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Supplementary appendix 1

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

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International research priorities to address the long-term effects of COVID-19 in airways diseases

Supplementary Online Material

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Supplementary tables

Table S1. Research ideas removed or merged with other questions during internal review

Ideas	Reasons for removal
Associations/risk factors	
1.To study the immune-pathology of post COVID-19 small and large airways?	Considered out of scope
2.To determine who is at greatest risk of long-term lung damage following COVID-19?	Merged with retained question
3. To investigate if pre-existing airways disease severity markers (ACQ, Gold stage for COPD, BSI for bronchiectasis) prior to COVID-19 predict in-patient length of stay and or post COVID morbidity (exacerbation rates, post COVID-19 hospitalisation, drug dose escalation, accelerated lung function loss)?	Merged with retained question
4. To explore which genetic and epigenetic mechanisms predispose patients with pre-existing airways diseases to long-lasting symptoms and complications ("long COVID")?	Merged with retained question
5. To assess the role of muco-ciliary clearance and other innate immunity pathways of the airways (upper and lower) in modulating the severity of SARS-CoV2 infection	Considered unanswerable within PHOSP-COVID research context
6. To compare the adaptive immune responses of the lower airways and lung parenchyma of the patients with COVID-19 pneumonia of different severities	Considered unanswerable within PHOSP-COVID research context
7. To measure changes in the IgA repertoire at mucosal surface in patients with pre-existing airway diseases	Considered unanswerable within PHOSP-COVID research context
8. To evaluate the expression patterns of collectins, pentraxins and other soluble innate receptors at airways	Considered unanswerable within PHOSP-COVID research context
9. To examine modulation in the expression of various entry and recognition receptors for respiratory pathogens and susceptibility to respiratory infectious diseases	Considered unanswerable within PHOSP-COVID research context
10· To study the architecture of respiratory epithelium, its metabolism and induction of inflammatory mediators	Considered unanswerable within PHOSP-COVID research context
11. To examine the intracellular signalling pathways in the epithelial cells of the lower airways and lung parenchyma of the Patients with COVID-19 pneumonia of different severities	Considered unanswerable within PHOSP-COVID research context
12. To investigate the role of microbiome resilience on long-term consequences of COVID-19	Merged with retained question
13. What is the relationship between Covid-19 social distancing and long-term outcome/mortality in patients with COPD (epidemiology, before, during and after the pandemic - impact of a probable reduction in exacerbations/admissions due to social distancing, impact on long-term outcome)	Considered unanswerable
14. Is heterozygosity (i.e. carrier of a mutant allele) for cystic fibrosis or alpha-1 antitrypsin represents a confounding factor in long-COVID?	Merged with retained question

15. Does acute COVID19 pneumonia lead to long (1 year) term small airways disease and airflow obstruction? If yes, is there a role for azithromycin either acutely to protect this from occurring (RECOVERY study data), or reduce airways disease once SAD diagnosed?	Merged with retained question
16. To determine what are the predictors of appearances consistent with undiagnosed bronchiectasis at 3 months and +12 months	Merged with retained question
17. To investigate what are the mechanism(s) of post COVID bronchiolitis?	Merged with retained question
Role of interventions	
18. To investigate the effects of experimental treatment options in reversing COVID associated lung disease (e.g. dexamethasone, hydroxychloroquine, azithromycin, anti virals)	Merged with retained question
19. To compare the effects of using Remdesivir or other anti-viral treatments in patients with and without pre-existing airway disease	Merged with retained question
20· To evaluate the effects of using bespoke pulmonary rehabilitation delivered virtually for COVID-19 survivors	Merged with retained question
21. To investigate whether an effective weight loss regime enhances recovery in patients with pre-existing airways diseases	Merged with retained question
22. To measure the short to long terms outcomes (3month, 12 months outcomes) for those with pre morbid airways disease randomised to standard care in RECOVERY vs those with active treatment	Merged with retained question
23. Does ICS/LABA scripts increase or decrease during lockdown periods when compared to non-lockdown periods? Does this differ according to geographical region, ethnicity, socioeconomic status and gender?	Merged with retained question
Long-term effects (disease burden)	
24. To assess the long term morbidity or mortality in COVID-19 survivors with pre-existing airways diseases and the association with severity of the acute COVID illness	Merged with retained question
25. To investigate whether patients with pre-existing airways diseases have more significant breathlessness following COVID-19 than other patients?	Merged with retained question
26. To examine the impact of long COVID in the development of bronchiectasis (BE) or progression of pre-existing ones and the predominant type (inflammatory or traction BE) observed	Merged with retained question
27. To evaluate the post-COVID changes of pulmonary function measurements in patients with pre-existing airway diseases at 6 & 12 months post discharge and any associated predicting factors	Merged with retained question
28. To compare the pulmonary function measurements in of COVID hospitalized survivors across the range of Covid-19 severity on admission	Merged with retained question

29. To assess whether in patients with pre-existing airways diseases, the rate of decline in lung function is accelerated following COVID-19?	Merged with retained question
30· To evaluate the exercise capacity post COVID-19 in patients with pre-existing airways diseases and associated factors e.g. severity of acute illness, premorbid phenotypes, etc.	Merged with retained question
31. To compare the reported CT imaging findings at 6 & 12 months in survivors of Covid-19 across the range of the acute disease severity	Merged with retained question
32. To evaluate the impact of COVID infection in patients with Cystic Fibrosis (CF), what effect on their disease control as is measured by: exacerbation frequency; antibiotic use; hospital admissions; disease control questionnaire; QoL questionnaires; change in maintenance therapy; change in sputum microbiology etc	Merged with retained question
33. To examine the association between premorbid disease severity/activity markers in patients with pre-existing airway diseases (FEV1, BODE, ADO, BSI, ACT, AQLQ) with post COVID symptoms (e.g. breathlessness, fatigue, depression)	Merged with retained question
34. To examine the baseline characteristics of patients with pre-existing bronchiectasis who were admitted with COVID, does BSI correlate with length of stay, disease severity and or oxygen requirements? Were the baseline characteristics different from UK cohorts e.g. BronchUK, EMBARC-UK. What were the differences between those ventilated and those who were not?	Merged with retained question
35. To compare the outcomes of step 1-3 asthma patients admitted with COVID 19 against those on step 4 or 5? are asthma biological therapies associated with poorer or better outcomes vs methotrexate/ long term steroids alone	Merged with retained question
Long-term effects (quality of life)	
36. To investigate the impact "long COVID" has on the family members/carers of people with pre-existing airways disease	Considered unanswerable within PHOSP-COVID research context
37. To assess the social burden of post COVID-19 complications in terms 'out of pocket' expenses/economics, quality of life and social life?	Considered unanswerable within PHOSP-COVID research context

Table S2. All research ideas ranked by their overall Research Priority Scores (RPS)

Overall Rank	Research idea	Sub-theme	Answer-able?	Feasible?	Timeliness?	Burden?	Equity?	RPS (unweighted)	wRPS (weighted)	AEA
1	Exploring how the admission ISARIC 4C prognostic score (a risk stratification score that predicts in-hospital mortality for hospitalised COVID-19 patients) correlate with post discharge morbidity at 3 and 12 months in patients with pre-existing airways disease compared to those with none.	I	1·00	1·00	0·98	0·56	0·78	0·864	0·808	0·838
2	Determining if the 3- and 6-month post-COVID-19 fatigue, sarcopenia, anxiety and depression scores are worse in patients with pre-existing airway diseases as compared to those with no airways disease? Is this significant when adjusted for severity of in-patient disease?	I	0·96	0·91	0·96	0·66	0·77	0·852	0·811	0·846
3	Investigating if patients with pre-existing airway diseases who were treated for severe COVID-19 are at higher risk of future cardiovascular complications e.g. myocardial infarction, stroke at 6 and 12 months in comparison to those with no pre-existing airway disease.	III	0·95	0·90	0·94	0·65	0·81	0·849	0·811	0·817
4	Understanding the predictors of hospital re-admission post-COVID-19 in patients with pre-existing airways.	I	0·93	0·88	0·89	0·71	0·83	0·847	0·825	0·833
5	Developing and validating tools for remote monitoring, and to help people self-monitor symptoms, especially in patients with pre-existing airway diseases.	V	0·89	0·88	0·90	0·76	0·78	0·841	0·822	0·821
6	Determining the incidence and risk factors of new onset symptomatic obstructive airways disease in COVID-19 survivors, defined clinically and/or using objective diagnostic tests, e.g. spirometry and CT imaging at 3 & 12 months.	I	0·97	0·91	0·91	0·64	0·77	0·840	0·803	0·808
7	Assessing if current smokers fair worse in terms of recovery in patients with COPD who have had severe COVID-19 pneumonia.	I	0·98	0·90	0·96	0·60	0·76	0·838	0·790	0·808
8	Comparing the clinical and cost-effectiveness of exercise and education-based rehabilitation to improve health status compared with standard care in COVID-19 survivors with pre-existing airways diseases.	II	0·90	0·81	0·89	0·74	0·81	0·828	0·810	0·821

9	Exploring the benefit of progressive/bespoke exercise rehabilitation in people with airways disease and persistent symptoms or physical limitation delivered live or virtually following discharge after COVID-19 infection.	II	0·92	0·87	0·86	0·74	0·74	0·826	0·809	0·813
10	Assessing whether the outcomes of acute hospitalization with COVID-19 in patients with pre-existing airways disease on pre-COVID-19 long-term anticoagulants are better than those who were not on long-term anticoagulants (e.g. using in patient length of stay, discharge rates, long COVID-19 markers at 3, 6 and 12 months).	III	0·90	0·88	0·90	0·63	0·81	0·825	0·790	0·775
11	Investigating if ethnicity affect recovery after admission with COVID-19 in patients with asthma and COPD.	I	0·95	0·90	0·95	0·56	0·75	0·819	0·768	0·771
12	Exploring if inhaled corticosteroids (ICS) use in preceding 12 months in patients with pre-existing airway disease is associated with greater in-patient COVID-19 disease burden (Sequential Organ Failure Assessment (SOFA) Score, length of stay, ventilation status) and/or post COVID-19 excess rates of fatigue/sarcopenia.	I	0·94	0·88	0·88	0·67	0·71	0·817	0·788	0·775
13	Determining the predictors of new diagnosis of bronchiectasis post-COVID-19 admission on CT scan at 6 months (disease severity, length of stay, clinical history of sputum production, sputum microbiology at 3 months plus)·	III	0·93	0·84	0·91	0·60	0·76	0·808	0·768	0·729
14	Assessing the impact of nutritional status (nutritional depletion or obesity) on recovery from COVID-19 in people with airways disease and can this be modified by nutritional interventions.	I	0·87	0·79	0·80	0·78	0·78	0·804	0·802	0·779
15	Estimating the incidence of pulmonary embolism up to one year after acute COVID-19.	I	0·95	0·95	0·98	0·47	0·67	0·802	0·733	0·788
16	Comparing the rates of return to work at 6 and 12 months between those with and without pre-existing airways diseases who survived COVID-19 hospitalization.	IV	0·96	0·93	0·95	0·51	0·66	0·802	0·742	0·783
17	Examining how the chest x-ray and CT scans changes apparent in COVID-19 correlate with subsequent long-term symptoms and outcomes.	III	0·96	0·95	0·82	0·57	0·68	0·796	0·762	0·763

18	Exploring if patients with asthma and COPD who have had severe COVID-19 pneumonia develop additional long term restrictive lung function impairment after recovery.	III	0·94	0·88	0·82	0·56	0·76	0·793	0·759	0·779
19	Determining the characteristics of patients with pre-existing airway diseases who required non-invasive ventilation vs those with airway disease who did not.	I	0·91	0·89	0·93	0·48	0·74	0·791	0·732	0·771
20	Determining the effect of type and duration of anticoagulation treatment given after venous thromboembolism or as prophylaxis in hospitalized COVID-19 patients with pre-existing airways diseases.	II	0·92	0·82	0·82	0·59	0·75	0·780	0·751	0·725
21	Determining if patients at risk of persisting disability following COVID-19 can be identified (potentially from disease indicators at the acute event, frailty scores or nutritional scores) and targeted for rehabilitation and/or nutritional interventions.	I	0·78	0·71	0·76	0·80	0·83	0·778	0·785	0·754
22	Exploring the long-term psychological and cognitive effects of COVID-19 on patients with pre-existing airway diseases.	IV	0·93	0·88	0·76	0·61	0·71	0·777	0·756	0·758
23	Exploring whether patients with pre-existing asthma who develop severe COVID-19 subsequently develop an accelerated loss of lung function (including small airways damage or dysfunction) as a consequence of infection or hyper-inflammation.	III	0·87	0·87	0·75	0·62	0·77	0·777	0·759	0·750
24	Assessing the effectiveness of counselling and psychological services in addressing the long-term psychological and cognitive effects of COVID-19 on patients with pre-existing airway diseases.	IV	0·90	0·87	0·74	0·70	0·67	0·776	0·770	0·758
25	Investigating the long-term effects of surviving COVID-19 on the mental health of people living with COPD.	IV	0·97	0·90	0·77	0·57	0·65	0·773	0·747	0·754
26	Comparing the differences in pre-morbid baseline characteristics of patients with pre-existing airway diseases who were admitted with COVID-19, with stable cohort who avoided COVID-19 infection and admission vis-vis BAME (Black, Asian and Minority Ethnic), social deprivation score, compliance score, quality of care.	III	0·87	0·84	0·89	0·50	0·73	0·767	0·716	0·738

27	Determining if patients with asthma are potentially protected from development of severe outcomes in COVID-19.	I	0·83	0·84	0·83	0·62	0·71	0·765	0·736	0·733
28	Developing scores to predict long-term respiratory disease severity and risk of mortality in survivors from severe COVID-19.	V	0·85	0·77	0·71	0·67	0·82	0·764	0·761	0·738
29	Assessing the risk/protective factors for the development of new post COVID-19 airways disease (e.g. patient or viral genetics, patient ethnicity and/or smoking status, admission inflammatory markers, treatments used such as steroids and Remdesivir, requirement for intubation, oxygen, etc.)	I	0·81	0·71	0·80	0·68	0·80	0·760	0·747	0·721
30	Assessing COVID outcomes of patients with airways disease to help ascertain the influence and interactions of risk and protective factors for poor COVID-19 outcomes (e.g. steroid use, steroid inhalers, long term antibiotics, colonising microbes, microbial community, and underlying disease/aetiology).	II	0·80	0·72	0·75	0·68	0·81	0·754	0·747	0·725
31	Assessing if clinical outcomes after contracting COVID-19 are different in those with pre-existing bronchiectasis compared to healthy age- or sex-matched controls.	III	0·95	0·90	0·84	0·40	0·67	0·753	0·695	0·750
32	Exploring long-term physical consequences of COVID-19 amenable to rehabilitation in patients with pre-existing airway disease.	III	0·81	0·81	0·76	0·64	0·74	0·749	0·734	0·725
33	Evaluating whether COVID-19 infection has any impact on subsequent exacerbation frequency and severity, and response to therapy in people with airways disease, including any influence on exacerbation biology or aetiology (e.g. inflammatory, bacterial, viral, and pauci-inflammatory).	III	0·90	0·85	0·78	0·52	0·70	0·749	0·714	0·725
34	Comparing the differences in long-term complications such as bronchiectasis or decline in lung function in participants with pre-existing airways disease.	II	0·88	0·90	0·74	0·49	0·67	0·736	0·701	0·717

35	Investigating the relationship between the severity of the acute COVID-19 illness and the development of structural airway abnormalities evident on CT imaging.	I	0·94	0·88	0·93	0·35	0·53	0·727	0·647	0·746
36	Assessing the effectiveness of experimental therapies administered acutely during COVID-19 in clinical trials e.g. azithromycin, dexamethasone) versus patients exposed to standard of care in developing post COVID-19 airways diseases.	II	0·81	0·70	0·73	0·68	0·71	0·726	0·721	0·683
37	Examining if COVID-19 infection in patients with pre-existing asthma results in any changes in underlying phenotype, lung function, measures of reversibility, fractional exhaled nitric oxide (FeNO), and or increased or decreased blood eosinophils.	III	0·86	0·82	0·90	0·48	0·56	0·724	0·668	0·704
38	Investigating if there is an increased prevalence of breathing pattern disorders post-severe COVID-19 in those with pre-existing airways disease and infection, and if this can be modified by physiotherapist lead breathing retraining?	III	0·81	0·78	0·76	0·64	0·63	0·722	0·705	0·700
39	Studying the impact of vaccination on the population of COVID-19 survivors with pre-existing or newly developed airways diseases.	II	0·86	0·74	0·67	0·57	0·76	0·722	0·712	0·700
40	Assessing if patients with pre-existing airway diseases have higher C-reactive protein (CRP) during admission (single test or area under curve calculation) and does this normalise by 3 months compared to patients without pre-existing airways diseases.	I	0·91	0·93	0·93	0·25	0·58	0·721	0·629	0·779
41	Investigating if T2 inflammation plays a protective role for patients with asthma from severe outcomes in COVID-19.	I	0·84	0·78	0·81	0·51	0·66	0·721	0·682	0·654
42	Assessing healthcare needs for patients with pre-existing airways disease who were hospitalized with COVID-19 infection (e.g. health behaviour and interaction with health care provider services) and how these differ globally in different health economies (particularly in LMICs).	V	0·79	0·76	0·75	0·60	0·69	0·719	0·700	0·688
43	Exploring the long-term consequences of COVID-19 on pre-existing uncontrolled severe asthma following biological therapy in terms of asthma control, spirometry, and annual exacerbation rate.	II	0·89	0·86	0·73	0·56	0·55	0·718	0·694	0·696

44	Understanding the relationship between pulmonary embolism and long COVID-19, and the consequences in patients with previous airway diseases.	I	0·84	0·80	0·72	0·59	0·64	0·716	0·699	0·667
45	Investigating whether baseline admission or prehospitalization vitamin D levels predict length of stay or severity of in-patient disease, and/or worse morbidity, at 3 and 6 months.	I	0·80	0·70	0·85	0·53	0·70	0·715	0·675	0·683
46	Examining the association between the described intensity of breathlessness and cough at 3 and 12 months post-COVID-19 hospitalization and the severity of the pre-existing airway disease.	III	0·83	0·82	0·87	0·39	0·63	0·709	0·645	0·725
47	Comparing the COVID-19 burden between patients in high-income countries (HICs) vs patients in low- and middle-income countries (LMICs).	V	0·88	0·74	0·83	0·41	0·66	0·703	0·649	0·704
48	Comparing the compliance rate for inhaler prescriptions in the 12 months prior to and 12 months after COVID-19 in patients with pre-existing airway diseases.	III	0·86	0·80	0·90	0·41	0·53	0·699	0·633	0·725
49	Comparing the differences in outcomes on those non-invasively ventilated for COVID-19 who have prior airways disease compared to those with no pre-NIV airways diseases.	II	0·94	0·86	0·86	0·33	0·50	0·696	0·624	0·725
50	Exploring the facilitators and barriers for implementing vaccination in COVID-19 survivors.	II	0·76	0·63	0·71	0·57	0·79	0·693	0·679	0·671
51	Determining whether coagulopathy plays a role in development of severe outcomes with COVID-19 in patients with asthma or COPD. Investigating specific mediators of the coagulation pathway may be targeted for development of treatments for long-term decline in lung function in COVID-19 patients with asthma or COPD.	I	0·74	0·67	0·74	0·64	0·66	0·692	0·680	0·608
52	Understanding the association between pre- and post-COVID-19 eosinophils and if prior eosinophilia is associated with swifter or slower recovery rates.	I	0·86	0·74	0·81	0·38	0·66	0·690	0·636	0·696
53	Exploring the differences in airway microbiome in those with persistent long COVID-19 symptoms as compared to those without.	I	0·89	0·77	0·82	0·35	0·61	0·688	0·628	0·717

54	Investigating the specific phenotypes of asthma that are more or less susceptible to long-term airway injury following SARS-CoV 2 infection and what are the underlying mechanisms for this susceptibility or protection.	I	0·84	0·74	0·75	0·53	0·58	0·688	0·659	0·629
55	Studying if airway immune-phenotype persists after COVID-19 e.g. the persistence of IgE-Associated respiratory Allergy and Allergy-specific IgE despite remission of COVID 19.	I	0·90	0·83	0·86	0·28	0·55	0·686	0·610	0·721
56	Assessing how interventions that occurred during the treatment for COVID-19 (e.g. prone positioning, lung ventilation, anti-viral treatments, dexamethasone, anti-cytokine antibodies, etc.) impact the risk of development of airway diseases.	II	0·76	0·64	0·67	0·63	0·74	0·686	0·683	0·663
57	Exploring the opportunity to develop or enhance teleconsultation in heath sector following the pandemic.	V	0·70	0·68	0·81	0·58	0·64	0·682	0·652	0·658
58	Assessing the effectiveness and safety of opioids for relieving severe breathlessness in COVID-19 patients in palliative care or as an adjunct to life-prolonging treatment.	II	0·71	0·68	0·79	0·51	0·72	0·682	0·646	0·629
59	Determining whether the underlying airway disease in COVID survivors has altered phenotype post-COVID-19 (e.g. microbiome pattern, community, clinical phenotype, and response to treatment).	III	0·78	0·67	0·73	0·47	0·71	0·672	0·640	0·663
60	Understanding the association between patient-reported dyspnoea and objective findings (diffusion capacity, radiology, 6 minute walk distance) at different time points and up to 5-years post-COVID-19 in patients with pre-existing airway diseases.	I	0·91	0·82	0·50	0·49	0·64	0·670	0·669	0·650
61	Assessing non-invasive ventilation (NIV) use in decompensated type 2 respiratory failure in COVID infected COPD patients (i.e. infection control issues and efficacy of this modality of treatment)	II	0·83	0·72	0·77	0·43	0·59	0·668	0·625	0·650
62	Studying the impact of COVID-19 on psychological health in asthma patients e.g. breathing pattern disorder or ILO (inducible laryngeal obstruction).	IV	0·81	0·73	0·77	0·48	0·55	0·667	0·629	0·646

63	Assessing whether non-invasive vascular damage or stiffness markers are higher after 6 and 12 months post COVID-19 in those with pre-existing airways disease versus no airways disease.	III	0·87	0·70	0·84	0·34	0·57	0·663	0·598	0·671
64	Studying COVID-19 knowledge and behaviours of primary care patients with chronic respiratory diseases, including self-protection, use of medication, decision-making, e.g. when to seek help.	I	0·71	0·66	0·74	0·44	0·74	0·660	0·622	0·658
65	Understanding the mechanisms driving accelerated loss of lung function in patients with pre-existing asthma who develop severe COVID-19, and if they are steroid or biologic responsive?	III	0·78	0·70	0·55	0·60	0·67	0·658	0·665	0·596
66	Assessing whether the regional admission profiles of patients with pre-existing airways disease infected with COVID-19 map to prior asthma and COPD hotspots.	III	0·77	0·74	0·78	0·35	0·63	0·653	0·598	0·667
67	Studying the long-term development of disease control, quality of life, physical capacity, psychological status in COVID-19 survivors with pre-existing or newly developed airway disease in primary care.	III	0·73	0·70	0·55	0·56	0·72	0·653	0·656	0·638
68	Investigating the long-term consequence of COVID-19 on lung airways hypersensitivity in patients who didn't have pre-existing airways disease by performing serial Methacholine Challenge Test.	I	0·76	0·71	0·79	0·41	0·59	0·650	0·601	0·650
69	Exploring if higher levels of PM2.5 and/or NO2 in towns and cities leave a population more susceptible to worse health impacts from COVID-19, especially in patients with pre-existing airway diseases.	I	0·74	0·64	0·75	0·48	0·63	0·647	0·613	0·621
70	Evaluating the impact of national and local lockdowns on access to airways disease medicines (e.g. acute bursts of corticosteroids that are used to define airway disease exacerbations) and if exacerbation rates for worsening symptoms, differ during national and local lockdowns when compared to non-lockdown periods.	II	0·71	0·63	0·70	0·47	0·69	0·639	0·611	0·625

71	Determining, when matched for acuity (national early warning score 2, NEWS2), if there was any evidence of therapeutic nihilism with fewer COPD patients offered ventilatory support or intensive treatment unit (ITU), i.e. understanding if patients with chronic respiratory disease do any worse than others if they were given ITU.	I	0·70	0·62	0·72	0·48	0·67	0·637	0·608	0·554
72	Studying factors that alter the pathophysiology of developing new post COVID-19 airways disease or worsening of pre-existing airways disease.	I	0·73	0·63	0·61	0·58	0·62	0·633	0·630	0·583
73	Investigating if there are evidence of Th1/ Th2 skewed changes after COVID-19 and if these persist (e.g. by comparing plasma and sputum in patients with and without airways disease).	I	0·83	0·67	0·79	0·34	0·51	0·628	0·570	0·629
74	Studying the long-term impact of COVID-19 on return to employment, and if this can be addressed with vocational rehabilitation.	IV	0·74	0·71	0·65	0·51	0·50	0·623	0·603	0·600
75	Conducting pathophysiological studies on interactions between co-morbidities and long-term consequences of airways disease in COVID-19 survivors.	I	0·68	0·59	0·53	0·55	0·76	0·622	0·628	0·583
76	Exploring the impact of the combination of pre-existing airways disease and COVID-19 infection on skeletal muscle function/biology over the medium long term. (i.e. how does dysfunction at a muscle level relate to symptoms such as fatigue and physical capacity?).	III	0·79	0·69	0·65	0·44	0·54	0·621	0·593	0·613
77	Studying the effect of shielding at protecting people with severe chronic airways disease from COVID-19 (e.g. Should people with less severe airways disease shield? Should shielding advice extend to MRC dyspnoea scale to define severity?)	V	0·65	0·52	0·66	0·57	0·66	0·612	0·602	0·554
78	Investigating the change in antibiotic prescription rate by GPs to treat COVID-19 like symptoms during pandemic in patients with pre-existing airways diseases.	II	0·75	0·70	0·71	0·30	0·55	0·603	0·549	0·667
79	Evaluating the relationship between care quality at previous admission (using National Asthma and COPD Audit Programme (NACAP) link) and risk of COVID admission/poor outcome e.g. smoking cessation, pulmonary rehab, etc.	I	0·71	0·55	0·70	0·45	0·59	0·600	0·570	0·596

80	Exploring if COVID-19 survivors who had pre-existing uncontrolled severe asthma can be treated with biological therapy (e.g. anti IgE Vs. Anti IL5 Vs. Anti IL4R)	II	0·74	0·67	0·63	0·45	0·47	0·592	0·568	0·583
81	Exploring if the care of COVID-19 survivors with pre-existing or newly developed airways disease be integrated into existing chronic respiratory diseases services such as pulmonary rehabilitation or if they need separate services? [Issues of equity, use of resources, how best to segment populations].	II	0·63	0·57	0·62	0·49	0·65	0·591	0·576	0·554
82	Comparing the airway microbiome differences in patients with pre-existing airway diseases, comparing those with severe COVID-19 infection vs patients with milder severity (accounting for antibiotics usage as a confounder).	III	0·71	0·55	0·68	0·44	0·56	0·590	0·560	0·575
83	Comparing the effects of biological therapy in controlling asthma between patients who developed airways disease post-COVID-19 and those who had pre-existing airways disease.	II	0·79	0·62	0·55	0·40	0·54	0·581	0·564	0·592
84	Exploring the need to come up with a global guideline for treatment and management of chronic airways diseases with COVID-19, or to modify the existing global guidelines such GOLD and GINA.	V	0·59	0·58	0·54	0·50	0·67	0·575	0·571	0·538
85	Determining if there is a need to come up with a global guideline for treatment and management of chronic respiratory diseases with COVID-19, or to modify the existing global strategies such GOLD and GINA?	II	0·60	0·55	0·53	0·51	0·66	0·571	0·571	0·538
86	Investigating the feasibility of alternative diagnostic tools to detect airways diseases in absence of aerosols generating tools such spirometry, peak flow meter, etc.	V	0·65	0·57	0·54	0·47	0·62	0·568	0·560	0·542
87	Assessing the most effective and efficient ways for primary care to monitor people diagnosed with COVID-19, considering the daily heavy workload from delivering routine care and monitoring patients.	II	0·56	0·47	0·64	0·49	0·67	0·564	0·549	0·550
88	To explore the feasibility of collecting world-wide data sets of patients with COPD and asthma to be analysed with deep-learning.	V	0·72	0·52	0·49	0·42	0·64	0·560	0·556	0·546

89	Studying the natural history of thoracic CT changes detected in COVID-19 associated pulmonary aspergillosis (CAPA).	I	0·83	0·69	0·58	0·24	0·35	0·538	0·493	0·621
90	Studying the GP's perceptions and practices followed during COVID-19 pandemic.	V	0·59	0·65	0·71	0·23	0·45	0·525	0·460	0·629
91	Assessing whether XeMRI (Xenon MRI) can be used to evaluate and locate specific areas of airway injury and remodelling, identify regions different from healthy airway, and follow the progression of airway obstruction longitudinally in patients hospitalized for COVID-19.	II	0·80	0·50	0·68	0·27	0·34	0·518	0·467	0·575
92	Exploring if COVID-19 survivors with persistent structural CT abnormalities are at an increased risk of developing chronic pulmonary aspergillosis (CPA). Exploring if they share similar multi-genetic characteristics in comparison to non-COVID patients.	I	0·81	0·63	0·41	0·31	0·41	0·514	0·502	0·571
93	Studying the long term outcomes of the hospitalized COVID-19 survivors who developed invasive aspergillosis.	I	0·86	0·69	0·41	0·18	0·36	0·501	0·471	0·638
94	Exploring the role of Artificial Intelligence (AI) in creating digital twins of COVID-19 patients with different disease severity, ranging from asymptomatic to ICU patients, and if such twins can be computationally treated with thousands of drugs to find one or more that modulate ineffective or exaggerated immune responses (see The Swedish Digital Twin Consortium webpage for details).	V	0·57	0·49	0·48	0·43	0·53	0·500	0·496	0·417
95	Determining if COVID-19 survivors with pre-existing or newly developed airways disease be a priority for vaccination. For example, which criteria for vaccination prioritisation should be applied to the population of COVID-19 survivors with pre-existing or newly developed airways disease?	II	0·48	0·33	0·51	0·54	0·64	0·499	0·508	0·558
96	Exploring if acute COVID-19 and/or long COVID-19 are potential risk factor/s for developing lung cancer.	I	0·60	0·48	0·15	0·46	0·54	0·446	0·490	0·588
97	Investigating any role of alternative system of medicine (e.g. Ayurveda, yoga, naturopathy, Unani, Siddha, and homeopathy (AYUSH)) in prevention and treatment of COVID-19 patients with pre-existing airway diseases.	V	0·42	0·31	0·50	0·21	0·37	0·362	0·326	0·608
98	Evaluating the involvement of private health sector in pandemic management and their perceptions about the same.	V	0·47	0·35	0·43	0·15	0·30	0·339	0·303	0·638

Table S3. Top 10 research ideas by their likelihood of answerability

Overall rank	Research idea	Sub-theme	Answer-ability	Feasibility	Timeliness	Burden	Equity	RPS (unweighted)	wRPS (weighted)	AEA
1	Exploring how the admission ISARIC 4C prognostic score (a risk stratification score that predicts in-hospital mortality for hospitalised COVID-19 patients) correlate with post discharge morbidity at 3 and 12 months in patients with pre-existing airways disease compared to those with none.	I	1·00	1·00	0·98	0·56	0·78	0·864	0·808	0·838
7	Assessing if current smokers fair worse in terms of recovery in patients with COPD who have had severe COVID-19 pneumonia.	I	0·98	0·90	0·96	0·60	0·76	0·838	0·790	0·808
25	Investigating the long-term effects of surviving COVID-19 on the mental health of people living with COPD.	IV	0·97	0·90	0·77	0·57	0·65	0·773	0·747	0·754
6	Determining the incidence and risk factors of new onset symptomatic obstructive airways disease in COVID-19 survivors, defined clinically and/or using objective diagnostic tests, e.g. spirometry and CT imaging at 3 & 12 months.	I	0·97	0·91	0·91	0·64	0·77	0·840	0·803	0·808
16	Comparing the rates of return to work at 6 and 12 months between those with and without pre-existing airways diseases who survived COVID-19 hospitalization.	IV	0·96	0·93	0·95	0·51	0·66	0·802	0·742	0·783
2	Determining if the 3- and 6-month post-COVID-19 fatigue, sarcopenia, anxiety and depression scores are worse in patients with pre-existing airway diseases as compared to those with no airways disease? Is this significant when adjusted for severity of in-patient disease?	I	0·96	0·91	0·96	0·66	0·77	0·852	0·811	0·846
17	Examining how the chest x-ray and CT scans changes apparent in COVID-19 correlate with subsequent long-term symptoms and outcomes.	III	0·96	0·95	0·82	0·57	0·68	0·796	0·762	0·763

31	Assessing if clinical outcomes after contracting COVID-19 are different in those with pre-existing bronchiectasis compared to healthy age- or sex-matched controls.	III	0·95	0·90	0·84	0·40	0·67	0·753	0·695	0·750
15	Estimating the incidence of pulmonary embolism up to one year after acute COVID-19.	I	0·95	0·95	0·98	0·47	0·67	0·802	0·733	0·788
3	Investigating if patients with pre-existing airway diseases who were treated for severe COVID-19 are at higher risk of future cardiovascular complications e.g. myocardial infarction, stroke at 6 and 12 months in comparison to those with no pre-existing airway disease.	III	0·95	0·90	0·94	0·65	0·81	0·849	0·811	0·817

Table S4. Top 10 research ideas by their likelihood of feasibility

Overall rank	Research idea	Sub-theme	Answer-ability	Feasibility	Timeliness	Burden	Equity	RPS (unweighted)	wRPS (weighted)	AEA
1	Exploring how the admission ISARIC 4C prognostic score (a risk stratification score that predicts in-hospital mortality for hospitalised COVID-19 patients) correlate with post discharge morbidity at 3 and 12 months in patients with pre-existing airways disease compared to those with none.	I	1·00	1·00	0·98	0·56	0·78	0·864	0·808	0·838
15	Estimating the incidence of pulmonary embolism up to one year after acute COVID-19.	I	0·95	0·95	0·98	0·47	0·67	0·802	0·733	0·788
17	Examining how the chest x-ray and CT scans changes apparent in COVID-19 correlate with subsequent long-term symptoms and outcomes.	III	0·96	0·95	0·82	0·57	0·68	0·796	0·762	0·763
16	Comparing the rates of return to work at 6 and 12 months between those with and without pre-existing airways diseases who survived COVID-19 hospitalization.	IV	0·96	0·93	0·95	0·51	0·66	0·802	0·742	0·783
40	Assessing if patients with pre-existing airway diseases have higher C-reactive protein (CRP) during admission (single test or area under curve calculation) and does this normalise by 3 months compared to patients without pre-existing airways diseases.	I	0·91	0·93	0·93	0·25	0·58	0·721	0·629	0·779
2	Determining if the 3- and 6-month post-COVID-19 fatigue, sarcopenia, anxiety and depression scores are worse in patients with pre-existing airway diseases as compared to those with no airways disease? Is this significant when adjusted for severity of in-patient disease?	I	0·96	0·91	0·96	0·66	0·77	0·852	0·811	0·846
6	Determining the incidence and risk factors of new onset symptomatic obstructive airways disease in COVID-19 survivors, defined clinically and/or using objective diagnostic tests, e.g. spirometry and CT imaging at 3 & 12 months.	I	0·97	0·91	0·91	0·64	0·77	0·840	0·803	0·808

25	Investigating the long-term effects of surviving COVID-19 on the mental health of people living with COPD.	IV	0·97	0·90	0·77	0·57	0·65	0·773	0·747	0·754
34	Comparing the differences in long-term complications such as bronchiectasis or decline in lung function in participants with pre-existing airways disease.	II	0·88	0·90	0·74	0·49	0·67	0·736	0·701	0·717
7	Assessing if current smokers fair worse in terms of recovery in patients with COPD who have had severe COVID-19 pneumonia.	I	0·98	0·90	0·96	0·60	0·76	0·838	0·790	0·808

Table S5. Top 10 research ideas by their likelihood of timeliness

Overall rank	Research idea	Sub-theme	Answer-ability	Feasibility	Timeliness	Burden	Equity	RPS (unweighted)	wRPS (weighted)	AEA
1	Exploring how the admission ISARIC 4C prognostic score (a risk stratification score that predicts in-hospital mortality for hospitalised COVID-19 patients) correlate with post discharge morbidity at 3 and 12 months in patients with pre-existing airways disease compared to those with none.	I	1·00	1·00	0·98	0·56	0·78	0·864	0·808	0·838
15	Estimating the incidence of pulmonary embolism up to one year after acute COVID-19.	I	0·95	0·95	0·98	0·47	0·67	0·802	0·733	0·788
2	Determining if the 3- and 6-month post-COVID-19 fatigue, sarcopenia, anxiety and depression scores are worse in patients with pre-existing airway diseases as compared to those with no airways disease? Is this significant when adjusted for severity of in-patient disease?	I	0·96	0·91	0·96	0·66	0·77	0·852	0·811	0·846
7	Assessing if current smokers fair worse in terms of recovery in patients with COPD who have had severe COVID-19 pneumonia.	I	0·98	0·90	0·96	0·60	0·76	0·838	0·790	0·808
16	Comparing the rates of return to work at 6 and 12 months between those with and without pre-existing airways diseases who survived COVID-19 hospitalization.	IV	0·96	0·93	0·95	0·51	0·66	0·802	0·742	0·783
11	Investigating if ethnicity affect recovery after admission with COVID-19 in patients with asthma and COPD.	I	0·95	0·90	0·95	0·56	0·75	0·819	0·768	0·771
3	Investigating if patients with pre-existing airway diseases who were treated for severe COVID-19 are at higher risk of future cardiovascular complications e.g. myocardial infarction, stroke at 6 and 12 months in comparison to those with no pre-existing airway disease.	III	0·95	0·90	0·94	0·65	0·81	0·849	0·811	0·817
40	Assessing if patients with pre-existing airway diseases have higher C-reactive protein (CRP) during admission (single test or area under curve calculation) and does	I	0·91	0·93	0·93	0·25	0·58	0·721	0·629	0·779

	this normalise by 3 months compared to patients without pre-existing airways diseases.									
35	Investigating the relationship between the severity of the acute COVID-19 illness and the development of structural airway abnormalities evident on CT imaging.	I	0·94	0·88	0·93	0·35	0·53	0·727	0·647	0·746
19	Determining the characteristics of patients with pre-existing airway diseases who required non-invasive ventilation vs those with airway disease who did not.	I	0·91	0·89	0·93	0·48	0·74	0·791	0·732	0·771

Table S6. Top 10 research ideas by their likelihood of impact on burden

Overall rank	Research idea	Sub-theme	Answer-ability	Feasibility	Timeliness	Burden	Equity	RPS (unweighted)	wRPS (weighted)	AEA
21	Determining if patients at risk of persisting disability following COVID-19 can be identified (potentially from disease indicators at the acute event, frailty scores or nutritional scores) and targeted for rehabilitation and/or nutritional interventions.	I	0·78	0·71	0·76	0·80	0·83	0·778	0·785	0·754
14	Assessing the impact of nutritional status (nutritional depletion or obesity) on recovery from COVID-19 in people with airways disease and can this be modified by nutritional interventions.	I	0·87	0·79	0·80	0·78	0·78	0·804	0·802	0·779
5	Developing and validating tools for remote monitoring, and to help people self-monitor symptoms, especially in patients with pre-existing airway diseases.	V	0·89	0·88	0·90	0·76	0·78	0·841	0·822	0·821
8	Comparing the clinical and cost-effectiveness of exercise and education-based rehabilitation to improve health status compared with standard care in COVID-19 survivors with pre-existing airways diseases.	II	0·90	0·81	0·89	0·74	0·81	0·828	0·810	0·821
9	Exploring the benefit of progressive/bespoke exercise rehabilitation in people with airways disease and persistent symptoms or physical limitation delivered live or virtually following discharge after COVID-19 infection.	II	0·92	0·87	0·86	0·74	0·74	0·826	0·809	0·813
4	Understanding the predictors of hospital re-admission post-COVID-19 in patients with pre-existing airways.	I	0·93	0·88	0·89	0·71	0·83	0·847	0·825	0·833
24	Assessing the effectiveness of counselling and psychological services in addressing the long-term psychological and cognitive effects of COVID-19 on patients with pre-existing airway diseases.	IV	0·90	0·87	0·74	0·70	0·67	0·776	0·770	0·758
29	Assessing the risk/protective factors for the development of new post COVID-19 airways disease (e.g. patient or viral genetics, patient ethnicity and/or smoking status, admission inflammatory markers, treatments used such as steroids and Remdesivir, requirement for intubation, oxygen, etc.)	I	0·81	0·71	0·80	0·68	0·80	0·760	0·747	0·721

30	Assessing COVID outcomes of patients with airways disease to help ascertain the influence and interactions of risk and protective factors for poor COVID-19 outcomes (e.g. steroid use, steroid inhalers, long term antibiotics, colonising microbes, microbial community, and underlying disease/aetiology).	II	0·80	0·72	0·75	0·68	0·81	0·754	0·747	0·725
36	Assessing the effectiveness of experimental therapies administered acutely during COVID-19 in clinical trials e.g. azithromycin, dexamethasone) versus patients exposed to standard of care in developing post COVID-19 airways diseases.	II	0·81	0·70	0·73	0·68	0·71	0·726	0·721	0·683

Table S7. Top 10 research ideas by their likelihood of equitability

Overall rank	Research idea	Sub-theme	Answer-ability	Feasibility	Timeliness	Burden	Equity	RPS (unweighted)	wRPS (weighted)	AEA
21	Determining if patients at risk of persisting disability following COVID-19 can be identified (potentially from disease indicators at the acute event, frailty scores or nutritional scores) and targeted for rehabilitation and/or nutritional interventions.	I	0·78	0·71	0·76	0·80	0·83	0·778	0·785	0·754
4	Understanding the predictors of hospital re-admission post-COVID-19 in patients with pre-existing airways.	I	0·93	0·88	0·89	0·71	0·83	0·847	0·825	0·833
28	Developing scores to predict long-term respiratory disease severity and risk of mortality in survivors from severe COVID-19.	V	0·85	0·77	0·71	0·67	0·82	0·764	0·761	0·738
8	Comparing the clinical and cost-effectiveness of exercise and education-based rehabilitation to improve health status compared with standard care in COVID-19 survivors with pre-existing airways diseases.	II	0·90	0·81	0·89	0·74	0·81	0·828	0·810	0·821
30	Assessing COVID outcomes of patients with airways disease to help ascertain the influence and interactions of risk and protective factors for poor COVID-19 outcomes (e.g. steroid use, steroid inhalers, long term antibiotics, colonising microbes, microbial community, and underlying disease/aetiology).	II	0·80	0·72	0·75	0·68	0·81	0·754	0·747	0·725
10	Assessing whether the outcomes of acute hospitalization with COVID-19 in patients with pre-existing airways disease on pre-COVID-19 long-term anticoagulants are better than those who were not on long-term anticoagulants (e.g. using in patient length of stay, discharge rates, long COVID-19 markers at 3, 6 and 12 months).	III	0·90	0·88	0·90	0·63	0·81	0·825	0·790	0·775
3	Investigating if patients with pre-existing airway diseases who were treated for severe COVID-19 are at higher risk of future cardiovascular complications e.g. myocardial infarction, stroke at 6 and 12 months in comparison to those with no pre-existing airway disease.	III	0·95	0·90	0·94	0·65	0·81	0·849	0·811	0·817

29	Assessing the risk/protective factors for the development of new post COVID-19 airways disease (e.g. patient or viral genetics, patient ethnicity and/or smoking status, admission inflammatory markers, treatments used such as steroids and Remdesivir, requirement for intubation, oxygen, etc.)	I	0·81	0·71	0·80	0·68	0·80	0·760	0·747	0·721
50	Exploring the facilitators and barriers for implementing vaccination in COVID-19 survivors.	II	0·76	0·63	0·71	0·57	0·79	0·693	0·679	0·671
5	Developing and validating tools for remote monitoring, and to help people self-monitor symptoms, especially in patients with pre-existing airway diseases.	V	0·89	0·88	0·90	0·76	0·78	0·841	0·822	0·821

Table S8. Top 20 research ideas by their weighted Research Priority Scores (RPS)

Overall Rank	Research idea	Sub-theme	Answer-able?	Feasible?	Timeliness?	Burden?	Equity?	RPS (unweighted)	wRPS (weighted)	AEA
4	Understanding the predictors of hospital re-admission post-COVID-19 in patients with pre-existing airways.	I	0·93	0·88	0·89	0·71	0·83	0·847	0·825	0·833
5	Developing and validating tools for remote monitoring, and to help people self-monitor symptoms, especially in patients with pre-existing airway diseases.	V	0·89	0·88	0·90	0·76	0·78	0·841	0·822	0·821
2	Determining if the 3- and 6-month post-COVID-19 fatigue, sarcopenia, anxiety and depression scores are worse in patients with pre-existing airway diseases as compared to those with no airways disease? Is this significant when adjusted for severity of in-patient disease?	I	0·96	0·91	0·96	0·66	0·77	0·852	0·811	0·846
3	Investigating if patients with pre-existing airway diseases who were treated for severe COVID-19 are at higher risk of future cardiovascular complications e.g. myocardial infarction, stroke at 6 and 12 months in comparison to those with no pre-existing airway disease.	III	0·95	0·90	0·94	0·65	0·81	0·849	0·811	0·817
8	Comparing the clinical and cost-effectiveness of exercise and education-based rehabilitation to improve health status compared with standard care in COVID-19 survivors with pre-existing airways diseases.	II	0·90	0·81	0·89	0·74	0·81	0·828	0·810	0·821
9	Exploring the benefit of progressive/bespoke exercise rehabilitation in people with airways disease and persistent symptoms or physical limitation delivered live or virtually following discharge after COVID-19 infection.	II	0·92	0·87	0·86	0·74	0·74	0·826	0·809	0·813
1	Exploring how the admission ISARIC 4C prognostic score (a risk stratification score that predicts in-hospital mortality for hospitalised COVID-19 patients) correlate with post discharge morbidity at 3 and 12 months in patients with pre-existing airways disease compared to those with none.	I	1·00	1·00	0·98	0·56	0·78	0·864	0·808	0·838
6	Determining the incidence and risk factors of new onset symptomatic obstructive airways disease in COVID-19 survivors, defined clinically and/or using objective diagnostic tests, e.g. spirometry and CT imaging at 3 & 12 months.	I	0·97	0·91	0·91	0·64	0·77	0·840	0·803	0·808

14	Assessing the impact of nutritional status (nutritional depletion or obesity) on recovery from COVID-19 in people with airways disease and can this be modified by nutritional interventions.	I	0·87	0·79	0·80	0·78	0·78	0·804	0·802	0·779
7	Assessing if current smokers fair worse in terms of recovery in patients with COPD who have had severe COVID-19 pneumonia.	I	0·98	0·90	0·96	0·60	0·76	0·838	0·790	0·808
10	Assessing whether the outcomes of acute hospitalization with COVID-19 in patients with pre-existing airways disease on pre-COVID-19 long-term anticoagulants are better than those who were not on long-term anticoagulants (e.g. using in patient length of stay, discharge rates, long COVID-19 markers at 3, 6 and 12 months).	III	0·90	0·88	0·90	0·63	0·81	0·825	0·790	0·775
12	Exploring if inhaled corticosteroids (ICS) use in preceding 12 months in patients with pre-existing airway disease is associated with greater in-patient COVID-19 disease burden (Sequential Organ Failure Assessment (SOFA) Score, length of stay, ventilation status) and/or post COVID-19 excess rates of fatigue/sarcopenia.	I	0·94	0·88	0·88	0·67	0·71	0·817	0·788	0·775
21	Determining if patients at risk of persisting disability following COVID-19 can be identified (potentially from disease indicators at the acute event, frailty scores or nutritional scores) and targeted for rehabilitation and/or nutritional interventions.	I	0·78	0·71	0·76	0·80	0·83	0·778	0·785	0·754
24	Assessing the effectiveness of counselling and psychological services in addressing the long-term psychological and cognitive effects of COVID-19 on patients with pre-existing airway diseases.	IV	0·90	0·87	0·74	0·70	0·67	0·776	0·770	0·758
13	Determining the predictors of new diagnosis of bronchiectasis post-COVID-19 admission on CT scan at 6 months (disease severity, length of stay, clinical history of sputum production, sputum microbiology at 3 months plus).	III	0·93	0·84	0·91	0·60	0·76	0·808	0·768	0·729
11	Investigating if ethnicity affect recovery after admission with COVID-19 in patients with asthma and COPD.	I	0·95	0·90	0·95	0·56	0·75	0·819	0·768	0·771

17	Examining how the chest x-ray and CT scans changes apparent in COVID-19 correlate with subsequent long-term symptoms and outcomes.	III	0·96	0·95	0·82	0·57	0·68	0·796	0·762	0·763
28	Developing scores to predict long-term respiratory disease severity and risk of mortality in survivors from severe COVID-19.	V	0·85	0·77	0·71	0·67	0·82	0·764	0·761	0·738
18	Exploring if patients with asthma and COPD who have had severe COVID-19 pneumonia develop additional long term restrictive lung function impairment after recovery.	III	0·94	0·88	0·82	0·56	0·76	0·793	0·759	0·779
23	Exploring whether patients with pre-existing asthma who develop severe COVID-19 subsequently develop an accelerated loss of lung function (including small airways damage or dysfunction) as a consequence of infection or hyper-inflammation.	III	0·87	0·87	0·75	0·62	0·77	0·777	0·759	0·750

Table S9. Bottom 20 research ideas by their weighted Research Priority Scores (RPS)

Overall Rank	Research idea	Sub-theme	Answer-able?	Feasible?	Timelines s?	Burden?	Equity?	RPS (unweighted)	wRPS (weighted)	AEA
98	Evaluating the involvement of private health sector in pandemic management and their perceptions about the same.	V	0·47	0·35	0·43	0·15	0·30	0·339	0·303	0·638
97	Investigating any role of alternative system of medicine (e.g. Ayurveda, yoga, naturopathy, Unani, Siddha, and homeopathy (AYUSH)) in prevention and treatment of COVID-19 patients with pre-existing airway diseases.	V	0·42	0·31	0·50	0·21	0·37	0·362	0·326	0·608
90	Studying the GP's perceptions and practices followed during COVID-19 pandemic.	V	0·59	0·65	0·71	0·23	0·45	0·525	0·460	0·629
91	Assessing whether XeMRI (Xenon MRI) can be used to evaluate and locate specific areas of airway injury and remodelling, identify regions different from healthy airway, and follow the progression of airway obstruction longitudinally in patients hospitalized for COVID-19.	II	0·80	0·50	0·68	0·27	0·34	0·518	0·467	0·575
93	Studying the long term outcomes of the hospitalized COVID-19 survivors who developed invasive aspergillosis.	I	0·86	0·69	0·41	0·18	0·36	0·501	0·471	0·638
96	Exploring if acute COVID-19 and/or long COVID-19 are potential risk factor/s for developing lung cancer.	I	0·60	0·48	0·15	0·46	0·54	0·446	0·490	0·588
89	Studying the natural history of thoracic CT changes detected in COVID-19 associated pulmonary aspergillosis (CAPA).	I	0·83	0·69	0·58	0·24	0·35	0·538	0·493	0·621
94	Exploring the role of Artificial Intelligence (AI) in creating digital twins of COVID-19 patients with different disease severity, ranging from asymptomatic to ICU patients, and if such twins can be computationally treated with thousands of drugs to find one or more that modulate ineffective or exaggerated immune responses (see The Swedish Digital Twin Consortium webpage for details).	V	0·57	0·49	0·48	0·43	0·53	0·500	0·496	0·417

92	Exploring if COVID-19 survivors with persistent structural CT abnormalities are at an increased risk of developing chronic pulmonary aspergillosis (CPA). Exploring if they share similar multi-genetic characteristics in comparison to non-COVID patients.	I	0·81	0·63	0·41	0·31	0·41	0·514	0·502	0·571
95	Determining if COVID-19 survivors with pre-existing or newly developed airways disease be a priority for vaccination. For example, which criteria for vaccination prioritisation should be applied to the population of COVID-19 survivors with pre-existing or newly developed airways disease?	II	0·48	0·33	0·51	0·54	0·64	0·499	0·508	0·558
87	Assessing the most effective and efficient ways for primary care to monitor people diagnosed with COVID-19, considering the daily heavy workload from delivering routine care and monitoring patients.	II	0·56	0·47	0·64	0·49	0·67	0·564	0·549	0·550
78	Investigating the change in antibiotic prescription rate by GPs to treat COVID-19 like symptoms during pandemic in patients with pre-existing airways diseases.	II	0·75	0·70	0·71	0·30	0·55	0·603	0·549	0·667
88	To explore the feasibility of collecting world-wide data sets of patients with COPD and asthma to be analysed with deep-learning.	V	0·72	0·52	0·49	0·42	0·64	0·560	0·556	0·546
82	Comparing the airway microbiome differences in patients with pre-existing airway diseases, comparing those with severe COVID-19 infection vs patients with milder severity (accounting for antibiotics usage as a confounder).	III	0·71	0·55	0·68	0·44	0·56	0·590	0·560	0·575
86	Investigating the feasibility of alternative diagnostic tools to detect airways diseases in absence of aerosols generating tools such spirometry, peak flow meter, etc.	V	0·65	0·57	0·54	0·47	0·62	0·568	0·560	0·542
83	Comparing the effects of biological therapy in controlling asthma between patients who developed airways disease post-COVID-19 and those who had pre-existing airways disease.	II	0·79	0·62	0·55	0·40	0·54	0·581	0·564	0·592
80	Exploring if COVID-19 survivors who had pre-existing uncontrolled severe asthma can be treated with biological therapy (e.g. anti IgE Vs. Anti IL5 Vs. Anti IL4R)	II	0·74	0·67	0·63	0·45	0·47	0·592	0·568	0·583

79	Evaluating the relationship between care quality at previous admission (using National Asthma and COPD Audit Programme (NACAP) link) and risk of COVID admission/poor outcome e.g. smoking cessation, pulmonary rehab, etc.	I	0·71	0·55	0·70	0·45	0·59	0·600	0·570	0·596
73	Investigating if there are evidence of Th1/ Th2 skewed changes after COVID-19 and if these persist (e.g. by comparing plasma and sputum in patients with and without airways disease).	I	0·83	0·67	0·79	0·34	0·51	0·628	0·570	0·629
85	Determining if there is a need to come up with a global guideline for treatment and management of chronic respiratory diseases with COVID-19, or to modify the existing global strategies such GOLD and GINA?	II	0·60	0·55	0·53	0·51	0·66	0·571	0·571	0·538

Supplementary figure

Figure S1. Weightings of the five criteria based on patients' response to the question: "Which is most important to you?"