



# A critical interpretive synthesis of the lived experiences and health and patient-reported outcomes of people living with COPD who isolated during the COVID-19 pandemic

Rose Swain<sup>1,7</sup>, Faye Forsyth<sup>2,7</sup>, Ben Bowers<sup>2,3</sup>, Frances Early<sup>4</sup>, Isla Kuhn<sup>5</sup>, Sagar Shrivastva<sup>4</sup>, Rachel Tufnell<sup>6</sup> and Jonathan Fuld<sup>4</sup>

<sup>1</sup>Department of Infection and Inflammation Research, Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK. <sup>2</sup>Primary Care Unit, Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK. <sup>3</sup>Queen's Nursing Institute, London, UK. <sup>4</sup>Department of Respiratory Medicine, Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK. <sup>5</sup>Medical Library, University of Cambridge, Cambridge, UK. <sup>6</sup>Cambridge Breathlessness Intervention Service, Cambridge University Hospitals NHS Foundation, Cambridge, UK. <sup>7</sup>These authors contributed equally to this work.

Corresponding author: Rose Swain ([rose.swain@nhs.net](mailto:rose.swain@nhs.net))



Shareable abstract (@ERSpublications)

Perception of risk influenced the actions of people with COPD during COVID-19. The data from this review can help clinicians to better understand how risk perceptions are formed and communicate risk more effectively so as to optimise care going forward. <https://bit.ly/42ycp1C>

**Cite this article as:** Swain R, Forsyth F, Bowers B, *et al.* A critical interpretive synthesis of the lived experiences and health and patient-reported outcomes of people living with COPD who isolated during the COVID-19 pandemic. *Eur Respir Rev* 2023; 32: 230031 [DOI: 10.1183/16000617.0031-2023].

Copyright ©The authors 2023

This version is distributed under the terms of the Creative Commons Attribution Non-Commercial Licence 4.0. For commercial reproduction rights and permissions contact [permissions@ersnet.org](mailto:permissions@ersnet.org)

Received: 15 Feb 2023  
Accepted: 23 May 2023

## Abstract

**Aims:** To determine the lived experiences of people with COPD who isolated at home during the coronavirus disease 2019 (COVID-19) pandemic, and explore how these experiences affected health and patient-reported outcomes.

**Methods:** Keyword searches were performed in five bibliographic databases. Critical interpretive synthesis (CIS) methods were used to interrogate and understand patterns across studies.

**Results:** 23 studies were identified; three employed qualitative methods and 20 quantitative methods. Application of CIS methods highlighted a core synthetic concept that appeared to underpin experiences and outcomes, that of a heightened perception of risk. Using the Risk Perception Model as a framework, we found that cognitive factors such as knowledge of underlying health status and the transmissibility of COVID-19; experiential factors including previous episodes of breathlessness and hospitalisation; and sociocultural factors such as access to trusted sources of information, influenced perceptions of risk. In turn, this influenced behaviour, which translated to outcomes such as reduced hospitalisations, deconditioning and social isolation as people avoided “high-risk” situations and settings.

**Conclusions:** Patients with COPD who isolated at home during the COVID-19 pandemic had a heightened perception of risk which was influenced by cognitive, experiential and sociocultural factors. The consequences of this were varied and included both positive (reduced exacerbations and hospitalisations) and negative (social isolation, deconditioning, diminished capacity for self-care) outcomes. Understanding risk and the impacts it can have could help clinicians to support people with COPD return to their pre-pandemic way of living and enable better communication of ongoing risk from respiratory viral illness.

## Introduction

COPD is a heterogeneous lung condition characterised by respiratory symptoms such as dyspnoea, cough and sputum production, due to abnormalities of the airways [1]. COPD affects an estimated 391 million people worldwide [2] and it is associated with substantial healthcare costs, primarily due to exacerbations [3]. Debilitating symptoms such as breathlessness have a substantial impact on patient health, affecting physical, psychological and social wellbeing [4].

During the coronavirus disease 2019 (COVID-19) pandemic, which was caused by the severe acute respiratory syndrome coronavirus 2 virus, governments worldwide implemented national safety strategies [5].



Given the presumed, and later substantiated, risk of serious illness or death if infected [6], many people living with COPD were encouraged to follow more stringent safety guidelines to limit exposure (*e.g.* shielding, confinement, quarantine) [7].

Shortly after COVID-19 mitigation recommendations were implemented, multiple unintended consequences were reported, for example social isolation and physical deconditioning [8]. Some researchers have tried to capture the lived experiences of people with COPD [9] or examine the impact of the pandemic on outcomes in COPD [10]; however, published studies have not yet been synthesised with a view to understanding experiences and outcomes more fully.

### Rationale and objectives

- 1) Determine the lived experiences of people with COPD who isolated at home during the COVID-19 pandemic.
- 2) Explore how these experiences affected health and patient-reported outcomes.

### Methods

We conducted a systematic review and critical interpretive synthesis (CIS). The protocol was registered on the International Prospective Register of Systematic Reviews ([www.crd.york.ac.uk/prospero](http://www.crd.york.ac.uk/prospero) identifier CRD42021261907). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement [11] has been used to structure this report.

### Eligibility criteria

Studies were included if they explored the lived experiences of people with COPD isolating during the COVID-19 pandemic and/or its impact on health or patient-reported outcomes. Studies did not have to explicitly mention the term “isolating” or its synonyms (quarantine, confinement, shielding, *etc.*); however, they had to have been conducted during a period when behavioural restrictions were mandated (*e.g.* lockdowns, curfews, stay-at-home orders). No limits were placed on study design and methods. Reports relating to other pandemics, those not published in English and non-full-text articles, reviews and conference abstracts were excluded.

### Search strategy

The search strategy was developed in collaboration with a specialist information technologist. Keyword searches were performed in June 2021 in five bibliographic databases: MEDLINE, Cumulated Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, Scopus and Web of Science Core Collection. Hand-searching of reference list of previous reviews and included studies was conducted. All searches are available in the supplementary material.

### Study selection

Searches identified 1995 papers, of which 1007 were excluded following title and abstract screening supported by the platform Rayyan [12]. We retrieved and assessed 40 full-text papers for eligibility. Screening and full-text review was performed in duplicate under blind conditions; disagreements were resolved by a third party. 23 papers were included in the final analysis [9, 13–34].

### Data extraction

PICO (population, intervention, comparator, outcome) characteristics for all studies were extracted and tabulated using a piloted data collection pro forma created in Excel. Qualitative studies were uploaded and labelled using NVivo (version 12; QSR International, Denver, CO, USA). Data extraction and labelling was performed independently in duplicate; discrepancies were resolved by third-party checking (quantitative) or discussion (qualitative).

### Risk of bias in individual studies

The Joanna Briggs Institute (JBI) Critical Appraisal Skills Programme (CASP) tools [35] were used to assess bias across studies (supplementary tables S3 and S4). The JBI-CASP includes a range of tools appropriate for different study designs, which was necessary given our broad inclusion criteria.

Within a CIS, risk of bias or the credibility and robustness of the literature, is assessed continuously and informs the data synthesis process. Therefore, as well as formally assessing the literature against standardised quality assessment criteria (JBI-CASP); we constantly critiqued included studies to identify any broader gaps or weaknesses within the literature. We considered this dual approach necessary given concerns raised over the quality of COVID-19-related research [36].

### Data synthesis

Qualitative data was inductively labelled within NVivo; quantitative data was described and tabulated or categorised based on similarity of outcomes. All data were brought together and initial categories, subcategories and theoretical relationships were independently derived by two authors. Through discussion, initial categories were either collapsed or expanded, reorganised and critiqued in a process similar to that described by DIXON-WOODS *et al.* [37]. Revised categories, which represented our interpretive transformation of the evidence into a new conceptual form, became the “synthetic constructs” from which we developed our “synthesising argument” [37]. All constructs were data-driven and based on the labelling, categorisation and relationships generated during the analysis process, *e.g.* no *a priori* constructs were defined or applied before the analysis.

A synthesising argument is described by DIXON-WOODS *et al.* [37] as an argument that “integrates evidence from across the studies in the review into a coherent theoretical framework comprising a network of constructs and the relationships between them”. Our argument evolved from a recursive process whereby we interrogated our constructs by asking “why have patients with COPD acted or felt this way during the COVID-19 pandemic and how does this link to healthcare outcomes such as admissions and exacerbations?” Through this process we identified a potential explanatory synthetic construct, the “perception of risk” from which we developed our initial synthesising argument (box 1).

#### BOX 1 Initial synthesising argument

The lived experiences of people with COPD isolating during the COVID-19 pandemic, and the outcomes reported, were driven by their perceptions of the risks associated with having a chronic respiratory condition, during a deadly pandemic that carried significant respiratory sequelae.

Critical interpretive syntheses have been used in the past to generate a theory of the phenomenon being described [37]. While we could have synthesised our data with the view to producing a new theory of risk specific to having a COPD diagnosis during the COVID-19 pandemic, we were acutely aware of the low volume and weaknesses of data retrieved. Firstly, our formal appraisal of the quality of each study (risk-of-bias assessment) highlighted concerns in terms of execution. Secondly, our ongoing critique of the body of the literature suggested a narrowness in the existing evidence base, which we felt resulted in questionable assumptions largely based on the analysis of health utilisation statistics.

Given these concerns, we elected not to generate a weak theory grounded in an imperfect evidence base; rather, we explored existing theory and models of risk for comprehensiveness and “fit” with our synthetic constructs. The risk perception model (RPM) [38], originally devised to conceptualise risk in relation to climate change, offered a framework that would allow for a more insightful interpretation. The RPM, which has at its core three dimensions of risk (cognitive factors, experiential processing and sociocultural influences), has been extensively tested for its robustness as an explanatory model of risk perception [38]. It has been successfully applied to explore risk perception in the era of COVID-19 [39]. As such, we reframed our synthesising argument (box 2) so that it was underpinned by the components of the RPM, and the RPM became the organising theory by which we structured our synthetic constructs and our final report.

#### BOX 2 Refined synthesising argument

Cognitive, experiential and sociocultural factors influenced COPD sufferers’ perception of risk, which in turn influenced experiences, behaviours and outcomes.

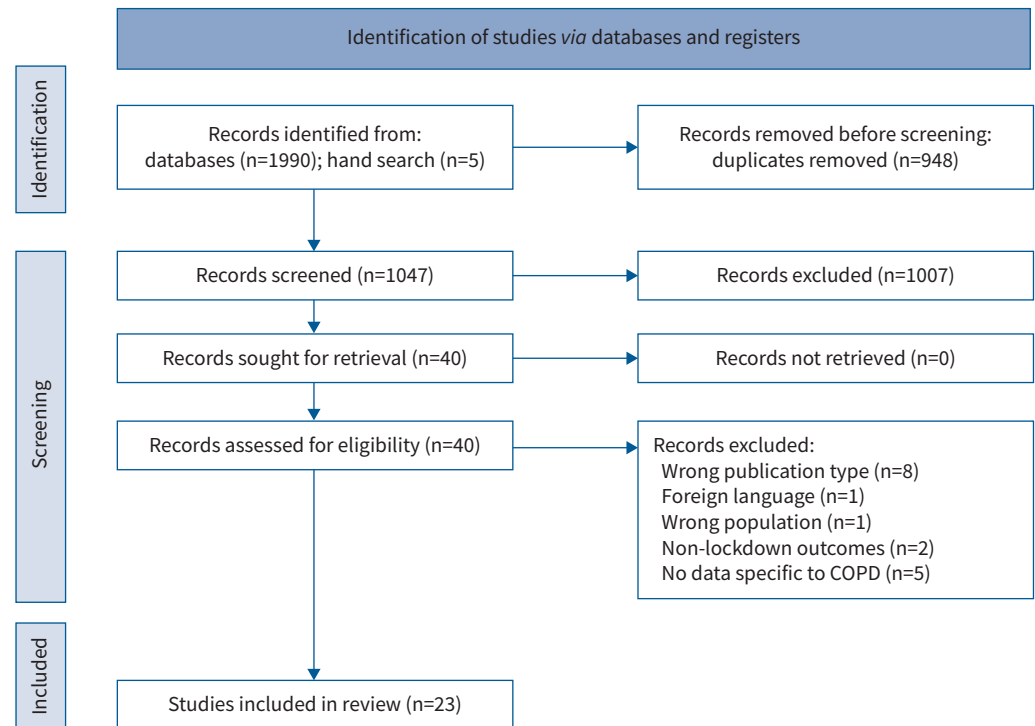
## Results

### Study selection

We identified 1995 papers; of these, 1007 were excluded following title and abstract screening. We assessed 40 full-text papers for eligibility; 23 of which were included in the final analysis [9, 13–34]. Figure 1 provides further information and reasons for exclusion.

### Study characteristics

Characteristics of the individual studies (n=23) are summarised in table 1. Three studies used qualitative methods; 18 studies were quantitative; and two employed a mixed-methods approach. Studies were predominantly conducted within Europe and the UK (n=11, 47%), and were performed at a range of time points throughout the pandemic (figure 2).



**FIGURE 1** Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.

Qualitative investigations included the following approaches: thematic analysis, qualitative description and phenomenology. Quantitative approaches were exclusively cross-sectional observations; however, within this design, a range of methods were represented, including analysis of anonymised/pseudonymised or internal clinical datasets (n=11), telephone surveys (n=4), online surveys (n=4) or face-to-face surveys (n=1). When categorised by aim, studies planned to explore the following: care utilisation (n=14), mental and physical health outcomes (n=6), mental health outcomes only (n=2) and medication adherence (n=1).

13 studies included COPD patients only; the remainder enrolled people with mixed-respiratory conditions that included COPD. COPD diagnosis, when confirmed, was based on electronic codes (n=9), self-reporting (n=4) or Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria (n=5). Five studies did not describe how they defined or determined COPD; based on our critique of these studies, they relied upon self-reporting/identification.

Outcomes measured were heterogeneous and the methods typically less robust (*e.g.* use of non-piloted questionnaires or reliance on self-reported data). Even when validated outcome measures were employed, these were often cross-sectional “snapshots” presented with no comparative data that would enable assessment of change over time. Moreover, pre-COVID-19 assessments were typically absent. Assessment of study characteristics confirmed concerns that we had articulated during our analysis. That is, the evidence base is skewed towards analysis of data that is routinely collected or easily obtained; for example, hospitalisation rates or online surveys.

### Findings

Our synthesising argument around the lived experience and outcomes of people with COPD isolating during the COVID-19 pandemic was that cognitive, experiential and sociocultural factors influenced COPD sufferers’ perception of risk, which in turn affected experiences, behaviours, and thus outcomes.

### Cognitive factors and risk perception

Based on the RPM, knowledge about the causes, impacts and responses to a perceived risk are significantly related to mitigatory action [38]. Within our review, knowledge was typically discussed in terms of acquisition (or not) of information on the risks of contracting COVID-19 when you have an underlying lung condition like COPD. Ability or inability to access, verify and contextualise information, was key to the operationalisation of health protective behaviours and often associated with psychological wellbeing.

TABLE 1 Characteristics of included studies

First author [ref.]	Country	Stringency index <sup>#</sup>	Aim	Design	Inclusion criteria	Method of recruitment	Percentage of sample with COPD	Method of data collection	Summary of findings
ZHANG [13]	China	26.39	To investigate medication adherence and the associated influencing factors in patients with COPD during the COVID-19 pandemic	Cross-sectional observation	COPD patients discharged from the investigators' department between January 2012 and April 2020	Telephone	100%	Telephone survey	Medication adherence during the pandemic in patients with COPD was similar to pre-COVID-19 adherence Adherence was correlated with drug combination, doctor's supervision and accompanying mood disorders
PEDROZO-PUPO [14]	Colombia	12.04	To compare the prevalence of depression, perceived stress related to COVID-19, post-traumatic stress and insomnia in asthma and COPD patients	Cross-sectional observation	Asthma and COPD adult outpatients at a pulmonary clinic in Santa Marta, Columbia	Telephone	63%	Online survey	Asthma and COPD patients present similar frequencies of depression risk, COVID-19 perceived stress, post-traumatic stress risk and insomnia risk during the Colombian lockdown
McAULEY [15]	UK	5.56	To evaluate the change in AECOPD treatment frequency during the first 6 weeks of lockdown compared with 2019 and to assess changes in self-reported behaviour/wellbeing	Cross-sectional observation	Confirmed diagnosis of COPD and managed by a specialist COPD clinic (Complex COPD clinic, Leicester), and able to provide verbal consent <i>via</i> English language telephone consultation	Telephone	100%	Electronic records or databases Telephone survey	Treatment for AECOPD events increased during the first 6 weeks of the COVID-19 pandemic in the UK compared with 2019 This was associated with increased symptoms of anxiety and significant behavioural change
Hu [16]	China	26.39	To identify the prevalence of COVID-19, acute exacerbations and outcomes in patients with COPD during the COVID-19 epidemic	Cross-sectional observation	COPD patients included in an ongoing study and COVID-19 patients from designated hospital for severe or critical patients with COVID-19	Recruited from an established cohort	100%	Telephone or SMS survey Electronic records or databases	Acute exacerbations and hospitalisations of COPD patients were infrequent during the COVID-19 pandemic COVID-19 patients with pre-existing COPD had a higher risk of all-cause mortality

Continued

TABLE 1 Continued

First author [ref.]	Country	Stringency index <sup>#</sup>	Aim	Design	Inclusion criteria	Method of recruitment	Percentage of sample with COPD	Method of data collection	Summary of findings
GONZÁLEZ [17]	Spain	11.11	To assess the impact of COVID-19 lockdown on COPD exacerbations, symptoms and healthcare costs in a cohort of Spanish COPD patients	Cross-sectional observation	COPD patients visiting the specialised pulmonary clinic	Recruited from an established cohort	100%	Electronic records or databases Telephone survey	Results suggest that the lockdown was associated with a reduction in COPD exacerbations and an improvement in symptoms
FARIA [18]	Portugal	5.56	To evaluate variations in sAECOPD rates after the pandemic outbreak	Cross-sectional observation	COPD patients aged >18 years followed-up by COPD specialists	NA, used anonymised/pseudonymised or internal clinical datasets	100%	Electronic records or databases	Results suggest that there was a significant reduction in the number of sAECOPD in March–July 2020, compared to the same months in 2016–2019
PLEGUEZUELOS [19]	Spain	11.11	To evaluate the impact of lockdown due to COVID-19 on quality of life and exacerbations in patients with severe COPD	Cross-sectional observation	COPD patients aged ≥40 years with a history of smoking and an FEV <sub>1</sub> <70% predicted registered on an outpatient clinic list	Telephone	100%	Telephone survey	Results suggested that lockdown had a low impact on COPD patients. Although many medical visits and tests were cancelled, patients were very satisfied with the medical telephone visits
IMERI [20]	USA	0.00	To examine potential differences in physical activity and HLOC between those with and without COVID-19-related fear and worry	Cross-sectional observation	Aged ≥18 years, a resident of USA and having one or more chronic conditions	Online <i>via</i> MTurk Amazon	27.9%	Online survey	Patients with worry or fear about how the COVID-19 pandemic would affect their ability to manage their chronic conditions had lower activation and lower external HLOC
ALSALLAKH [21]	Wales and Scotland	5.56	To investigate the impact of the UK-wide COVID-19 lockdown on numbers of recorded sAECOPD leading to admission/death across primary and secondary care	Cross-sectional observation	None stated	NA, used anonymised/pseudonymised or internal clinical datasets	100%	Electronic records or databases	Lockdown was associated with 48% pooled reduction in emergency admissions for COPD in both countries relative to the 5-year averages. There was no statistically significant change in deaths due to COPD

Continued

TABLE 1 Continued

First author [ref.]	Country	Stringency index <sup>#</sup>	Aim	Design	Inclusion criteria	Method of recruitment	Percentage of sample with COPD	Method of data collection	Summary of findings
Boyce [22]	USA	0.00	To investigate telemedicine adoption, emergency department avoidance and related characteristics of patients with COPD during COVID-19	Mixed-methods	None stated	Online <i>via</i> the COPD Foundation website	100%	Online survey	In response to social distancing and other COVID-19 precautions, people with COPD are avoiding traditional, in-person healthcare environments and turning to telemedicine to prevent and manage exacerbations
Mousing [23]	Denmark	0.00	To explore the existential significance of living with the risk of being infected with coronavirus in patients with COPD	Phenomenology	None stated	Online <i>via</i> a Facebook group	92%	Interview (face-to-face or virtual)	Patients with COPD felt compelled to self-isolate, as they feared dying from COVID-19 Proactive contact with health professionals appeared to reduce patients' feelings of deprivation, loneliness, hopelessness and anxiety
Tan [24]	Singapore	25.00	To assess whether public health measures were associated with a reduction in AECOPD	Cross-sectional observation	None stated	NA, used anonymised/pseudonymised or internal clinical datasets	100%	Electronic records or databases	There was a significant and sustained decrease in hospital admissions for all AECOPD as well as respiratory viral infection associated AECOPD, which coincided with the introduction of public health measures during the pandemic
Ekdahl [25]	Sweden		To describe women's experiences of everyday life with COPD stage III or IV	Qualitative description	Adults aged >18 years, diagnosed with COPD stage III or IV, who were able to speak and understand Swedish	Telephone	100%	Interview (telephone)	Being afraid of contracting infections and the consequences of suffocation had increased since the pandemic COVID-19, which led to self-isolation and an inactive everyday life To get help, support and socialise, women used digital media

Continued

TABLE 1 Continued

First author [ref.]	Country	Stringency index <sup>#</sup>	Aim	Design	Inclusion criteria	Method of recruitment	Percentage of sample with COPD	Method of data collection	Summary of findings
Wu [9]	England		To better understand the extent to which care has moved to using telehealth approaches for COPD under specialist community and secondary care services in the UK	Mixed-methods	Adults aged $\geq 18$ years with COPD who had accessed specialty COPD care in the past 3 months	Online <i>via</i> the Thiscovery platform	100%	Online survey	Adoption of remote care delivery appears high, with many care activities partially or completely delivered remotely
PHILIP [26]	England	5.56	To identify and explore the concerns and impact of people with long-term respiratory conditions during the COVID-19 pandemic	Thematic analysis	None stated	Online <i>via</i> mailing lists, websites and social media platforms	9%	Online survey	The COVID-19 pandemic is having profound psychological impacts The concerns we identified largely reflect contextual factors, as well as their subjective experience of the current situation
WAŃKOWICZ [27]	Poland	11.11	To assess psychological health and insomnia in people with chronic diseases in the time of elevated stress associated with the pandemic	Cross-sectional observation	Adults aged $\geq 18$ years with chronic diseases who attended the inpatient units and outpatient clinics of the West Pomerania region	Face-to-face recruitment at clinic	Incalculable	Face-to-face survey	Among chronic diseases including COPD, patients with Hashimoto's disease showed a strong correlation with increased scores on anxiety, depression and insomnia scales
LIANG [28]	China	26.39	To investigate the change of respiratory symptoms, pharmacological treatment and healthcare utilisation of COPD patients during the epidemic in Beijing, China	Cross-sectional observation	Aged $\geq 40$ years, a history of $\geq 3$ months of being diagnosed with COPD according to GOLD report	Telephone	100%	Telephone survey	Most COPD patients contacted maintained their long-term medications and had mild-to-moderate symptoms ~30% of patients experienced worsening respiratory symptoms, but did not seek medical care in the hospital due to concerns about cross-infection

Continued



TABLE 1 Continued

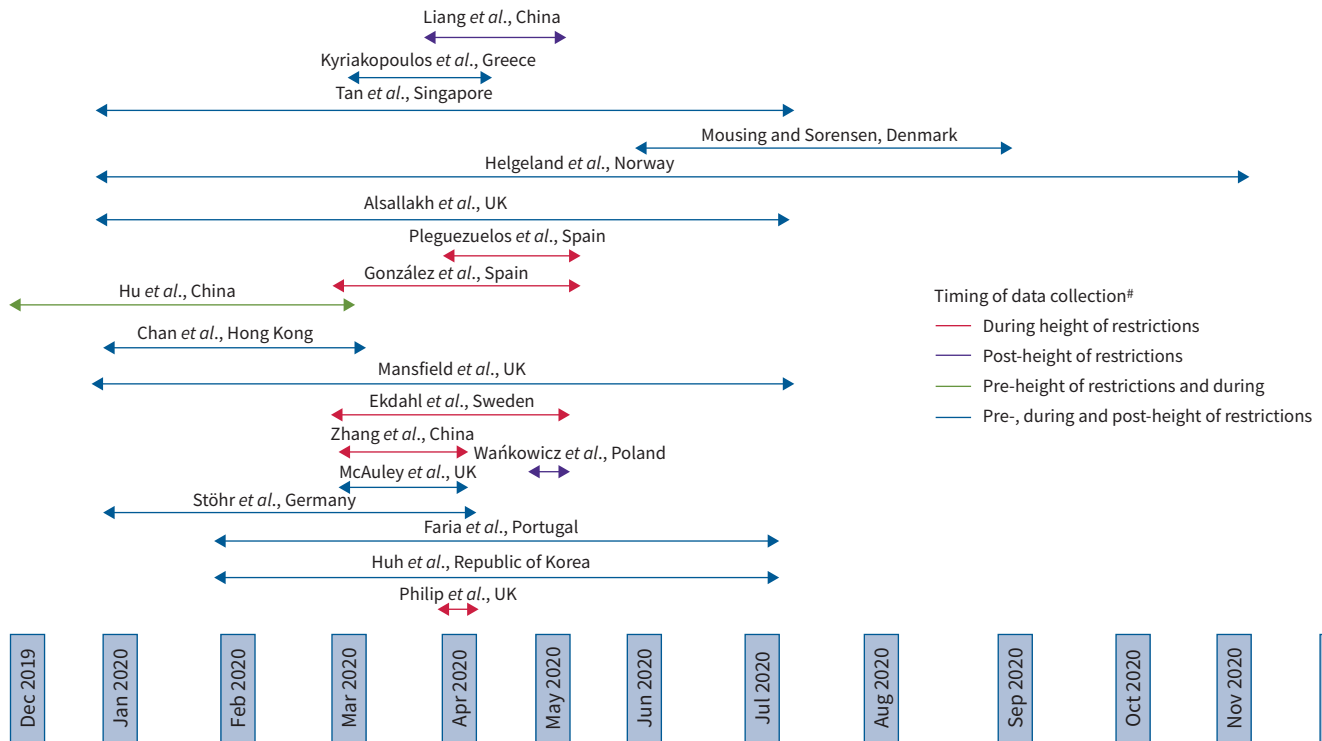
First author [ref.]	Country	Stringency index <sup>#</sup>	Aim	Design	Inclusion criteria	Method of recruitment	Percentage of sample with COPD	Method of data collection	Summary of findings
MANSFIELD [29]	UK	0.00	To ascertain what has happened to general practice contacts for acute physical and mental health outcomes during the pandemic	Cross-sectional observation	Aged $\geq 11$ years; $\geq 1$ year of registration with a GP practice contributing data to a central database	NA Used anonymised/ pseudonymised or internal clinical datasets	NA	Electronic records or databases	There were substantial reductions in primary care contacts for acute physical and mental conditions following the introduction of restrictions, with limited recovery by July 2020 To July 2020, in people with COPD there were ~43 900 per million fewer contacts for COPD exacerbations than expected
CHAN [30]	Hong-Kong	13.89	To assess the number of admissions for AECOPD during the period of COVID-19	Cross-sectional observation	Aged >45 years; known diagnosis of COPD; AECOPD	NA Used anonymised/ pseudonymised or internal clinical datasets	NA	Electronic records or databases	The number of admissions for AECOPD decreased in first 3 months of 2020, compared with previous years This was observed with increased masking percentage and social distancing
KYRIAKOPOULOS [31]	Greece	0.00	To assess if there were any changes in the number of patients hospitalised for respiratory diseases in Greece during the first COVID-19 wave	Cross-sectional observation	Hospitalisation caused by a respiratory disease (multiple) during the study period	NA Used anonymised/ pseudonymised or internal clinical datasets	NA	Electronic records or databases	Observed a significant reduction in respiratory admissions in 2020 that suggests patients may have avoided seeking medical attention during the COVID-19 pandemic
HUH [32]	Republic of Korea	NK	To assess the effect of nonpharmaceutical interventions to mitigate COVID-19 on hospitalisations for respiratory conditions	Cross-sectional observation	Admission to hospital for an acute respiratory infection and/or chronic respiratory disease	NA Used anonymised/ pseudonymised or internal clinical datasets	NA	Electronic records or databases	Hospitalisations for four respiratory conditions decreased substantially during the analysis period The cumulative incidence of admissions for COPD was 58% of the mean incidence during the 4 preceding years

Continued

TABLE 1 Continued

First author [ref.]	Country	Stringency index <sup>#</sup>	Aim	Design	Inclusion criteria	Method of recruitment	Percentage of sample with COPD	Method of data collection	Summary of findings
HELGELAND [33]	Norway	11.11	To describe the changes in the use of hospital inpatient services in Norway during the initial response to the COVID-19 pandemic	Cross-sectional observation	Hospital use data recorded in the electronic records systems of Norwegian hospitals every day from 1 January 2020 up to and including November 2020	NA Used anonymised/pseudonymised or internal clinical datasets	NA	Electronic records or databases	Pre-pandemic, there was an average of 2400 inpatient admissions per day, which decreased to ~1500 in the first few days post-lockdown Admission rates gradually increased to pre-pandemic levels in June The reductions in admissions for COPD seemed to persist
STÖHR [34]	Germany	5.56	To evaluate the deployment of emergency services and consecutive hospital admissions following the initial lockdown period in Germany	Cross-sectional observation	All emergency physicians' records containing the pre-clinical diagnosis of unstable angina pectoris, ST-elevation myocardial infarction, heart failure, uncontrolled hypertension, arrhythmic event, cardiopulmonary resuscitation, syncope/dizziness and stroke were included	NA Used anonymised/pseudonymised or internal clinical datasets	11.5%	Electronic records or databases	A significant decline in hospitalisation for cardiovascular events was observed during the government-enforced shutdown Reductions in admissions was mainly driven by "discretionary" cardiovascular events (unstable angina, heart failure, exacerbated COPD) Reductions in unavoidable events (e.g. cardiopulmonary resuscitation) were not observed

COVID-19: coronavirus disease 2019; (s)AECOPD: (severe) acute exacerbation of COPD; SMS: short message service; NA: not applicable; FEV<sub>1</sub>: forced expiratory volume in 1 s; HLOC: health locus of control; GOLD: Global Initiative for Chronic Obstructive Lung Disease; GP: general practitioner; NK: not known. <sup>#</sup>: stringency indexes for the period January 2020 (or closest date to this) were obtained from the Oxford Coronavirus Government Response Tracker (OxCGRT) project [40]. The stringency index is a composite measure of nine of the response metrics; a higher score indicates a stricter response (*i.e.* 100=strictest response).



**FIGURE 2** Study timeline in context of coronavirus disease 2019 pandemic and restrictions. Arrows indicate when the data for each study were collected. Some studies did not specify when data were collected and are not included in the figure. #: information regarding restrictions was obtained from publicly available websites, of which we have low certainty of veracity.

Greater access to information, whether it be through the internet or *via* formal routes such as contact with healthcare services/professionals, appeared to improve or validate knowledge about personal vulnerability and was linked to stringent or enhanced adoption of health-protective behaviours [23, 25]. Information provided by healthcare services, professionals or health charities was considered to be more trustworthy and therefore had greater currency than news reports [20, 26].

“I actually talked to my lung doctor [about COVID-19], and she said that in the case of someone like me they wouldn’t even use a respirator because it damages internal terms. I didn’t know that before, but now I do.” COPD patient, female [23]

“An interesting finding was that the patients who had received a phone call or a video-based consultation from a health professional felt very safe and were comfortable about the coronavirus situation.” [23]

Ability to contextualise information to an individual’s own situation was equally important for estimating risk and implementing personal mitigation strategies. For example, individuals who were aware of the transmissibility of COVID-19 and the protective role of personal protective equipment or social distancing reported dismissing social care services due to inadequate adherence [23, 25]. Those with COPD and very poor lung function perceived significant risks from infection and thus avoided “risky” settings/situations [13, 15, 23].

“I usually get an annual check-up at the doctors, but this year I haven’t had one. I’d like to, but (sigh), those waiting rooms, you know, you can’t be sure of anything can you? You just don’t know who is sitting there do you?” COPD patient, female [23]

“...women with COPD cancelled homecare as a precaution because they were afraid of COVID-19.” [25]

### *Experiential processing and risk perception*

The second component of the RPM, experiential processing, incorporates heuristic affect and personal experiences. Within our analysis, we identified experiences of breathlessness, past hospitalisations and beliefs about rationing or prioritising care to be key experiential factors influencing risk perception in COPD. Memories of past experiences, particularly relating to breathlessness, appeared to trigger heightened responses or other emotions such as fear and anxiety [23, 25, 26]. As one participant put it:

“If I get corona, put me down with morphine. Finish me off so that I don’t have to feel these disgusting suffocating feelings because I’ve felt them a few times before.” Female, COPD [25]

Survey data included in the review consistently demonstrated correlations between recent exacerbations and adherence to health-protective behaviours such as self-care or shielding [13, 15, 17]; while these studies don’t attribute their observations to a specific mechanism, we postulate that they may be driven by a recent exacerbation experience. Recollections from prior admission of a health service struggling to provide optimal care before COVID-19 pressures amplified concerns and reinforced the need to avoid healthcare settings at all costs.

### *Sociocultural influences and risk perception*

The third component of the RPM relates to sociocultural influences. Underpinning this component is the concept of “normative influences”; that is, expectations surrounding behaviour are informed by important social referents, usually family and friends. For those with COPD who were isolating, access to normal sociocultural influences were limited; as a result, the media became an important source through which people with COPD gauged and assessed their personal risk.

For many people, following briefings from central government became an important part of daily life [23, 25, 26]. Some perceived imposed restrictions as a source of reassurance and a legitimiser of a high perception of risk [25]. For others, restrictions were not severe enough and government response was perceived as “slow, confused and inadequate” [26]. Both views appeared to exert the same effect, in that they confirmed or intensified perceptions of high risk related to living with COPD during the pandemic and reinforced the need for continuation or enhancement of protective behaviours.

The media was frequently cited as the source of information pertaining to rationing, ceilings of care and/or lower prioritisation. As a result, those with severe disease feared they would not be eligible for ventilation or that they would not survive ventilation [23, 25, 26]. Such voiced beliefs were also linked to efforts to reduce exposure with multiple reports of COPD sufferers going beyond the standard health protection guidelines of social distancing, hand hygiene and mask wearing [15, 23, 25, 26].

“The level of preparation of the health service was often mentioned. Lack of health service capacity was a frequent concern, which in turn contributed to concerns regarding denial of care.” [26]

### *Social demographics and risk perception*

Sociodemographic factors, while not a core component of the RPM due to lack of consistent evidence that they unidirectionally influence risk perception, are included in the model as they permeate all the other components. We were able to identify only limited sociodemographic factors that influenced risk perception within the studies retrieved. Most commonly featured were living/familial situation and employment status [23, 26]; such factors were associated with elevated risk as they limited personal ability to avoid exposure.

“Many respondents had concerns about ongoing exposures, particularly for those whose profession or personal circumstances made further reductions in exposure impossible.” [26]

“For those who lived with a spouse, there were other concerns. Especially in cases where the spouse either worked, had things to do outside the house, or visited family and friends alone. In these situations, there was a fear that the spouse would bring the virus home to the isolated COPD sufferer.” [23]

Given that social-demographic factors were only minimally explored, our synthesis focused on highlighting where data was lacking in terms of representativeness. We pooled data on key variables where it was

provided in a format that could be synthesised. Across studies, 77% of the population were female; within the 12 studies presenting age data, the range was 36.6–75 years, and the median age was 67.6 years (interquartile range 60–71.2 years). In studies with a COPD-only sample that reported age (n=7) and retirement status (n=5), the mean age was 68.6 years (range 60–75 years), and between 69% and 93% of the sample were retired. Of the four studies that reported GOLD criteria, only 2% of participants were GOLD stage 1; most were GOLD stage 3 (42%). Five studies reported on employment status; 657 (81%) out of a total 806 subjects were either retired or unemployed. In each individual study reporting employment data, unemployed or retired subjects made up at least half the sample.

While these statistics are broadly in keeping with epidemiological data [2], they do highlight an important gap in the data; that is, how younger adults with COPD perceived risk and negotiated daily life. Retired, older adults with relatively severe disease that made up the majority of the included participants; this could mean we captured only a proportion of risk perceptions. Younger adults with less severe disease and competing priorities or responsibilities (*e.g.* the need to provide for a family) may have perceived risk differently; particularly during periods of restriction easing.

### *Outcomes of cognitive, experiential and sociocultural influences*

Summaries of key outcomes (hospitalisations, exacerbations and fear/worry) are provided in supplementary tables S1 and S2. Our analysis initially sought to link specific outcomes to separate components of the RPM. However, the same outcome could result from different facets of risk perception. For example, avoiding hospitals could have resulted from either cognitive (knowledge that healthcare settings/professionals could be a source of transmission), experiential (negative recollections of breathlessness, previous COPD admissions) or sociocultural perceptions of risk (hospitals are overwhelmed and rationing care); or a combination of all three. Therefore, we summarised outcomes to describe collectively the broad domains of health impacted by risk perception (figure 3).

### *Physical*

The most frequently explored outcomes were COPD exacerbations and associated healthcare utilisation [13, 15, 17, 18, 21, 24, 29–34], with most studies reporting marked decreases in both. This positive outcome has been attributed to public health measures that resulted in lower exposure to bacterial, viral and environmental triggers [41]. However, such measures also had indirect impacts; for example, limiting physical activity by forcing people to stay indoors.

“This [pre-lockdown activity levels] contrasted sharply to the lockdown period where 52 (32.5%) reported doing slightly less and 78 (49%) reported doing a lot less physical activity than normal, implying a significant decrease in activity levels.” [15]

Lockdowns similarly resulted in disruption to rehabilitation services and routine disease management programmes, while they were reconfigured to enable safer delivery or to release staff for other duties [9]. This combination created the perfect conditions for deconditioning through reduced physical activity, reduced preventative interventions and self-care abilities.

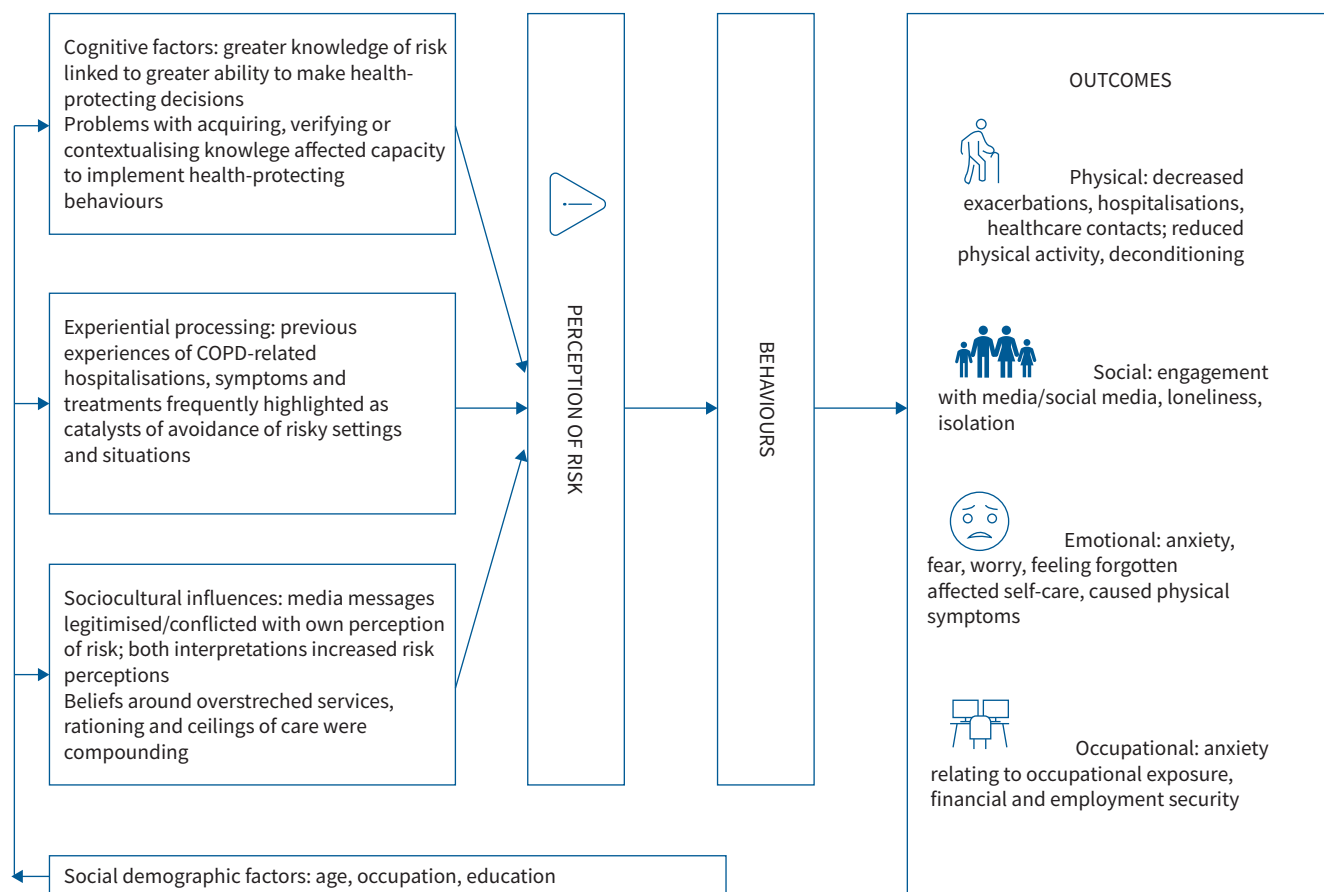
“The closedown of rehabilitation therapy and limiting access to group training created concerns among the patients. They feared disability, loss of function and muscle mass.” [23]

“I went to the doctor with some pains in my foot and they didn’t even touch it. We just talked about my foot. That means I’ve been going around with a bad foot for five months without getting it examined.” Female, COPD [23]

### *Social*

Limited access to normal life and services impacted upon social wellbeing and multiple studies reported concerns regarding loneliness and social isolation [23, 25, 26]. COPD sufferers were apprehensive that life would never return to normal, which was linked to low mood, particularly in those who considered themselves to be at the end stages of their disease/life-course [23]. Socialisation and connectedness was often confined to mainstream or social media; while engagement with new platforms could be positive, it was longitudinally associated with negative physical and psychological outcomes.

“The patients said that long-term home isolation was making them ‘crazy’ and a few even talked about their home isolation as a jail-like situation.” [23]



**FIGURE 3** Conceptual model of risk perception and outcomes.

“Media depictions were raised, and frustration shown at the negativity of media coverage: ‘The news and media makes you feel as if you will definitely die if you have coronavirus and underlying health issues...This does not help with mental health and anxiety’.” [23, 26]

#### *Emotional*

The most commonly explored emotions were anxiety, fear and worry. Increases in rates of worry or anxiety were captured across multiple surveys [13–15, 19, 20], and often attributed to catching COVID-19. However, other negative emotions were prominent, such as being considered a less important or a disposable member of society, which in turn affected self-worth [23, 26]. For others, psychological distress affected ability to engage in self-care [19, 20], whether through lack of access [29], treatment options or conflation of symptoms.

“The feeling of disappointment also arose when a health professional due to the health crises with coronavirus refused a need for a consultation. Refusals and cancellations of consultations contributed to a feeling of being left alone, forgotten and less important.” [23]

“A key challenge was differentiating the symptoms of their pre-existing respiratory condition from symptoms of COVID-19.” [26]

#### *Occupational*

Few studies explored occupation-related outcomes; however, those that did [23, 26] indicate that COPD sufferers experienced anxiety in relation to potential occupational exposure, job or financial security, or the safety of dependants following a change in circumstances (post-infection hospitalisation/death).

“Vulnerability related to impaired capacity for caring roles was common, including caring for children: ‘Who will look after my son who has learning disabilities if I don’t survive?’.” Female, COPD [26]

### Discussion

To our knowledge, this study is the first to view the behaviours and experiences of those with COPD who isolated during the COVID-19 pandemic, through a lens of risk perception. Conceptualising diverse data under this theoretical concept has enabled a more holistic assessment of motivations for behaviour change, and thus a more comprehensive overview of the impact and potential outcomes, beyond the immediately observable impacts like reduced hospitalisation. By domains of the RPM, we show that knowledge was an important driver of response in patients with COPD during the COVID-19 pandemic and appeared to be linked to greater ability to make health-protecting decisions. Problems with acquiring, verifying or contextualising knowledge could conversely affect ability to implement health-protecting behaviours.

Previous experiences of COPD-related hospitalisations, and the symptoms and treatments associated with this, greatly influenced behaviour changes and were frequently highlighted as catalysts of avoidance of risky settings and situations. Sociocultural influences, particularly messages relayed in mainstream media, were important for legitimising risk perceptions, or in contrast, to highlight inadequate government responses, with either interpretation increasing perceptions of risk. Voiced beliefs around rationing and limits of care compounded feelings of risk, similarly leading to health-protective efforts.

Lastly, sociodemographic factors such as employment and living status, while minimally explored in the data, had the potential to mediate perception of risk. Research exploring employment experiences of people within COPD suggests that it is a hidden condition that engenders little sympathy in the workplace, disclosure reticence and presenteeism (sickness presence) [42]. When coupled with concern regarding paying for necessities such as food, housing and utility bills, it is possible that younger adults with COPD would continue to work during the pandemic, despite the risks posed by COVID-19. Such tensions are only visible through the application of CIS methods and a risk lens.

Organising and interrogating *via* the methods described here has allowed us to describe large-scale impacts upon the health and wellbeing of people living with COPD during the recent pandemic. The information presented helps to contextualise the current situation patients continue to face which goes beyond the description of outcomes, the purview of previous reviews. We are not clear to what extent people with COPD have returned to pre-pandemic behaviours, nor do we know how clinically appropriate such a move would be. By adhering to advice, patients protected themselves from exacerbations and admissions, but the long-term impact of social isolation, deconditioning and fear of substandard care or risk probably persists.

### Application of findings in clinical practice

This analysis highlights how perception of risk, holistically measured *via* the RPM, influenced the actions of people with COPD during COVID-19. Clinicians and politicians who are responsible for communicating public health messages regarding outbreaks could learn from the data presented here to help communicate risk more effectively during and after future pandemics. Those with a previous exacerbation of COPD drew on this experience when gauging their personal risk from COVID-19. Utilising personal experiences, through stories and social media, may help some better perceive and contextualise their personal risk.

### Comparison with other reviews

To our knowledge, only two reviews have examined outcomes in COPD that are unrelated to infection. ALQAHTANI *et al.* [41] conducted a systematic review and meta-analysis of COPD exacerbations and hospitalisation during COVID-19 and concurrently modelled what might have driven the observed reductions. In their model, ALQAHTANI *et al.* [41] proposed that regulations and fear probably drove observed reductions in exacerbations. MADAWALA *et al.* [43], who similarly reviewed the healthcare experiences of people with COPD during the pandemic, concluded that while healthcare quality was impacted, telehealth mitigated this to some extent and improved feelings of isolation and anxiety.

While both studies extend the evidence base by describing the effects of COVID-19, they do not offer a logical explanation as to why these outcomes may have been observed. We would argue that perceptions of risk more broadly influenced people with COPD and led to changes in behaviour, rather than the components of fear and restrictions alone as proposed by ALQAHTANI *et al.* [41]. An analysis of risk awareness in the general population during the pandemic confirms, in a much larger sample, our contention that risk perception is a potent mediator of behaviour [44].



### Limitations of review process and evidence

This review is limited by the size of the evidence base and the relatively low quality of evidence that has been produced during the pandemic. For example, studies measuring traits other than hospitalisations did not collect pre-pandemic measures; no study obtained serial measures to determine change over time and no interview studies were conducted with participants over time. Given the urgency to learn during the pandemic, the evidence is frequently based on availability, therefore brief snapshots and convenience samples predominate. We are not alone in highlighting poor methodological quality; a recent review of COVID-19 research [36] indicates significant shortcomings. We await longitudinal data exploring ongoing impacts and recovery from the pandemic, and recognise that a fuller dataset concerning the impact of COVID-19 upon people with COPD is unlikely to become available.

While a critical interpretative synthesis has the advantage of being inclusive of all types of research, using an established framework such as the RPM may have curtailed our analysis by forcing data into established constructs. However, as the model has been tested extensively, including within the setting of COVID-19 [39], we do not believe this to be a limitation of our analysis. Rather, the model enables framing of the data in a coherent and evidence-grounded framework that enhances our interpretation of data and therefore understanding of the phenomena. Synthesis of this type have been criticised for their lack of transparency, particularly around the methods used to generate the synthesising constructs and argument [45]. Every effort has been made to be as transparent as possible about this process and we provide additional information in the supplementary material.

### Conclusions

People with COPD had heightened perceptions of risk informed by knowledge of their inter-individual risk of COVID-19, previous experiences of hospitalisations and normative influences, primarily government messaging. A heightened perception of risk resulted in a broad range of outcomes, such as reduced exacerbations and hospitalisations as people with COPD engaged in stringent or enhanced self-isolation measures. High-quality longitudinal studies are needed to understand the longer-term impact on outcomes. Government and health professionals could utilise the RPM to better understand how risk perceptions are formed and how these then mediate behaviours. Such knowledge can help people living with COPD to recover from the impacts of the pandemic and find a way through to optimal care approaches going forward, balancing risk with clinical benefit, as well as informing future support at times of increased viral infection risk.

Provenance: Submitted article, peer reviewed.

Data availability: Data will be made available upon request.

Author contributions: R. Swain and F. Forsyth: conception and design, acquisition of data, analysis and interpretation of data, drafted the article, revised the draft critically for important intellectual content, gave final approval of the version to be published, agreed to be accountable for all aspects of the work. F. Early and J. Fuld: conception and design, interpretation of data, revised the draft critically for important intellectual content, gave final approval of the version to be published, agreed to be accountable for all aspects of the work. S. Shrivastva, I. Kuhn and R. Tufnell: acquisition of data, analysis and interpretation of data, revised the draft critically for important intellectual content, gave final approval of the version to be published. B. Bowers: design, interpretation of data, revised the draft critically for important intellectual content, gave final approval of the version to be published, agreed to be accountable for all aspects of the work.

Conflict of interest: F. Forsyth reports grants from Evelyn Trust; outside the submitted work. B. Bowers reports Wellcome Trust Research Fellowship 2022–2027; lecture honoraria from Oxford Palliative Care Symptom Management Course 2022; and a leadership role as a Community Nursing Research Consultant (paid role), Queen's Nursing Institute Charity; outside the submitted work. J. Fuld reports lecture honoraria from AstraZeneca; outside the submitted work. All other authors have nothing to disclose.

Support statement: F. Forsyth is supported by the Evelyn Trust.

### References

- 1 Venkatesan P. GOLD COPD report: 2023 update. *Lancet Respir Med* 2023; 11: 18.
- 2 Quaderi SA, Hurst JR. The unmet global burden of COPD. *Glob Health Epidemiol Genom* 2018; 3: e4.
- 3 Gutiérrez Villegas C, Paz-Zulueta M, Herrero-Montes M, et al. Cost analysis of chronic obstructive pulmonary disease (COPD): a systematic review. *Health Econ Rev* 2021; 11: 31.



- 4 Miravittles M, Ribera A. Understanding the impact of symptoms on the burden of COPD. *Respir Res* 2017; 18: 67.
- 5 Our World in Data. Policy Responses to the Coronavirus Pandemic. 2020. <https://ourworldindata.org/policy-responses-covid>
- 6 Gerayeli FV, Milne S, Cheung C, et al. COPD and the risk of poor outcomes in COVID-19: a systematic review and meta-analysis. *EclinicalMedicine* 2021; 33: 100789.
- 7 Bostock B. Shielding people with COPD from COVID-19: what you need to know. *Indep Nurse* 2020; 2020: 18–21.
- 8 Gordon Patti K, Kohli P. COVID's impact on non-communicable diseases: what we do not know may hurt us. *Curr Cardiol Rep* 2022; 24: 829–837.
- 9 Wu F, Burt J, Chowdhury T, et al. Specialty COPD care during COVID-19: patient and clinician perspectives on remote delivery. *BMJ Open Respir Res* 2021; 8: e000817.
- 10 Hume E, Armstrong M, Manfield J, et al. Impact of COVID-19 shielding on physical activity and quality of life in patients with COPD. *Breathe* 2020; 16: 200231.
- 11 Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021; 372: n71.
- 12 Uzzani M, Hammady H, Fedorowicz Z, et al. Rayyan – a web and mobile app for systematic reviews. *Syst Rev* 2016; 5: 210.
- 13 Zhang HQ, Lin JY, Guo Y, et al. Medication adherence among patients with chronic obstructive pulmonary disease treated in a primary general hospital during the COVID-19 pandemic. *Ann Transl Med* 2020; 8: 1179.
- 14 Pedrozo-Pupo JC, Campo-Arias A. Depression, perceived stress related to COVID, post-traumatic stress, and insomnia among asthma and COPD patients during the COVID-19 pandemic. *Chron Respir Dis* 2020; 17: 1479973120962800.
- 15 McAuley H, Hadley K, Elneima O, et al. COPD in the time of COVID-19: an analysis of acute exacerbations and reported behavioural changes in patients with COPD. *ERJ Open Res* 2021; 7: 00718-2020.
- 16 Hu W, Dong M, Xiong M, et al. Clinical courses and outcomes of patients with chronic obstructive pulmonary disease during the COVID-19 epidemic in Hubei, China. *Int J Chron Obstruct Pulmon Dis* 2020; 15: 2237–2248.
- 17 González J, Moncusí-Moix A, Benitez I, et al. Clinical consequences of COVID-19 lockdown in patients with COPD results of a pre-post study in Spain. *Chest* 2021; 160: 135–138.
- 18 Faria N, Costa MI, Gomes J, et al. Reduction of severe exacerbations of COPD during COVID-19 pandemic in Portugal: a protective role of face masks? *COPD* 2021; 18: 226–230.
- 19 Pleguezuelos E, Del Carmen A, Moreno E, et al. The experience of COPD patients in lockdown due to the COVID-19 pandemic. *Int J Chron Obstruct Pulmon Dis* 2020; 15: 2621–2627.
- 20 Imeri H, Holmes E, Desselle S, et al. The impact of the COVID-19 pandemic on self-reported management of chronic conditions. *J Patient Exp* 2021; 8: 23743735211007693.
- 21 Alsallakh MA, Sivakumaran S, Kennedy S, et al. Impact of COVID-19 lockdown on the incidence and mortality of acute exacerbations of chronic obstructive pulmonary disease: national interrupted time series analyses for Scotland and Wales. *BMC Med* 2021; 19: 124.
- 22 Boyce DM, Thomashow BM, Sullivan J, et al. New adopters of telemedicine during the coronavirus-19 pandemic in respondents to an online community survey: the case for access to remote management tools for individuals with chronic obstructive pulmonary disease. *Chronic Obstr Pulm Dis* 2021; 8: 213–218.
- 23 Mousing CA, Sørensen D. Living with the risk of being infected: COPD patients' experiences during the coronavirus pandemic. *J Clin Nurs* 2021; 30: 1719–1729.
- 24 Tan JY, Conceicao EP, Wee LE, et al. COVID-19 public health measures: a reduction in hospital admissions for COPD exacerbations. *Thorax* 2021; 76: 512–513.
- 25 Ekdahl A, Söderberg S, Rising-Holmström M. Living with an ever-present breathlessness: women's experiences of living with chronic obstructive pulmonary disease stage III or IV. *Scand J Caring Sci* 2022; 36: 1064–1073.
- 26 Philip KEJ, Lonergan B, Cumella A, et al. COVID-19 related concerns of people with long-term respiratory conditions: a qualitative study. *BMC Pulm Med* 2020; 20: 319.
- 27 Wańkowitz P, Szylińska A, Rotter I. The impact of the COVID-19 pandemic on psychological health and insomnia among people with chronic diseases. *J Clin Med* 2021; 10: 1206.
- 28 Liang Y, Chang C, Chen Y, et al. Management and healthcare utilization of COPD patients during the COVID-19 epidemic in Beijing. *Int J Chron Obstruct Pulmon Dis* 2020; 15: 2487–2494.
- 29 Mansfield KE, Mathur R, Tazare J, et al. Indirect acute effects of the COVID-19 pandemic on physical and mental health in the UK: a population-based study. *Lancet Digit Health* 2021; 3: e217–e230.
- 30 Chan KPF, Ma TF, Kwok WC, et al. Significant reduction in hospital admissions for acute exacerbation of chronic obstructive pulmonary disease in Hong Kong during coronavirus disease 2019 pandemic. *Respir Med* 2020; 171: 106085.
- 31 Kyriakopoulos C, Gogali A, Exarchos K, et al. Reduction in hospitalizations for respiratory diseases during the first COVID-19 wave in Greece. *Respiration* 2021; 100: 588–593.

- 32 Huh K, Kim YE, Ji W, *et al.* Decrease in hospital admissions for respiratory diseases during the COVID-19 pandemic: a nationwide claims study. *Thorax* 2021; 76: 939–941.
- 33 Helgeland J, Telle KE, Grøslund M, *et al.* Admissions to Norwegian hospitals during the COVID-19 pandemic. *Scand J Public Health* 2021; 49: 681–688.
- 34 Stöhr E, Aksoy A, Campbell M, *et al.* Hospital admissions during Covid-19 lock-down in Germany: differences in discretionary and unavoidable cardiovascular events. *PLoS One* 2020; 15: e0242653.
- 35 The Joanna Briggs Institute. The Joanna Briggs Institute Critical Appraisal Tools for Use in JBI Systematic Reviews: Checklist for Systematic Reviews and Research Syntheses. 2017. [https://jbi.global/sites/default/files/2019-05/JBI\\_Critical\\_Appraisal-Checklist\\_for\\_Systematic\\_Reviews2017\\_0.pdf](https://jbi.global/sites/default/files/2019-05/JBI_Critical_Appraisal-Checklist_for_Systematic_Reviews2017_0.pdf)
- 36 Jung RG, Di Santo P, Clifford C, *et al.* Methodological quality of COVID-19 clinical research. *Nat Commun* 2021; 12: 943.
- 37 Dixon-Woods M, Cavers D, Agarwal S, *et al.* Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *BMC Med Res Methodol* 2006; 6: 35.
- 38 van der Linden S. The social-psychological determinants of climate change risk perceptions: towards a comprehensive model. *J Environ Psychol* 2015; 41: 112–124.
- 39 Dryhurst S, Schneider CR, Kerr J, *et al.* Risk perceptions of COVID-19 around the world. *J Risk Res* 2020; 23: 994–1006.
- 40 Mathieu E, Ritchie H, Rodés-Guirao L, *et al.* COVID-19: Stringency Index. 2020. <https://ourworldindata.org/covid-stringency-index>
- 41 Alqahtani JS, Oyelade T, Aldhahir AM, *et al.* Reduction in hospitalised COPD exacerbations during COVID-19: a systematic review and meta-analysis. *PLoS One* 2021; 16: e0255659.
- 42 Kirkpatrick P. An Exploration of Employment Factors in Working-Age People with Chronic Obstructive Pulmonary Disease. PhD thesis. Aberdeen, Robert Gordon University, 2022. Available from: <https://doi.org/10.48526/rgu-wt-1880266>.
- 43 Madawala S, Quach A, Lim JY, *et al.* Healthcare experience of adults with COPD during the COVID-19 pandemic: a rapid review of international literature. *BMJ Open Respir Res* 2023; 10: e001514.
- 44 Cipolletta S, Andregretti GR, Mioni G. Risk perception towards COVID-19: a systematic review and qualitative synthesis. *Int J Environ Res Public Health* 2022; 19: 4649.
- 45 Depraetere J, Vandeviver C, Keygnaert I, *et al.* The critical interpretive synthesis: an assessment of reporting practices. *Int J Soc Res Methodol* 2020; 24: 669–689.