

Preventable deaths from SARS-CoV-2 in England and Wales: a systematic analysis of coroners' case reports from the COVID-19 pandemic

Bethan Swift^{1,2}, Carl Heneghan^{3,4}, Jeffrey K. Aronson³, David J. Howard^{4,5}, Georgia C. Richards^{3,4}*

¹Oxford Endometriosis Care Centre, Nuffield Department of Women's and Reproductive Health, University of Oxford, Oxford, OX3 9DU, UK.

²Wellcome Centre for Human Genetics, University of Oxford, Oxford, OX3 7BN, UK.

³Centre for Evidence-Based Medicine, Nuffield Department of Primary Care Health Sciences, University of Oxford, Radcliffe Observatory Quarter, Woodstock Road, Oxford, OX2 6GG, UK.

⁴Global Centre on Healthcare and Urbanisation, Kellogg College, University of Oxford, 60-62 Banbury Road, Oxford, OX2 6PN, UK.

⁵Department for Continuing Education, University of Oxford, UK.

*corresponding author: B Swift

Word count: 2647

Abstract

As of June 2021, 12% of global deaths attributed to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have occurred in England and Wales. Examining Coroners' Prevention of Future Deaths reports (PFDs) between March 2020 and 28 June 2021 in England and Wales, we found 23 cases (4.5% of PFDs) involving SARS-CoV-2, with 52% (n=12) of deaths indirectly- and 48% directly-related. There was geographical variation with most (39%) PFDs written by coroners in the North-West of England. Fifty-six concerns were raised by coroners with problems in communication being the most (30%) repeated concern, followed by a failure to follow protocols (23%). Organisations in the National Health Services (NHS) received the most PFDs (51%), followed by the government (26%). Policymakers should consider an intermediate step prior to PFDs to ensure lessons from the COVID-19 pandemic are rapidly identified. In the meantime, PFDs should be used to prevent future deaths.

Introduction

Over four million deaths worldwide have been attributed to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with 12% of deaths occurring in England and Wales¹. While many deaths from SARS-CoV-2 may have been prevented, in law coroners in England and Wales have a duty to report and communicate information about deaths when the coroner believes that action should be taken to prevent future deaths². Such reports, previously called Rule 43, named Prevention of Future Deaths reports or PFDs, are mandated under Paragraph 7 of Schedule 5 of the Coroners and Justice Act 2009, and under Regulations 28 and 29 of the Coroners (Investigations) Regulations 2013^{3,4}.

The PFD system has three processes: 1) coroners generate PFDs; 2) addressees respond to coroners regarding the concerns raised in PFDs within 56 days; and 3) actions to prevent such deaths are proposed and or implemented. Systematic analyses of PFDs have been carried out to investigate preventable deaths from medication errors, adverse drug reactions, suicides, cardiovascular disease, and opioids⁵⁻⁹. PFDs have also been used to disseminate case reports that describe pertinent lessons for the public, healthcare professionals, and policymakers¹⁰⁻¹⁴. During the COVID-19 pandemic, healthcare professionals in England and Wales called for the deaths of their colleagues to be reported to the coroner and for PFDs to be issued^{15,16}. However, PFDs issued during the COVID-19 pandemic have not been analysed. We therefore aimed to systematically analyse PFDs in which SARS-CoV-2 was directly or indirectly implicated in a death.

Methods

We designed a retrospective observational study and preregistered the study protocol on an open repository²⁸.

Data collection

PFDs are openly available on the Courts and Tribunals Judiciary website²⁹. We used the Preventable Deaths Database, which uses web scraping to systematically collect all available PFDs. The code for the web scraper is openly available on GitHub and has been previously described^{27,30}. The Preventable Deaths Database contains the case reference number; the date of the report; the name of the deceased; the coroner's name; the coroner's jurisdiction; the category of death (as assigned by the Chief Coroners' office); to whom the report was sent; and the URL to the Judiciary website.

Eligibility of cases

We independently screened all PFDs in the Preventable Deaths Database from 01 January 2020 to 28 June 2021 (n=510) for cases that mentioned COVID-19 as a direct or indirect cause of death. Direct deaths were defined as those that the coroner explicitly reported COVID-19 as a cause of death or a positive test for COVID-19 within 28 days of death. Indirect deaths were

defined as those that occurred due to the associated mitigation measures during the COVID-19 pandemic (for example, missed appointments due to lockdown). Cases that did not mention COVID-19 as a direct or indirect cause of death were excluded.

Data extraction

For the included cases, we extracted the individuals or organisations to whom reports were sent and who responded; date of death; age; sex; setting or location of death; medical cause(s) of death; the coroner's conclusion(s) of the inquest; relevant medical, mental health and social history; substance(s) implicated in the death and the type of substance(s); coroner's concern(s) and actions proposed by the coroner. The data available for extraction was limited by the information reported by coroners in the PFDs.

Data analysis

We used descriptive statistics to describe the numbers and types of cases that met the eligibility criteria for inclusion. The numbers and types of individuals and organisations who received PFDs were synthesised and response rates to coroners were calculated. We performed content analysis to categorise the concerns reported by coroners.

Software and data sharing

We used Python v3.7 in Jupyter Notebooks with pandas, seaborn, and matplotlib libraries to analyse the data. The data, statistical code, and study materials are openly available via the Open Science Framework (OSF) and GitHub^{30,31}.

Results

There were 23 PFDs representing 23 cases (4.5% of all PFDs screened between 01 January 2020 and 28 June 2021; n=510) where COVID-19 caused or contributed to a preventable death. Nearly half (48%; n=11) of all deaths were directly related to COVID-19, defined as those where the coroner explicitly reported COVID-19 as a cause of death or a positive test for COVID-19 within 28 days of death. Twelve deaths were indirectly related (Table 1), defined as those that occurred due to the associated mitigation measures during the COVID-19 pandemic. Most (78%; n=18) deaths occurred in males and the median age at death was 76 years (IQR: 50-87; n=11).

Of the 11 deaths directly caused by COVID-19, coroners reported other causes of death that are risk factors for COVID-19, including type 2 diabetes mellitus, kidney disease, hypertension, heart failure, and epilepsy. Pneumonitis co-occurred in 64% (n=7) of deaths. One death was due to drowning to which COVID-19 and asthma were contributory.

Table 1: Summary of the 23 deaths directly and indirectly caused by COVID-19 as reported by coroners in Prevention of Future Deaths reports in England and Wales between 01 January 2020 and 28 June 2021, ordered by date of death.

		Dates				Responses to PFDs	
Age	Sex	Death	Inquest	Report	Causes of death	Addressee(s)	Date of reply
Directly-related to COVID-19							
-	M	13/04/2020	14/04/2020	01/12/2020	<ol style="list-style-type: none"> 1) Community Acquired Pneumonia 2) COVID-19 3) Dementia, Chronic Obstructive Pulmonary Disease, Asbestos Related Pulmonary Fibrosis, Pleural Plaques, Type 2 Diabetes 	<ol style="list-style-type: none"> 1) CQC 2) Vicarage Residential Care Home 3) Public Health England 4) NHS England 5) Greater Manchester Health and Social Care Partnership 	<ol style="list-style-type: none"> 1) 04/02/2021 2) Undated 3) 26/01/2021 4) 02/03/2021 5) 19/02/2021
86	F	17/04/2020	03/07/2020	11/12/2020	Natural causes and COVID-19	Whipps Cross Hospital	Received but not dated
74	M	21/04/2020	22/04/2020	01/12/2020	<ol style="list-style-type: none"> 1) Hypovolemic shock 2) End-stage kidney disease 3) Polyneuropathy, frailty and COVID-19 	<ol style="list-style-type: none"> 1) Department of Health and Social Care 2) Royal London Hospital 	Not yet received
-	M	21/05/2020	26/05/2020	09/12/2020	<ol style="list-style-type: none"> 1) COVID-19 pneumonia 2) Right sided neck of femur fracture, Hypertension, Atrial fibrillation 	<ol style="list-style-type: none"> 1) Public Health England 2) NHS England 	<ol style="list-style-type: none"> 1) 11/02/2021 2) 09/02/2021
18	M	31/07/2020	03/08/2020	30/03/2020	Drowning to which COVID-19 and asthma were contributory	<ol style="list-style-type: none"> 1) Craven District Council 2) Yorkshire Dales National Park 3) Yorkshire Water 	Not yet received
-	M	07/09/2020	07/09/2020	24/04/2021	<ol style="list-style-type: none"> 1) Bronchopneumonia in combination with COVID-19 2) Falls with vertebral fractures, Type 2 diabetes mellitus, pulmonary fibrosis, heart 	<ol style="list-style-type: none"> 1) Greater Manchester Health and Social Care Partnership 2) NHS England 	Not yet received

					failure and epilepsy.		
-	M	15/11/2020	16/11/2020	11/06/2021	1) COVID 19 Pneumonitis 2) Chronic Obstructive Pulmonary Disease, Ischaemic Heart Disease, Previous Right Upper Lobe Resection for Lung Adenocarcinoma, Type 2 Diabetes Mellitus.	Tameside CCG	24/06/2021
90	M	28/01/2021	08/02/2021	23/04/2021	1) COVID-19 pneumonia 2) Dementia, heart failure, acute on chronic subdural haematoma, fall	Medway Maritime Hospital	07/06/2021
-	M	05/02/2021	08/02/2021	10/06/2021	1) COVID-19 on background of immunomodulatory treatment 2) Seborrheic eczema 3) Peripheral vascular disease	1) NHS England 2) Secretary of State of Health	Not yet received
-	M	03/04/2021	17/11/2020	14/06/2021	1) Aspiration pneumonia on a background of a choking incident, COVID-19 pneumonitis 2) Alzheimers dementia	1) MHRA 2) NHS Stockport CCG	Not yet received
-	M	-	30/10/2020	19/02/2021	COVID-19 pneumonitis	1) Brighton Sussex University NHS Hospital Trust 2) West Sussex NHS Hospital Trust 3) Medico-Legal	1) 19/03/2021 2) Not yet received 3) Not yet received
Indirectly-related to COVID-19							
32	F	19/03/2020	30/03/2020	23/11/2020	1) Hanging 2) Bipolar affective disorder	1) Sussex Partnership Foundation NHS Trust 2) Brighton and Hove City Council	1) 10/02/2021 2) 10/02/2021

-	M	17/04/2020	24/04/2020	07/12/2020	Methadone toxicity	1) Public Health England 2) Haverhill Pharmacy	1) 13/01/2021 2) Undated
-	M	24/04/2020	05/05/2020	19/11/2020	Suicide	1) Woolwich Station Medical Centre 2) Ministry of Defence	1) Not received 2) 16/02/2021
-	F	20/06/2020	23/06/2020	11/02/2021	1) Bronchopneumonia 2) Frailty 3) Dementia 4) Hypertension 5) Fractured neck of femur	1) CQC 2) Department of Health and Social Care	1) 04/06/2021 2) 03/06/2021
28	M	10/08/2020	14/08/2020	15/03/2021	Suicide	Sussex Partnership NHS Foundation Trust	Not yet received
76	F	28/09/2020	03/12/2020	16/12/2020	Atherosclerosis and complete blockage of one artery	1) NHS Pathways* 2) COVID-19 Pandemic Response Service	10/02/2021
-	M	25/10/2020	26/10/2020	02/06/2021	Combined drug toxicology	Stockport CCG	Not yet received
77	M	-	08/10/2020	02/02/2021	1) Advanced dementia 2) Fractured neck of femur 3) Ischaemic heart disease	1) Adult Social Services, Norfolk County Council 2) Norfolk and Norwich University Hospital	1) 11/03/2021 2) 09/04/2021
88	M	-	20/08/2020	05/02/2021	1) Bronchopneumonia 2) Heat stroke 3) Dehydration	Care Outlook Ltd	18/04/2021
-	M	-	11/08/2020	07/05/2021	1) Small bowel obstruction and perforation 2) Ingestion of foreign body	Norfolk and Norwich University Hospital NHS Foundation Trust	Not yet received
68	F	-	20/09/2020	14/12/2020	1) Pneumothorax 2) Rib fractures 3) Fall 4) COPD and IHD	West Midlands Ambulance Service	08/01/2021

87	M	-	08/10/2020	07/05/2021	<ol style="list-style-type: none"> 1) Urosepsis 2) Long term indwelling catheter not changed since October 2019 3) Alzheimer's dementia, cerebrovascular accident, chronic kidney disease, bladder cancer, prostate cancer 	Lower Clapton Group Practice	Not yet received
----	---	---	------------	------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------	------------------

**NHS Digital responded on behalf of NHS Pathways and the COVID-19 Pandemic Response Service. CCG: Clinical Commissioning Group; CQC: Care Quality Commission; COPD: Chronic Obstructive Pulmonary Disease; MHRA: Medicines and Healthcare products Regulatory Agency; NHS: National Health Service. Deaths directly-related were defined as those that the coroner explicitly reported COVID-19 as a cause of death or a positive test for COVID-19 within 28 days of death. Indirectly-related deaths were defined as those that occurred due to the associated mitigation measures during the COVID-19 pandemic.*

Of the 12 deaths indirectly caused by COVID-19, 25% (n=3) were caused by suicide and 17% (n=2) were caused by medication errors. Two deaths (17%) were a result of the deceased refusing to go to a hospital or care home against medical advice owing to the fears of COVID-19, while two deaths occurred due to medical equipment being left inside of the patient as a result of cancelled appointments during the national lockdown. A further two deaths were caused by COVID-19 being incorrectly diagnosed via remote telehealth appointments and the patients surcomming from the un-diagnosed medical issue. One death was caused by a fall that was made worse with the distress caused to the patient who had to be isolated, due to COVID-19, each time he was readmitted to his care home.

The deaths were classified into nine groups by the Chief Coroner's Office, including hospital-related (28%; n=11), community healthcare (18%; n=7), care homes (13%; n=5), other (13%; n=5), emergency services (10%; n=4), alcohol, drug and medication related (8%; n=3), mental health related (5%; n=2), suicide (3%; n=1), and service personnel related (3%; n=1).

Twelve coroners across 14% (n=12) of all jurisdictions wrote the PFDs. Most (39%) PFDs were written by coroners in the North West of England, followed by the South East (22%), and London (17%) (Figure 1, Table S1). Coroners in the South West, North East, West Midlands and Wales did not report any COVID-19 PFDs.

We identified 56 individual concerns raised by coroners in the 23 cases, which were categorised into 28 groups and five higher-order categories (Figure 2, Table S2). Poor communication was reported by approximately a third, followed by a failure to follow protocols, a lack of education and training and issues of safety.



Created with Datawrapper

Figure 1. Map of the number of Prevention of Future Deaths reports involving COVID-19 issued by coroners in England and Wales between 01 January 2020 and 28 June 2021

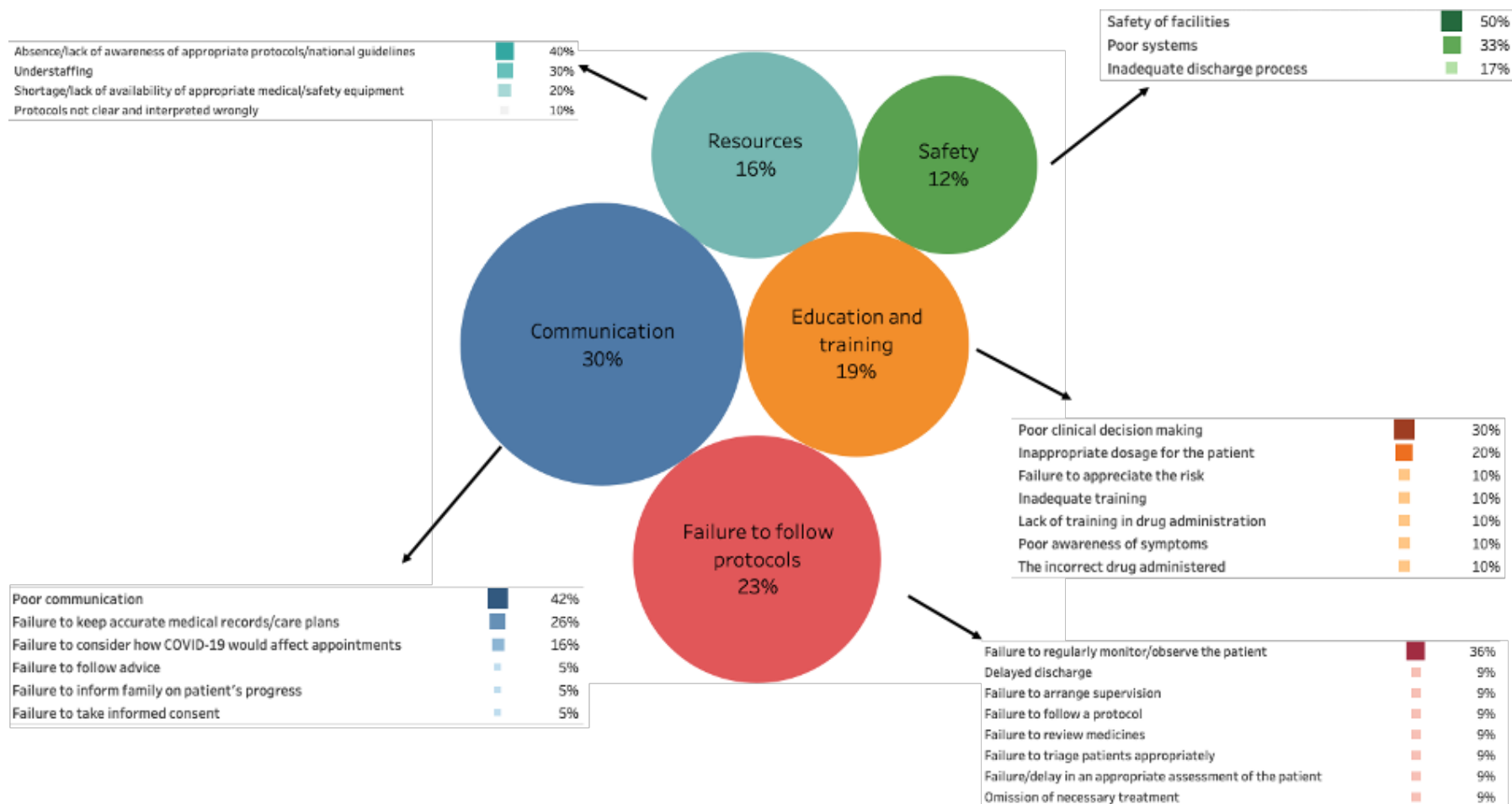


Figure 2. Concerns raised by coroners in Prevention of Future Deaths reports involving COVID-19 in England and Wales between 01 January 2020 and 28 June 2021

Examples of coroners' concerns from the 23 cases

(a) Unclear guidance resulted in an inpatient being moved to a ward with patients who had tested positive for SARS-COV-2 (Case 2020-0280)

A man was admitted to hospital following an accidental fall at his home address. He underwent surgery for his fractured hip and postoperatively became unwell with a chest infection. Once considered fit for discharge, he was moved to several different wards and eventually put in a bay where patients had been exposed to a patient with COVID-19. He subsequently tested positive for COVID-19, deteriorated rapidly, and passed away.

The coroner heard that the decision to move the deceased was made upon the interpretation of guidance from Public Health England (PHE) and in reflection, the trust has changed their policy and such movement no longer takes place. However, at the time of writing the PFD, the guidance from PHE had not been amended and it was unknown how other trusts were choosing to interpret the guidance and potentially putting other vulnerable patients at risk of developing COVID-19 as an inpatient.

(b) Misdiagnosis following a GP telephone appointment for a patient with common COVID-19 symptoms (Case 2021-0201)

A man had been feeling unwell for over a week and had a telephone consultation with his GP. He reported shortness of breath, a cough, tight chest, fevers, and was not eating. He was not seen face to face and was prescribed antibiotics. He was found unresponsive at his home address two days later and a post-mortem examination found that he had died from COVID-19 pneumonitis. He had underlying health issues including diabetes, chronic obstructive pulmonary disease (COPD) and had a previous lobectomy for lung cancer.

The GP surgery had a policy of primarily using telephone appointments. Despite the inquest accepting that the man's symptoms were consistent with COVID-19, the GP had not considered them to be so. The coroner believes that a face to face appointment and subsequent precautionary testing may have led to the early identification of COVID-19 and subsequent treatment. The coroner was also concerned that the GPs in question did not have the appropriate tools to identify potential high-risk COVID-19 patients and that additional assessments should be used for these patients in the future, such as oxygen levels consistent with silent hypoxia.

(c) An accidental overdose due to altered quantities of controlled drugs (Case 2020-0275)

A man with known drug dependency issues had been receiving support from a Recovery Network and was generally fit, well, and in good spirits. The man received a regular methadone prescription and received the drug three times per week in daily dosage bottles. During the COVID-19 pandemic, this regime changed to once every 14 days, meaning he had access to a much larger quantity of methadone and this supply was not provided in daily doses. The deceased was found [in his home?] with higher than the usual toxic level of methadone in his system. There was no evidence that he intended to take his own life.

At the start of the pandemic, PHE guidance was issued that patients on shorter-term methadone treatment should be moved to longer-term. The doctor who made the changes to the prescription stipulated that the man's dose must be in single daily dosage bottles and letters had been sent to all of the pharmacies that supplied opiate replacement therapies to his patients, explaining this. The coroner saw evidence that the prescription the man received was not in daily dose bottles nor was there a 'measuring jug' to enable accurate measuring of doses. The coroner believed that it was probable that the man guessed his first dose from the large methadone bottle. If the man had been given his daily dose bottles as prescribed, a 'measuring jug' and instructions on how to use it, his death may have been prevented.

(d) Incorrect diagnosis of SARS-COV-2, subsequent isolation, and unobserved falls (Case 2021-0038)

An elderly woman residing in a care home who had a high risk of falls showed signs of being unwell. She was diagnosed remotely by her GP with suspected COVID-19 and isolated in her room, with the use of staff observation and sensor mats to ensure her wellbeing. She fell whilst unobserved and was admitted to hospital with a fractured neck of femur, bronchopneumonia, and possibly COVID-19. The test for SARS-COV-2 was negative and as she was unfit for surgery, it was proposed that she was discharged to the care home. She deteriorated and later died at the hospital from bronchopneumonia exacerbated by the fracture.

The elderly lady was frail and at risk of falls and the care home had a risk plan in place that was based around her being observed during the day in communal areas. The home was not staffed to provide one to one observations for residents that were required to self isolate because of COVID-19. Therefore, when the lady was required to self-isolate they could not provide continuous observations. The coroner believed that it was unclear how care homes were being advised to safely manage residents at risk of falls where isolation was required and the home was unaware of any guidance they should follow to manage the risk.

In addition to this, when the lady was required to go to hospital, her family were not able to go with her due to COVID-19 restrictions. The coroner heard that the unsupported presentation/assessment of vulnerable, frail and elderly patients presented significant problems to clinicians in terms of effective communication and understanding their health baseline to support appropriate and timely clinical decision making.

Responses to PFDs

Coroners sent the 23 PFDs to 43 unique individuals and organisations (Table 2). Reports were most commonly sent to the NHS (51%) followed by the government and its related bodies, other organisations and professional bodies. Government organisations had the highest (64%) response rates to PFDs, followed by professional bodies (50%) other organisations (50%) and NHS organisations (45%). Of the 23 PFDs involving COVID-19, nine had a 100% response rate, (ten PFDs had no responses at all).

Table 2: Recipients of Prevention of Future Deaths reports involving COVID-19 in England and Wales between 01 January 2020 and 28 June 2021, and their response rates.

Addressee	No. of PFDs sent	No. of responses	Response rate (%)
NHS organisations	22	10	45%
Trusts	5	2	40%
NHS England	4	2	50%
NHS Hospitals	4	3	75%
CCGs	3	0	0%
Health and Social Care Partnerships	2	1	50%
NHS Pathways*	1	1	100%
Ambulance	1	1	100%
GPs	2	0	0%
Government	11	7	64%
Public Health England	3	3	100%
Department of Health and Social Care	2	1	50%
Local authorities	3	2	67%
COVID-19 pandemic response service*	1	1	100%
Secretary of State of Health	1	0	0%
Ministry of Defence	1	0	0%
Professional bodies	4	2	50%
CQC	2	2	100%
General Pharmaceutical Council	1	0	0%
MHRA	1	0	0%
Other	6	3	50%
Care homes/providers	2	2	100%
Water board	1	0	0%
National Park	1	0	0%
Legal	1	0	0%
Pharmacy	1	1	100%

**NHS Digital responded on behalf of NHS Pathways and the COVID-19 Pandemic Response Service. CCG; Clinical Commissioning Group; CQC: Care Quality Commission; GPs: General Practitioners; MHRA: Medicines and Healthcare products Regulatory Agency; NHS: National Health Service.*

Discussion

There were 23 deaths involving COVID-19 in England that coroners believed may have been preventable. The majority of COVID-19-related PFDs were in men and there was wide geographical variation in the issuing of PFDs across England and Wales. Coroners raised several concerns particularly regarding communication issues and problems with following protocols. The highest number of PFDs were sent to NHS Trusts and the government.

Just over half of the included PFDs were indirectly caused by the COVID-19 pandemic. This finding highlights the importance of considering the harms of measures and policies that were implemented to reduce the transmission of SARS-COV-2 in the community. Reduced social interaction and changed working conditions or a loss of work and income have negatively affected the mental health of adults in the UK¹⁷. Six million patients in the UK did not seek treatment in 2020, coined “missing patients”, owing to the reprioritisation of healthcare services¹⁸. Therefore it is likely that the 12 indirectly related preventable deaths identified in our study are an underestimation of the true impact of the COVID-19 pandemic. Since public health measures, treatments, and vaccines have been rapidly developed and implemented since the start of the pandemic^{19–23}, the number of directly related PFDs will likely reduce.

The Covid-19 pandemic has magnified pre-existing health inequalities and longstanding issues in the NHS. In the city of Manchester, where the highest number of Covid-19-related PFDs were issued, there was a 25% greater death rate from SARS-COV-2 compared to the rest of England in the 13 months prior to March 2021²⁴. Life expectancy in North West England fell by 1.6 years in men and 1.2 years in women in 2020 compared to 1.3 years and 0.9 years in 2019 respectively²⁴.

The UK government has stated that they will begin their public inquiry into the handling of the COVID-19 pandemic to learn lessons for future pandemics²⁵. We identified several issues including poor communication, gaps in education and training, and safety, where lessons can be learnt. Such concerns reported by coroners in PFDs should be examined by the government during their inquiry.

We found that the Office of the Chief Coroner, who is responsible for uploading PFDs to the Courts and Tribunals Judiciary website, categorised the Covid-19-related PFDs into nine groups including hospital-related, community healthcare, and care homes, amongst others. While we have created the Preventable Deaths Database and are developing the Preventable Deaths Tracker (<https://preventabledeathstracker.net/>) using novel data collection methods to streamline such analyses, the Office of the Chief Coroner should establish a new category on their website specific to SARS-COV-2 to assist the government in examining these case reports and learning lessons for future pandemics.

There are several limitations to our study. The 23 PFDs included may not represent all preventable deaths caused by COVID-19 and several jurisdictions did not publish any PFDs relating to COVID-19, with no PFDs reported in the North East, East Midlands, South West or Wales.

The underreporting of PFDs limits the capacity for actions to be taken to prevent future deaths. However, it is likely that the number of PFDs relating to COVID-19 will increase in the coming months and years owing to the backlog of inquests as well as the time it takes for inquests to conclude and PFDs to be written and uploaded to the Judiciary website. For example, healthcare professionals in England and Wales called for the deaths of their colleagues to be reported to the coroner and for PFDs to be issued^{15,16}. However, we did not identify any PFDs that reported deaths of healthcare professionals. There are also no clear guidelines for when deaths should be reported to the coroner and when PFDs should be issued after inquests, nor any auditing or quality control of these processes. In the meantime, we encourage coroners across England and Wales to continue writing PFDs when they believe deaths could have been prevented so lessons can be learnt from the COVID-19 pandemic.

We are also limited by the information reported by coroners in PFDs and we identified missing data in the reports. In 52% of PFDs the age of the deceased was not reported and 26% did not report the date of death. We did not assess compliance with Regulation 28 of the Coroners (Investigations) Regulations 2013, which requires individuals or organisations who are sent PFDs to respond to the coroner within 56 days, as the Chief Coroner issued guidance on 26 March 2020 stating that those under pressure from COVID-19 (e.g. medical professionals, NHS Trusts, healthcare organisations and prisons) may be granted an extension beyond the 56 days²⁶. Despite these limitations, we have used a novel, open, and reproducible data-collection method²⁷ that reduces selection biases, pre-registered our study protocol²⁸, and examined all available PFDs for deaths related to Covid-19 in England and Wales between 01 January 2020 and 28 June 2021.

PFDs contain a rich source of information. Training and clear guidelines on when deaths should be reported to the coroner, thresholds for issuing PFDs and the necessary information to report in PFDs is needed. The UK government should use PFDs systematically and consider introducing an intermediate step prior to an inquest and PFD to reduce underreporting and the time it takes for such deaths to be identified. In the meantime, the Office of the Chief Coroner should implement a new category for COVID-19-related deaths on their website and coroners in England and Wales should be encouraged to continue writing PFDs, particularly when the death involves frontline healthcare professionals, to ensure pertinent lessons are learnt from the COVID-19 pandemic.

Funding statement

No grant or research funding was obtained to undertake this study.

Competing interests statement

BS receives funding from Mustafa Bahceci (Bahceci Health Group, Istanbul, Turkey) for her Doctor of Philosophy at the University of Oxford (2019-2022). CH is a National Institute for Health Research (NIHR) Senior Investigator and has received expenses and fees for his media work, received expenses from the WHO, FDA, and holds grant funding from the NIHR School for Primary Care Research (SPCR) and the NIHR SPCR Evidence Synthesis Working Group [Project 380], the NIHR BRC Oxford and the WHO. On occasion, CH receives expenses for teaching EBM and is also paid for his GP work in NHS out of hours (contract with Oxford Health NHS Foundation Trust). JKA has published articles and edited textbooks on adverse drug reactions and interactions and has often given medicolegal advice, including appearances as an expert witness in coroners' courts, often dealing with the adverse effects of opioids and other medicines. DJH is the Director of Studies for Sustainable Urban Development at the Department for Continuing Education, University of Oxford. DJH has received financial remuneration for providing political and socioeconomic country updates for Latin America and the Caribbean for IHS Global. GCR was financially supported by the NIHR SPCR, the Naji Foundation, and the Rotary Foundation to study for a Doctor of Philosophy (2017-2021), but no longer has any financial COIs. GCR is an Associate Editor of BMJ Evidence Based Medicine and is developing <https://preventabledeathstracker.net/>. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

Contributorship statement

GCR developed the idea for this study, wrote the initial study protocol, ran the python code to collect the most recent PFDs for screening, contributed to the first draft of the manuscript, and provided supervisory support. BS contributed to the study protocol, screened the 510 PFDs for their eligibility, extracted the data from the 23 included cases, analysed the data, and wrote the first draft of the manuscript. CH, JKA, DJH contributed to the study protocol and supervision of the project. All authors read, reviewed, and approved the manuscript prior to submission.

References

1. Public Health England. Coronavirus (COVID-19) in the UK. *GOV.UK*
<https://coronavirus.data.gov.uk/details/cases> (2021).
2. The Coroners Rules 1984. *Rule 43*
<http://www.legislation.gov.uk/ukxi/1984/552/article/43/made> (1984).
3. Coroners and Justice Act 2009.

- https://www.legislation.gov.uk/ukpga/2009/25/pdfs/ukpga_20090025_en.pdf (2009).
4. The Coroners (Investigations) Regulations 2013.
http://www.legislation.gov.uk/uksi/2013/1629/pdfs/uksi_20131629_en.pdf.
 5. Ferner, R. E., Easton, C. & Cox, A. R. Deaths from Medicines: A Systematic Analysis of Coroners' Reports to Prevent Future Deaths. *Drug Saf.* **41**, 103–110 (2017).
 6. Ferner, R. E., Ahmad, T., Babatunde, Z. & Cox, A. R. Preventing Future Deaths from Medicines: Responses to Coroners' Concerns in England and Wales. *Drug Safety* vol. 42 445–451 (2018).
 7. Ains, A., Heneghan, C., Aronson, J. K., DeVito, N. J. & Richards, G. C. Deaths from cardiovascular disease involving anticoagulants: a systematic synthesis of coroners' case reports to prevent future deaths. *medRxiv* (2021).
 8. Richards, G. C. *et al.* Preventable suicides: a systematic analysis of coroners' prevent future death reports in England and Wales. (2020) doi:10.17605/OSF.IO/AD4UP.
 9. Richards, G. C. Preventable opioid-related deaths in England and Wales. (2021) doi:10.17605/OSF.IO/ECZ4R.
 10. Richards, G. C., Aronson, J. K. & Heneghan, C. Coroners' concerns to prevent harms: a series of coroners' case reports to serve patient safety and educate the public, clinicians and policy-makers. *BMJ Evid. Based Med.* **26**, 37–38 (2020).
 11. Richards, G. C. Alcohol-based hand sanitisers: a warning to mitigate future poisonings and deaths. *BMJ Evid Based Med* (2020) doi:10.1136/bmjebm-2020-111568.
 12. Thomas, E. T. & Richards, G. C. Diclofenac in adolescents: diagnosing and treating gastrointestinal adverse drug reactions can prevent future deaths. *BMJ Evid Based Med* (2021) doi:10.1136/bmjebm-2020-111640.
 13. Cox, A. R. & Ferner, R. Tramadol: repeated prescriptions and repeated warnings. *BMJ Evidence-Based Medicine* (2021) doi:10.1136/bmjebm-2020-111661.
 14. Bilip, M. K. & Richards, G. C. Emollients and smoking: a fire hazard that could be prevented

- to reduce future deaths. *BMJ Evid Based Med* (2021) doi:10.1136/bmjebm-2020-111648.
15. Kendrick, D. *et al.* Covid-19: Learning lessons from the deaths of our colleagues. *BJGP Life* <https://bjgplife.com/2020/05/18/gp-deaths/> (2020).
 16. Agius, R. M. Doctors' deaths from covid-19 should be reported to the coroner. *BMJ* vol. 369 m1622 (2020).
 17. Abbott, A. COVID's mental-health toll: how scientists are tracking a surge in depression. *Nature* vol. 590 194–195 (2021).
 18. The Health Foundation. Unequal pandemic, fairer recovery: The COVID-19 impact inquiry report. <https://reader.health.org.uk/unequal-pandemic-fairer-recovery> (2021).
 19. Tammes, P. Social distancing, population density, and spread of COVID-19 in England: a longitudinal study. *BJGP Open* **4**, (2020).
 20. Gerli, A. G. *et al.* COVID-19 mortality rates in the European Union, Switzerland, and the UK: effect of timeliness, lockdown rigidity, and population density. *Minerva Med.* **111**, 308–314 (2020).
 21. RECOVERY Collaborative Group *et al.* Dexamethasone in Hospitalized Patients with Covid-19. *N. Engl. J. Med.* **384**, 693–704 (2021).
 22. Beigel, J. H. *et al.* Remdesivir for the Treatment of Covid-19 - Final Report. *N. Engl. J. Med.* **383**, 1813–1826 (2020).
 23. Lopez Bernal, J. *et al.* Effectiveness of the Pfizer-BioNTech and Oxford-AstraZeneca vaccines on covid-19 related symptoms, hospital admissions, and mortality in older adults in England: test negative case-control study. *BMJ* **373**, n1088 (2021).
 24. Institute of Health Equity, UCL. Greater Manchester: A Marmot City Region - Institute of Health Equity. *Institute of Health Equity, UCL* <https://www.instituteofhealthequity.org/about-our-work/latest-updates-from-the-institute/greater-manchester-a-marmot-city-region> (2021).
 25. Booth, R. Johnson says public inquiry into Covid will begin this parliament. *The Guardian* (2021).

26. Lucraft, M. Chief Coroner Guidance - COVID-19. https://www.judiciary.uk/wp-content/uploads/2020/03/Chief-Coroner-Guidance-No.-34-COVID-19_26_March_2020-.pdf (2020).
27. DeVito, N. J., Richards, G. C. & Inglesby, P. How we learnt to stop worrying and love web scraping. *Nature* **585**, 621–622 (2020).
28. Swift, B., Heneghan, C., Aronson, J. K., Howard, D. & Richards, G. C. Preventable deaths from SARS-CoV-2 in England and Wales: a systematic analysis of coroners' case reports. *OSF Registries* <https://osf.io/ej6ks> (2021).
29. Judiciary. Prevention of Future Deaths. *Courts and Tribunals Judiciary* <https://www.judiciary.uk/subject/prevention-of-future-deaths/> (2021).
30. Richards, G. *georgiarichards.github.io*. (Github).
31. Swift, B., Heneghan, C., Aronson, J. K., Howard, D. & Richards, G. C. Preventable deaths from SARS-CoV-2 in England and Wales. *OSF* <https://osf.io/bfypc/> (2021)
doi:10.17605/OSF.IO/BFYPC.