriaki Nomikou PhD ⁵³, Dr Lily Tong PhD ⁵³, Ioulia Tsatsani MSc ⁵³, Prof Sarah O'Brien PhD ⁵⁴, Prof Steven Rushton PhD ⁵⁴, Dr Roy Sanderson PhD ⁵⁴, Dr Jon Perkins MBChB ⁵⁵, Seb Cotton MSc ⁵⁶, Abbie Gallagher BSc ⁵⁶, Dr Elias Allara MD, PhD ^{70,102}, Clare Pearson MSc ^{70,102}, Dr David Bibby PhD ⁷², Dr Gavin Dabrera PhD ⁷², Dr Nicholas Ellaby PhD ⁷², Dr Eileen Gallagher PhD ⁷², Dr Jonathan Hubb PhD ⁷², Dr Angie Lackenby PhD ⁷², Dr David Lee PhD ⁷², Nikos Manesis ⁷², Dr Tamyo Mbisa PhD ⁷², Dr Steven Platt PhD ⁷², Katherine A Twohig ⁷², Dr Mari Morgan PhD ⁷⁴, Alp Aydin MSci ⁷⁵, David J Baker BEng ⁷⁵, Dr Ebenezer Foster-Nyarko PhD ⁷⁵, Dr Sophie J Prosolek PhD ⁷⁵, Steven Rudder ⁷⁵, Chris Baxter BSc ⁷⁷, Sílvia F Carvalho MSc ⁷⁷, Dr Deborah Lavin PhD ⁷⁷, Dr Arun Mariappan PhD ⁷⁷, Dr Clara Radulescu PhD ⁷⁷, Dr Aditi Singh PhD ⁷⁷, Miao Tang MD ⁷⁷, Helen Morcrette BSc ⁷⁹, Nadua Bayzid BSc ⁹⁶, Marius Cotic MSc ⁹⁶, Dr Carlos E Balcazar PhD ¹⁰⁴, Dr Michael D Gallagher PhD ¹⁰⁴, Dr Daniel Maloney PhD ¹⁰⁴, Thomas D Stanton BSc ¹⁰⁴, Dr Kathleen A Williamson PhD ¹⁰⁴, Dr Robin Manley PhD ¹⁰⁵, Michelle L Michelsen BSc ¹⁰⁵, Dr Christine M Sambles PhD ¹⁰⁵, Dr David J Studholme PhD ¹⁰⁵, Joanna Warwick-Dugdale BSc ¹⁰⁵, Richard Eccles MSc ¹⁰⁷, Matthew Gemmell MSc ¹⁰⁷, Dr Richard Gregory PhD ¹⁰⁷, Dr Margaret Hughes PhD ¹⁰⁷, Charlotte Nelson MSc ¹⁰⁷, Dr Lucille Rainbow PhD ¹⁰⁷, Dr Edith E Vamos PhD ¹⁰⁷, Hermione J Webster BSc ¹⁰⁷, Dr Mark Whitehead PhD ¹⁰⁷, Claudia Wierzbicki BSc ¹⁰⁷, Dr Adrienn Angyal PhD ¹⁰⁹, Dr Luke R Green PhD ¹⁰⁹, Dr Max Whiteley PhD ¹⁰⁹, Emma Betteridge BSc ¹¹⁶, Dr Iraad F Bronner PhD ¹¹⁶, Ben W Farr BSc ¹¹⁶, Scott Goodwin MSc ¹¹⁶, Dr Stefanie V Lensing PhD ¹¹⁶, Shane A McCarthy ^{116,102}, Dr Michael A Quail PhD ¹¹⁶, Diana Rajan MSc ¹¹⁶, Dr Nicholas M Redshaw PhD ¹¹⁶, Carol Scott ¹¹⁶, Lesley Shirley MSc ¹¹⁶ and Scott AJ Thurston BSc ¹¹⁶

Software and analysis tools:

Dr Will Rowe PhD⁴³, Amy Gaskin MSc⁷⁴, Dr Thanh Le-Viet PhD⁷⁵, James Bonfield BSc¹¹⁶, Jennifer Liddle¹¹⁶ and Andrew Whitwham BSc¹¹⁶

1 Barking, Havering and Redbridge University Hospitals NHS Trust, **2** Barts Health NHS Trust, **3** Belfast Health & Social Care Trust, **4** Betsi Cadwaladr University Health Board, **5** Big Data Institute, Nuffield Department of Medicine, University of Oxford, **6** Blackpool Teaching Hospitals NHS Foundation Trust, **7** Bournemouth University, **8** Cambridge Stem Cell Institute, University of Cambridge, **9** Cambridge University Hospitals NHS Foundation Trust, **10** Cardiff and Vale University Health Board, **11** Cardiff University, **12** Centre for Clinical Infection and Diagnostics Research, Department of Infectious Diseases, Guy's and St Thomas' NHS Foundation Trust, **13** Centre for Enzyme Innovation, University of Portsmouth, **14** Centre for Genomic Pathogen Surveillance, University of Oxford, **15** Clinical Microbiology Department, Queens Medical Centre, Nottingham University Hospitals NHS Trust, **16** Clinical Microbiology, University Hospitals of Leicester NHS Trust, **17** County Durham and Darlington NHS Foundation Trust, **18** Deep Seq, School of Life Sciences, Queens Medical Centre, University of Nottingham, **19** Department of Infectious Diseases and Microbiology, Cambridge University Hospitals NHS Foundation Trust, **20** Department of Medicine, University of Cambridge, **21** Department of Microbiology, Kettering General Hospital, **22** Department of Microbiology, South West London Pathology, **23** Department of Zoology, University of Oxford, **24** Division of Virology, Department of Pathology, University of Cambridge, **25** East Kent Hospitals University NHS Foundation Trust, **26** East Suffolk and North Essex NHS Foundation Trust, **27** East Sussex Healthcare NHS Trust, **28** Gateshead Health NHS Foundation Trust, **29** Great Ormond Street Hospital for Children NHS Foundation Trust, **30** Great Ormond Street Institute of Child Health (GOS ICH), University College London (UCL), **31** Guy's and St. Thomas' Biomedical Research Centre, **32** Guy's and St. Thomas' NHS Foundation Trust, **33** Hampshire Hospitals NHS Foundation Trust, **34** Health Services Laboratories, **35** Heartlands Hospital, Birmingham, **36** Hub for Biotechnology in the Built Environment, Northumbria University, **37** Hull University Teaching Hospitals NHS Trust, **38** Imperial College Healthcare NHS Trust, **39** Imperial College London, **40** Infection Care Group, St George's University Hospitals NHS Foundation Trust, **41** Institute for Infection and Immunity, St George's University of London, **42** Institute of Biodiversity, Animal Health & Comparative Medicine, **43** Institute of Microbiology and Infection, University of Birmingham, **44** Isle of Wight NHS Trust, **45** King's College Hospital NHS Foundation Trust, **46** King's College London, **47** Liverpool Clinical Laboratories, **48** Maidstone and Tunbridge Wells NHS Trust, **49** Manchester University NHS Foundation Trust, **50** Microbiology Department, Buckinghamshire Healthcare NHS Trust, **51** Microbiology, Royal Oldham Hospital, **52** MRC Biostatistics Unit, University of Cambridge, **53** MRC-University of Glasgow Centre for Virus Research, **54** Newcastle University, **55** NHS Greater Glasgow and Clyde, **56** NHS Lothian, **57** NIHR Health Protection Research Unit in HCAI and AMR, Imperial College London, **58** Norfolk and Norwich University Hospitals NHS Foundation Trust, **59** Norfolk County Council, **60** North Cumbria Integrated Care NHS Foundation Trust, **61** North Middlesex University Hospital NHS Trust, **62** North Tees and Hartlepool NHS Foundation Trust, **63** North West London Pathology, **64** Northumbria Healthcare NHS Foundation Trust, **65** Northumbria University, **66** NU-OMICS, Northumbria University, **67** Path Links, Northern Lincolnshire and Goole NHS Foundation Trust, **68** Portsmouth Hospitals University NHS Trust, **69** Public Health Agency, Northern Ireland, **70** Public Health England, **71** Public Health England, Cambridge, **72** Public Health England, Colindale, **73** Public Health Scotland, **74** Public Health Wales, **75** Quadram Institute Bioscience, **76** Queen Elizabeth Hospital, Birmingham, **77** Queen's University Belfast, **78** Royal Brompton and Harefield Hospitals, **79** Royal Devon and Exeter NHS Foundation Trust, **80** Royal Free London NHS Foundation Trust, **81** School of Biological Sciences, University of Portsmouth, **82** School of Health Sciences, University of Southampton, **83** School of Medicine, University of Southampton, **84** School of Pharmacy & Biomedical Sciences, University of Portsmouth, **85** Sheffield Teaching Hospitals NHS Foundation Trust, **86** South Tees Hospitals NHS Foundation Trust, **87** Southwest Pathology Services, **88** Swansea University, **89** The Newcastle upon Tyne Hospitals NHS Foundation Trust, **90** The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust, **91** The Royal Marsden NHS Foundation Trust, **92** The Royal Wolverhampton NHS Trust, **93** Turnkey Laboratory, University of Birmingham, **94** University College London Division of Infection and Immunity, **95** University College London Hospital Advanced Pathogen Diagnostics Unit, **96** University College London Hospitals NHS Foundation Trust, **97** University Hospital Southampton NHS Foundation Trust, **98** University Hospitals Dorset NHS Foundation Trust, **99** University Hospitals Sussex NHS Foundation Trust, **100** University of Birmingham, **101** University of Brighton, **102** University of Cambridge, **103** University of East Anglia, **104** University of Edinburgh, **105** University of Exeter, **106** University of Kent, **107** University of Liverpool, **108** University of Oxford, **109** University of Sheffield, **110** University of Southampton, **111** University of St Andrews, **112** Viapath, Guy's and St Thomas' NHS Foundation Trust, and King's College Hospital NHS Foundation Trust, **113** Virology, School of Life Sciences, Queens Medical

Centre, University of Nottingham, **114** Watford General Hospital, **115** Wellcome Centre for Human Genetics, Nuffield Department of Medicine, University of Oxford, **116** Wellcome Sanger Institute, **117** West of Scotland Specialist Virology Centre, NHS Greater Glasgow and Clyde, **118** Whittington Health NHS Trust