

**Protocol for a longitudinal mixed-methods study of psychosocial determinants of health behaviour,
health and well-being outcomes during the COVID-19 pandemic: The UK COVID-19 Public Experiences
(COPE) Study**

Authors

Britt Hallingberg¹, Denitza Williams¹, Rebecca Cannings-John², Kathryn Hughes³, Anna Torrens-Burton³, David Gillespie², Paul A. Sellars¹, Bethan Pell⁴, Ashley Akbari⁵, Pauline Ashfield-Watt⁶, Delyth James¹, Diane Crone¹, Clare Glennan¹, Catherine Heidi Seage¹, Nick Perham¹, Wouter Poortinga^{7,8}, Karin Wahl-Jorgensen⁹, Sarah Peddle¹⁰, Susan H. Campbell¹¹, James Blaxland¹, Fiona Wood³, Natalie Joseph-Williams³, Emily Harrop¹², Khadijeh Taiyari², Emma Thomas-Jones², Rhiannon Phillips¹.

Corresponding author: Dr Britt Hallingberg, Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University, D 3.12b Llandaff Campus, Western Avenue, Cardiff CF5 2YB, UK, BHallingberg@cardiffmet.ac.uk

Affiliation

¹Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University, Cardiff, UK

²Centre for Trials Research, Cardiff University, Cardiff, UK

³PRIME Centre Wales, Division of Population Medicine, Cardiff University, Cardiff, UK

⁴Centre for the Development and Evaluation of Complex Intervention for Public Health Improvement (DECIPHer), Cardiff University, Cardiff, UK

⁵Health Data Research UK (HDR-UK) Wales & Northern Ireland, Swansea University Medical School, Swansea University, Swansea, UK

⁶HealthWise Wales, Division of Population Medicine, Cardiff University, Cardiff, UK

⁷School of Psychology, Cardiff University, Cardiff, UK

⁸Welsh School of Architecture, Cardiff University, Cardiff, UK

⁹Cardiff School of Journalism, Media and Culture, Cardiff University, Cardiff, UK

¹⁰Public and Patient Representative, Cardiff, UK

¹¹Wales Cancer Research Centre, Cardiff University, Cardiff, UK

¹²Marie Curie Palliative Care Research Centre, Division of Population Medicine, Cardiff, UK

Abstract

Introduction: The COVID-19 pandemic is having a profound and wide-reaching effect on society globally. Understanding what influences health behaviour and how the pandemic impacts on subjective health and well-being in the general population is vital in planning government and health agency responses to current and future pandemics.

Methods and analysis: Mixed-methods longitudinal study comprising a large-scale prospective online survey with three-five phases of data collection at baseline (March/April 2020), 3-months (July/August 2020), ~~and~~ 12-months (March/April 2021), 18-months (September/November 2021) and 24-months (March – April, 2022); data linkage with Electronic Health Records, pre-pandemic self-reported health and lifestyle data, and; longitudinal qualitative interviews with up to 30 individuals in May 2020, November 2020, and March 2021. The Capability, Opportunity, Motivation model of Behaviour (COM-B) will be used as the theoretical framework for the study. Participants will be >10,000 adults (18+ years) living in the UK at the time of recruitment to the baseline online survey, invited via social media snowballing and advertising (Facebook, Twitter, Instagram) and the HealthWise Wales (HWW) research registry. Interview participants will be purposively sampled from survey respondents using a maximum variation approach. We will use multivariable mixed regression models, accounting for the clustered

nature of repeated observations within individuals, to examine changes in health behaviour over time and identify psycho-social predictors of health and well-being outcomes. Qualitative data will be analysed thematically. Methodological, data, and investigator triangulation approaches will be used to integrate our findings.

Ethics and dissemination: The COPE study received ethical approval from the Cardiff Metropolitan University Applied Psychology ethics panel on 13.3.20 (reference Sta-2707). Findings will be disseminated through rapid knowledge exchange with policy makers and public health agencies, publications in peer-reviewed journals, and co-produced public-facing summaries.

Keywords: COVID-19, SARS CoV2, longitudinal, mixed-methods, health behaviour, protocol, cohort profile, COM-B.

Strengths and limitations of this study

- This study adopts a prospective longitudinal mixed-methods approach and was launched in the very early stages of the COVID-19 outbreak in the UK (March 2020), enabling us to build a detailed and unique understanding of health behaviours and subjective health and well-being of a UK cohort over the course of the first ~~24~~¹² months of the pandemic.
- We are using an established theoretical framework, the COM-B model, to guide the design of the study, analysis, and interpretation of findings.
- Data analysis and interpretation will be complex and will require consideration of the policy, disease prevalence and severity, and wider social context during each phase of data collection.

- We are not employing a random sampling technique, therefore, our study population will be self-selecting; we will need to consider the socio-demographic profile of our cohort relative to the general UK population when interpreting our findings and considering our ability to generalize from them.

Introduction

The COVID-19 pandemic is having a profound and wide-reaching effect on society globally¹. Public perceptions of pandemic threats and government policies can influence adherence to containment, delay, and mitigation policies such as physical distancing, hygienic practices, use of physical barriers (e.g. face coverings), and uptake of testing, contact tracing, and vaccination programs²⁻¹⁴. There are marked social inequalities in the risk of harm to health and well-being during the COVID-19 pandemic, in particular in relation to ethnicity, occupational status, social deprivation, gender, housing, and pre-existing physical and mental-health conditions¹⁵⁻¹⁸. Understanding the impact of the pandemic and related policies on physical health and psychological well-being is a high priority for government and public health agencies¹¹⁹. High-quality research that adopts a holistic approach to behaviour, health, and well-being is needed to inform the immediate response to and long-term recovery from the COVID-19 pandemic^{1 18}.

The Behaviour Change Wheel (BCW) provides an integrated method for characterising and designing behaviour change interventions²⁰. The Capability, Opportunity, and Motivation model of Behaviour (COM-B) forms the hub of the BCW framework, providing a system for identifying potentially modifiable determinants of behaviour and allowing these to be mapped against the intervention functions and policy categories of the BCW²⁰. The COM-B model has been used to explain a range of infection-related health behaviours, including hand hygiene, environmental disinfection, use of personal protective equipment (PPE), uptake of screening and testing, use of antivirals and antibiotics for respiratory tract infections,

uptake of influenza vaccines, and lifestyle behaviour in the context of respiratory tract infection outbreaks

10 13 21-43

Using the COM-B model as a theoretical framework²⁰, we rapidly developed a mixed-methods prospective longitudinal study during the early stages of the COVID-19 outbreak in the UK to enable us to investigate changes in health behaviour, health and well-being over the first 24 months of the pandemic. The COPE study launched on the 13th of March 2020 and data collection is scheduled to be completed in April 2022. In this protocol, we describe the COPE study methods, analysis approach, ethical considerations and dissemination plan.

Aims

The COPE study aims to build a detailed understanding of how people experience and respond to the COVID-19 pandemic and government policy during the first 24-months since the start of the UK outbreak, focusing on understanding the:

- Determinants of infection transmission-prevention and lifestyle behaviours.
- Impact of the pandemic on subjective and objective health and well-being.
- Specific challenges affecting sub-groups of the population that are at increased risk of adverse health and well-being outcomes during the pandemic.

Study design

This mixed-methods study design includes three work packages: a longitudinal prospective online survey, data linkage, and qualitative interviews. The objectives of each work package are described below:

Work Package 1: Longitudinal online survey

1. Assess health behaviour in a large cohort at three time points over the two years of the COVID-19 pandemic in the UK, focusing on:
 - a. Infection transmission-prevention behaviours (e.g. social distancing, hygiene, physical barriers to infection, engagement in testing, tracing and vaccination programs).
 - b. Lifestyle behaviours (e.g. physical activity, diet, alcohol, smoking, and management of pre-existing health conditions).
2. Identify psychosocial barriers to infection-transmission prevention behaviour at each phase of the survey.
3. Establish how attitudes, behaviour, and self-reported health and well-being change across the three phases of data collection and contextualise this based on COVID-19 case numbers, hospitalisation and mortality, government policy, and media and social media discourse at each phase of data collection.
4. Identify differences in health behaviour, determinants of health behaviour, and health and well-being outcomes at each phase of the survey by socio-demographic group.
5. Assess the association between self-reported health behaviour and self-reported health and well-being outcomes.
6. Identify and investigate additional emerging issues affecting individual outcomes and planning the public health response at each phase of the survey, depending on the UK context at that point in time.

Work Package 2: Linkage with routine electronic health record (EHR) data and pre-pandemic lifestyle and self-reported health and well-being data for participants recruited via the HWW cohort⁴⁴:

1. Describe pre-pandemic health and lifestyle data for our cohort including data on diet, exercise, alcohol, smoking, work, well-being, mental health, general health, coping mechanisms and resilience, family composition, neighbourhood and health literacy.
2. Identify pre-pandemic health and lifestyle predictors for self-reported health behaviour during the first 24-months since the start of the UK COVID-19 outbreak.
3. Assess the association between health behaviour and objective health outcomes (confirmed and suspected COVID-19 infection, mortality, primary care General Practitioner (GP) consultations, secondary care hospital admissions and outpatient care via EHR data).

Work package 3: Longitudinal qualitative interviews:

1. Explore how people perceive the impact of the COVID-19 pandemic on their lives over time.
2. Explore beliefs about the virus, vaccine attitudes, behaviour, physical and psychological well-being over time.
3. Identify perceived barriers and facilitators to following government advice during the different stages in the pandemic development (containment, delay, mitigation), including trust and credibility of information.
4. Investigate how physical distancing measures have impacted on people's lives, with a specific focus on coping strategies, digital interaction, use of healthcare services, psychological well-being, physical activity, financial and caring responsibilities.

Table 1 provides a summary of the topics we plan to cover in each work package over the course of the study.

Table 1: COPE study data collection plan

Topic	Online survey					Data linkage		Qualitative interviews		
	Phase 1: Mar/ Apr 20	Phase 2: Jul/ Aug 20	Phase 3: Mar/ Apr 21	Phase 4: Sep/ Nov 21	Phase 5: Mar/ Apr 22	HWW: Pre-pandemic data	EHR: Extracts in Jan & Apr 21	Phase 1: May 20	Phase 2: Nov 20	Phase 3: Mar 21
Health behaviour										
COVID-19 transmission prevention behaviour	X	X	X	X	X			X	X	X
Lifestyle behaviour (smoking, diet, physical activity, social contact, self-care)	X	X	X	X	X	X		X	X	X
Psychosocial determinants of health behaviour										
Socio-demographic data	X	X				X	X			
Capability: COVID-19 knowledge and information needs	X	X	X	X	X			X	X	X
Opportunity: availability/accessibility of healthcare services and treatment		X	X	X	X			X	X	X
Motivation: COVID-19 perceived impact, susceptibility and severity, self-efficacy, fear, anxiety, hyper-vigilance	X	X	X	X	X			X	X	X
Motivation: attitudes towards COVID-19 vaccination, community testing, and contact tracing apps		X	X	X	X				X	X

Motivation: attitudes towards future COVID-19 waves/new pandemics			X						X	X
Opportunity: social isolation/support, neighbourhood cohesion, social norms relating to COVID-19, portrayal of risk in media/government/public health messaging, life events (e.g. bereavement, job losses)		X	X	X	X	X		X	X	X
Health and well-being outcomes										
Subjective physical and mental health	X	X	X	X	X	X		X	X	X
Patient experience (use of NHS services, patient safety, bereavement)		X	X	X	X	X	X	X	X	X
Primary healthcare use		X	X	X	X	X	X			
Objective health outcomes (including COVID-19 suspected/confirmed infection, mortality, hospital admissions, COVID-19 vaccination uptake)			X	X	X		X			

HWW: HealthWise Wales cohort pre-pandemic data, EHR: Electronic Health Record data

COPE Study Context

On the 9th of January 2020, the Chinese authorities informed the World Health Organization (WHO) that an outbreak of viral pneumonia cases in Wuhan had been caused by a novel coronavirus ⁴⁵. The first confirmed case of COVID-19 disease, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was identified in the UK on the 31st of January 2020. On the 5th of March 2020, the first death as a result of COVID-19 was confirmed in the UK, with a total of 115 people having tested positive ⁴⁶. The World Health Organization (WHO) declared the COVID-19 outbreak a pandemic on the 11th of March 2020 ⁴⁷. It was clear by this stage that COVID-19 posed a significant threat to health and well-being globally and in the UK population ⁴⁸.

There are many uncertainties relating to the progression and impact of the COVID-19 pandemic and government responses to it. Fixed time points for survey data collection facilitate effective resource, delivery, planning and the potential for repeated core measures over time. Building in flexibility to the design will enable us to capture additional data in each phase in response to emerging issues, using the WHO pandemic phase descriptions to contextualise our data⁴⁹. Our plans for data linkage and analysis will adapt as additional data becomes available as part of Electronic Health Record (EHR) data that can be accessed via the Secure Anonymised Information Linkage (SAIL) Databank ⁵⁰⁻⁵², such as COVID-19 testing, contact tracing, and vaccination data. We will contextualise our findings based on the policy context during each phase of data collection. Details of the UK and Welsh Government response to the COVID-19 pandemic are available at <https://research.senedd.wales/research-articles/coronavirus-timeline-welsh-and-uk-governments-response/> (accessed 19.1.21). We will map prominent themes and key events in mainstream media relating to COVID-19 during each data collection phase to be able to relate these to public perceptions and attitudes towards the pandemic.

Longitudinal online survey

Participants and sampling

A target number of 10,000 adults (18+ years) living in the UK at the time of recruitment will be recruited to the COPE study through the Phase 1 online survey between March 13th and April 14th 2020. This large sample will enable us to capture data on a wide range of experiences and carry out sub-group analysis by socio-demographic group. Recruitment to the Phase 1 survey will occur via two routes:

1. A multi-faceted sampling method based on convenience sampling, snowballing, and purposive sampling via Social Media (Facebook, Twitter, and Instagram). We have created dedicated Facebook (@COVID19publicexperiencesUK), Instagram (@covid19publics1) and Twitter (@COVID19publics1) feeds, and a study website (<https://copestudy.yolasite.com>). Through these, we will regularly post information about the study and invitations to take part in the baseline survey, which will include a hyperlink to the online survey. Social media feeds will be regularly monitored and moderated. Facebook and Instagram's paid promotion feature will be used to boost posts, tailored as recruitment progresses to focus on reaching under-represented demographic groups.
2. From the 20th of March, the study will be advertised via HealthWise Wales (HWW), a national population survey and research register of residents who live or receive healthcare in Wales. Invitations to take part will be e-mailed to HWW participants on two occasions, providing a summary of the COPE study and a hyperlink to the survey.

Phase 1 data will be collected using the Onlinesurveys.ac.uk platform. Phase 2 and Phase 3 data will be collected using Qualtrics.com for pragmatic reasons, as the Cardiff Metropolitan University institutional subscription for Qualtrics includes additional functionality for contacting and following up participants.

Online survey measures

Phase 1 and Phase 2 survey questions are provided in Supplemental Material 1 and 2.

Phase 1 measures:

- Demographic information: age, gender, socio-economic status, highest level of education, employment status, occupation, religion, ethnicity, caring responsibilities (children under 18-years of age, children under the age of 5-years, children with pre-existing health conditions, adults with pre-existing health conditions, older adults), sexual orientation, religion, recent travel outside of the UK, and whether the UK was participants' country of birth.
- Experiences of COVID-19: Suspected or confirmed cases of COVID-19 oneself and for close family/household members, experience of key symptoms of COVID-19 (continuous cough, fever, loss of taste or smell).
- Open text items: Participants will be asked to describe the impact of the pandemic on their day-to-day life, whether they have done anything to avoid getting the COVID-19 infection, whether they have done anything to prepare for measures that might come in (such as school closures and travel restrictions), and barriers and facilitators to following government guidance. These items will be included to capture information on a rapidly changing situation in a flexible way, and to inform the design of closed-response measures to be used in future phases of the survey.
- Perceived risk, anxiety and behavioural responses: The core questions in this section were adapted from surveys conducted during previous viral pandemics⁵³⁻⁵⁵. Questions focus on perceived severity and vulnerability to the COVID-19 infection, perceived efficacy of preventative measures, self-efficacy, intention to take measures, vaccination intention, maladaptive responses (underestimation, fatalism, and avoidance), information (quantity, attention paid, reliability of government information and communication preferences), and knowledge about modes of

transmission, infectiousness and fatality. To establish how the perceived personal risk from COVID-19 compared with other infectious diseases in circulation in the UK in recent years, we will include questions on susceptibility to and harmfulness of seasonal influenza, swine flu (H1N1), the common cold, measles and stomach bugs.

- COVID-19 transmission-prevention behaviour: 10 items relating to hygiene, social distancing, and use of physical barriers (e.g. face coverings and disposable gloves). These were based on emerging guidance at the time of the Phase 1 survey in early March 2020, and will ask people to indicate whether they are engaging in each behaviour less often, about the same, more often than usual, or not applicable.
- Self-reported health and well-being: Three items will be included to assess psychological well-being and one to assess general health based on the SF-36 measure ⁵⁶. Participants will be asked whether they have pre-existing medical conditions, which conditions these are, and whether they have received a seasonal flu vaccination in the last 12-months.
- Lifestyle behaviour: Participants will be asked whether there had been a change in their lifestyle behaviour during the pandemic (increase, decrease, or no change) using 14 items relating to physical activity, diet, alcohol, smoking, and self-care and socialising.

Phase 2 measures:

The phase 2 survey will include a core module relating to health behaviour, health and well-being, which everyone will be asked to complete. There will be three additional optional modules relating to neighbourhoods, use of NHS services and bereavement that participants can choose to complete. These will be made optional to reduce participant burden while capturing valuable information on a range of relevant emerging issues.

Phase 2 core module

- Items on COVID-19 risk perception, lifestyle, and subjective health and well-being included in Phase 1 will be repeated (perceived susceptibility, harm, worry, thinking about COVID-19, psychological well-being and general health SF-36 items).
- New measures of infection-transmission prevention behaviour, psychosocial determinants of infection-transmission prevention behaviour, and attitudes towards vaccination, community testing and tracing will be developed for use in the Phase 2 survey based on the Phase 1 qualitative and open-text survey data. Analysis of the psychometric properties of these measures is underway in preparation for scoring for analysis and use in the Phase 3 data collection point in February/March 2021 (details available from authors on request).
- Experiences of COVID-19: Questions on suspected or confirmed cases of COVID-19 for self or close contacts will be repeated from Phase 1, but the section has been updated and expanded to obtain further detail based on the roll-out of community testing services and emerging knowledge of symptoms associated with COVID-19.
- Additional demographic and health data: current UK nation of residence, pregnancy and birth, changes to employment, and shielding.
- The PHQ-4⁵⁷ will be added to enable comparability with international longitudinal studies of the impact of the pandemic on mental health (see <https://www.covidminds.org>).

Phase 2 optional additional modules:

- Experiences of using NHS services: delays in seeking / accessing treatment, disruption to ongoing care, perception of whether experience of accessing / using services differed to pre-pandemic experiences, and patient safety concerns.

- Neighbourhoods: type of area (city, large town, small town, village or hamlet, isolated dwelling), access to private and public outdoor spaces, four items from the Neighbourhood Cohesion Scale⁵⁸ (attracted to living in the neighbourhood, sense of community, advice, and friendships), and an additional item 'I feel my behaviour is being observed or judged by my neighbours'.
- Bereavement experiences during the pandemic: relationship to the person/people who died, whether COVID-19 was a suspected or confirmed cause of death, whether they had experienced limited contact with their loved one in their last few days of life, been unable to say goodbye properly, had restricted funeral arrangements, or experienced social isolation following bereavement, and an open question for further comments on their experience.

Phase 3-5 measures:

The Phase 3-5 surveys (12, 18- and 24-month follow-up) is due to take place in March/April 2021; September/November 2021 and March/April 2022 respectively. All participants who completed the survey at baseline will be invited to take part. The Phase 2 core module will be repeated. Optional modules and additional items will be reviewed during January and February 2021 to ensure that information on relevant emerging issues is captured, such as attitudes towards vaccination, vaccination uptake, and attitudes towards the recovery phase of the pandemic.

Data linkage

Participants from the HWW cohort have completed a number of questionnaires relating to health, well-being, neighbourhoods, resilience, and lifestyle behaviours before the commencement of the COVID-19 pandemic⁴⁴. These data are securely record-linked to administrative and EHR data via the Secure Anonymised Information Linkage (SAIL) Databank and are stored and available for analysis via the Secure Analysis Portal and Protected HealthWise Wales Information Repository (SAPPHIRE) subject to HWW data governance procedures⁴⁴. COPE participants who are registered with HWW will be asked for consent to

link their data during their 3-month and 12-month follow-up surveys. For those providing consent, personal identifiable information will be collected on full name, address and date of birth which will be merged with data on gender provided during the Phase 1 survey to facilitate accurate data linkage using a secure split-file procedure⁵¹. This will provide access to unique data on:

- Pre-pandemic self-report measures of health behaviour (diet, physical activity, alcohol, smoking), neighbourhood cohesion, mental health, well-being, resilience, and socio-economic status.
- Patient-driven healthcare service usage during the pandemic: GP consultations (frequency and reason); Accident and Emergency (A&E) attendances; Outpatient appointments and attendances; use of NHS 111.
- Objective health outcomes during the pandemic: mortality, all cause and COVID-19 specific hospital admissions, COVID-19 test results and if available, vaccine uptake.

A full list of data requested for the first data download (anticipated date of download: January 2021) is included in Supplemental Material 3.

Longitudinal qualitative interviews

The COPE study includes longitudinal interviews with up to 30 individuals at three time points; Phase 1 (May 2020), Phase 2 (November 2020) and Phase 3 (March 2021) to establish how people's experiences of the pandemic, attitudes, and perception of risk develop and change over the course of the pandemic. The qualitative study incorporates a range of visual and creative methods, enabling participants to drive the direction of the interview and share the experiences that are most important to them⁵⁹⁻⁶¹.

Participants and sampling: Longitudinal qualitative interviews

Up to 30 participants will be purposively sampled for the qualitative interviews from those who complete the baseline online survey via the UK-wide social media recruitment route and have agreed to be

contacted for follow-up interviews. A maximum variation sampling approach will be used to capture a range of views and experiences based on gender, age, socioeconomic status, pre-existing conditions, and caring responsibilities, perceived susceptibility and severity of COVID-19. Sample adequacy⁶² has been determined by considering the composition as well as the size of the sample and pragmatic considerations relating to resources and the timeframe for the study, and previous studies of attitudes towards novel respiratory tract infections⁶³⁻⁶⁵.

Qualitative interview procedure:

Interview participants can choose to take part in the interviews over telephone, Skype, Zoom, MS Teams, or WhatsApp. Qualitative data will be audio-recorded, transcribed verbatim and anonymized prior to analysis.

Phase 1 interviews: Semi-structured baseline interviews

Phase 1 (baseline) interviews will be conducted in May 2020, using a flexible narrative approach guided by a semi-structured interview schedule (Supplemental Material 4). Topics will include: personal experience of COVID-19 infection in self or others; perceptions of symptoms/symptom congruence and behavioural and emotional responses; perceptions of government and health agency responses to the outbreak; perceived social responsibility; perceived barriers and facilitators to engaging with government/health agency guidance and infection control measures; perceived impact of COVID-19 on behaviour including eating habits, quality of life; coping methods including physical activity, activities of daily living and social connectivity.

Phase 2: Visual artifact facilitated narrative interviews

Follow-up interviews will use an artefact-facilitated approach^{66 67} to enable participants to discuss the issues that are most important to them. Three pre-selected images depicting events during the COVID-19 pandemic will be included towards the end of the interview to stimulate further discussion about societal aspects of the pandemic. The images focus on everyday life (shopping, childcare, being at home), and were selected based on feedback from the study patient and public representatives. In order to avoid psychological distress, none of the images represent highly emotive topics related to the pandemic (e.g. critical care). Participants will be provided with copies of the images ahead of the interview to allow them to reflect on these and on their experiences.

Phase 3: Timeline facilitated narrative interviews

In March 2021, we will conduct timeline-facilitated interviews^{61 68} with participants to enable them to reflect on their experiences over the last year, and talk about their hopes, fears, and expectations for the future. Visual qualitative approaches help to shift the power-dynamics in interviews, enabling participants to take control over their own narratives providing high quality rich data⁶¹. An example timeline template is provided in Supplemental Material 5. The accompanying topic guide for the 12-month follow-up interviews will be finalised in February 2021 to take into account the changing landscape of the COVID-19 pandemic and the findings of earlier phases of the qualitative study and survey.

Patient and public involvement

Members of the public were consulted informally to comment on the online baseline survey design, which needed to be developed rapidly before we had secured any external funding for the project. We subsequently invited two members of the public to formally join our research team. They have

commented on the design of the study, including the survey and interview questions in each phase, are co-applicants on funding applications, and are included as co-authors on key study outputs. They will also be supporting us with the preparation of public-facing updates and summaries of our findings as the project progresses.

Analysis approach

Descriptive statistical analysis will be carried out on data from each of the survey phases and data linkage download points to characterise our sample in terms of their demographic profile, health behaviour, and health and well-being outcomes. We will use multivariable mixed regression models, accounting for the clustered nature of repeated observations within individuals, to examine changes in health behaviour over time, and investigate whether previous attitudes and behaviours are associated with subsequent and self-reported health and well-being outcomes. To investigate how the association between health attitudes and behaviours and subsequent health and well-being outcomes vary across different sub-groups (e.g. ≥ 70 years of age, pre-existing health condition, health/frontline occupation, insecure employment), models will be extended to include subgroup-predictor interactions. We will explore the use of post-stratification weights and regression adjustments to allow for differences in socio-demographic and clinical factors between sample and population (e.g. age, gender, socio-economic status, ethnic group, long-term conditions, shielding and vaccination priority categories, pregnancy).

Qualitative data from each phase of data collection will be analysed using thematic analysis⁶⁹, with consistency and discrepancy between themes across the three time points being explored to enable us to understand how people's experiences, views, and perceptions change over time. The coding framework will be built around the COM-B model⁷⁰ to enable us to develop a theoretical model of behavioural responses to the COVID-19 outbreak and logic model of potential interventions. To ensure rigour and

reflexivity we will use regular qualitative research team meetings to discuss data production, development of the coding framework and data analysis, with each member of the qualitative research group adding their unique perspective to the analysis.

We will triangulate data^{71 72} from our survey, data linkage, and qualitative work to build a comprehensive understanding of changes in health behaviour, and objective and subjective mental and physical health outcomes. Three approaches to triangulation will be applied: methodological (survey and interviews), data (survey responses and EHR data), and investigator (i.e. more than one data analyst) triangulation⁷³.

Ethics

Ethical approval was obtained for the COPE Study from the Cardiff Metropolitan University Applied Psychology ethics panel on 13.3.20 (Project reference Sta-2707). Participants will provide consent and confirm eligibility electronically at the beginning of the online survey, and informed verbal consent will be sought and audio-recorded at the start of each qualitative interview. This ethical approval also covers recruitment and data linkage supported by the Health Wise Wales research database (Wales Research Ethics Committee: approvals 15WA0076/20WA0064). Approval for use of evolving COVID related datasets and other anonymised healthcare and administrative datasets, provisioned by the Secure Anonymised Information Linkage (SAIL) Databank to HWW, will be achieved by amendment of existing permissions granted by the SAIL independent Information Governance Review Panel (IGRP) to HWW reference Project 0415. HWW will make available data only on COPE UK participants who have provided consent for record linkage. As described above, access to all HealthWise Wales data are via SAPPHIRE and subject to HWW governance and access procedures⁴⁴.

Dissemination

The COPE study will enable us to identify potentially modifiable psychosocial determinants of the health behaviour specified using the Capability, Opportunity, and Motivation model (COM-B)^{8 20}. In line with WHO guidance ⁷, this research will enable us to provide timely in-depth information to key stakeholders including members of the public, governments, public health agencies and health and social care providers to inform the design and implementation of the COVID-19 pandemic response. We will engage with partners in UK and the devolved nation governments and our international infection research networks to contribute to collaborative efforts to understand and inform the short- and long-term response to the pandemic and increase preparedness for future pandemic threats. Guided by our Public and Patient Involvement members, we will disseminate public-facing summaries, infographics, and videos via the project social media feeds and website.

Acknowledgements

We are grateful to our patient and public involvement members for their invaluable contributions to designing and steering this research. This study was facilitated by HealthWise Wales, the Health and Care Research Wales initiative which is led by Cardiff University in collaboration with SAIL, Swansea University. We are grateful for their invaluable support and expertise. This study will make use of data held in the Secure Anonymised Data Linkage (SAIL) system, which is part of the e-health national records research infrastructure for Wales. We would like to acknowledge all the data providers who make anonymised data available for research. We would like to thank Cardiff Metropolitan University, Cardiff University, PRIME Centre Wales, and Swansea University who have all been immensely supportive of this work, allowing our team the time, resources and infrastructure to get the study up and running quickly during the very early stages of the pandemic.

Funding

This work is supported by Health Data Research UK, which receives its funding from HDR UK Ltd (HDR-9006) funded by the UK Medical Research Council, Engineering and Physical Sciences Research Council, Economic and Social Research Council, Department of Health and Social Care (England), Chief Scientist Office of the Scottish Government Health and Social Care Directorates, Health and Social Care Research and Development Division (Welsh Government), Public Health Agency (Northern Ireland), British Heart Foundation (BHF) and the Wellcome Trust. Phase 1 & 2 of this research were supported by internal resources at Cardiff Metropolitan University, Cardiff University, HealthWise Wales, and PRIME Centre Wales. This included allowing core team members time to design, set up, and conduct the baseline and 3-month data collection. Financial support was provided by internal Cardiff Metropolitan University 'Get Started' and Cardiff University Division of Population funds to support transcription of the Phase 1 qualitative data. In August 2020, we were awarded a Sêr Cymru III Tackling COVID-19 grant (Project number WG 90) to cover the period between the 1st of August 2020 to 30th of April 2021 to support our Phase 3 follow-up data collection, analysis and dissemination. PRIME Centre Wales, HealthWise Wales (HCRW 519709) and the Centre for Trials Research are part of Health and Care Research Wales infrastructure. Health and Care Research Wales is a networked organisation supported by Welsh Government.

Author contributions

Britt Hallingberg produced the first draft of this protocol. Denitza Williams drafted the section on the qualitative methods, Rhiannon Phillips drafted the section on the survey methods, Rebecca Cannings-John, Pauline Ashfield-Watt, Kathryn Hughes and Ashley Akbari drafted the sections relating to the data linkage component. David Gillespie and Rebecca Cannings-John drafted the quantitative analysis

approach section. Rhiannon Phillips co-ordinated the process of gathering and acting on feedback and further specialist from co-authors. Susan H. Campbell and Sarah Peddle commented on the manuscript from a Public and patient Involvement perspective. Fiona Wood, Bethan Pell, Paul A. Sellars, and Anna Torrens-Burton contributes to the sections on qualitative methods and analysis approach. Emma Thomas-Jones (common infections research, study design and management), Delyth James (behaviour relating to medication), Diane Crone (physical activity), Catherine Heidi Seage (eating behaviour), Nick Perham (risk perception), Wouter Poortinga (environmental psychology), Karin Wahl-Jorgensen (media), James Blaxland (microbiology), Natalie Joseph-Williams (healthcare communication and patient safety), Emily Harrop (bereavement), Khadijeh Taiyari (statistician) have all been involved with the design of the study and have commented on their specific areas of expertise. All authors have read, provided comments on, and approved the final version of this manuscript.

Conflicts of Interest

None to declare.

Word count: 3,981

Data Availability Statement

Raw data from our COPE online survey and qualitative data will not be made publicly available due to security and ethical considerations. The data provided is of a detailed and sensitive nature, and our public contributors as well as potential research participants expressed concerns about privacy and security during the development and recruitment stages of this research. Where participants have provided consent for their data to be linked to HealthWise Wales Survey data and administrative health care and EHR provisioned by the SAIL databank, these data will be available only via the HealthWise Wales secure

portal SAPPHiRe which is held on the UK Secure eResearch Platform UKSeRP, Swansea University, Swansea, UK⁴⁴. A multistage application process is required for data sharing and access

<https://www.healthwisewales.gov.wales/for-researchers/>

References

1. Holmes EA, O'Connor RC, Perry VH, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *Lancet Psychiatry* 2020;7(6):547-60. doi: 10.1016/s2215-0366(20)30168-1 [published Online First: 2020/04/19]
2. He D, Dushoff J, Day T, et al. Inferring the causes of the three waves of the 1918 influenza pandemic in England and Wales. *Proc Biol Sci* 2013;280(1766):20131345. doi: 10.1098/rspb.2013.1345 [published Online First: 2013/07/12]
3. Davis MDM, Stephenson N, Lohm D, et al. Beyond resistance: social factors in the general public response to pandemic influenza. *BMC Public Health* 2015;15(1):436. doi: 10.1186/s12889-015-1756-8
4. Teasdale E, Yardley L. Understanding responses to government health recommendations: public perceptions of government advice for managing the H1N1 (swine flu) influenza pandemic. *Patient Educ Couns* 2011;85(3):413-8. doi: 10.1016/j.pec.2010.12.026 [published Online First: 2011/02/08]
5. Uscher-Pines L, Duggan PS, Garoon JP, et al. Social justice and disadvantaged groups. *Hastings Cent Rep* 2007;37(4):32-9. doi: 10.1353/hcr.2007.0064 [published Online First: 2007/09/12]
6. Lin L, Savoia E, Agboola F, et al. What have we learned about communication inequalities during the H1N1 pandemic: a systematic review of the literature. *BMC Public Health* 2014;14(1):484. doi: 10.1186/1471-2458-14-484
7. World Health Organization Regional Office for Europe. Survey tool and guidance: rapid, simple, flexible behavioural insights on COVID-19: 29 July 2020. Copenhagen, 2020.
8. Michie S, West R. Behavioural, environmental, social, and systems interventions against covid-19. *Bmj* 2020;370:m2982. doi: 10.1136/bmj.m2982 [published Online First: 2020/07/30]
9. Mowbray F, Marcu A, Godinho CA, et al. Communicating to increase public uptake of pandemic flu vaccination in the UK: Which messages work? *Vaccine* 2016;34(28):3268-74. doi: <https://doi.org/10.1016/j.vaccine.2016.05.006>
10. Rubinstein H, Marcu A, Yardley L, et al. Public preferences for vaccination and antiviral medicines under different pandemic flu outbreak scenarios. *BMC Public Health* 2015;15:190. doi: 10.1186/s12889-015-1541-8 [published Online First: 2015/04/18]
11. West R, Michie S, Rubin GJ, et al. Applying principles of behaviour change to reduce SARS-CoV-2 transmission. *Nat Hum Behav* 2020;4(5):451-59. doi: 10.1038/s41562-020-0887-9 [published Online First: 2020/05/08]
12. Bonell C, Michie S, Reicher S, et al. Harnessing behavioural science in public health campaigns to maintain 'social distancing' in response to the COVID-19 pandemic: key principles. *J Epidemiol Community Health* 2020;74(8):617-19. doi: 10.1136/jech-2020-214290 [published Online First: 2020/05/10]
13. Gibson Miller J, Hartman TK, Levita L, et al. Capability, opportunity, and motivation to enact hygienic practices in the early stages of the COVID-19 outbreak in the United Kingdom. *Br J Health Psychol* 2020;25(4):856-64. doi: 10.1111/bjhp.12426 [published Online First: 2020/05/18]
14. Arden MA, Chilcot J. Health psychology and the coronavirus (COVID-19) global pandemic: A call for research. *Br J Health Psychol* 2020;25(2):231-32. doi: 10.1111/bjhp.12414 [published Online First: 2020/04/01]
15. Wright L, Steptoe A, Fancourt D. Are we all in this together? Longitudinal assessment of cumulative adversities by socioeconomic position in the first 3 weeks of lockdown in the UK. *J Epidemiol Community Health* 2020;74(9):683-88. doi: 10.1136/jech-2020-214475 [published Online First: 2020/06/07]

16. Yao H, Chen JH, Xu YF. Patients with mental health disorders in the COVID-19 epidemic. *Lancet Psychiatry* 2020;7(4):e21. doi: 10.1016/s2215-0366(20)30090-0 [published Online First: 2020/03/23]
17. Frith L. Lockdown, public good and equality during COVID-19. *J Med Ethics* 2020;46(11):713-14. doi: 10.1136/medethics-2020-106964 [published Online First: 2020/10/30]
18. O'Connor DB, Aggleton JP, Chakrabarti B, et al. Research priorities for the COVID-19 pandemic and beyond: A call to action for psychological science. *Br J Psychol* 2020;111(4):603-29. doi: 10.1111/bjop.12468 [published Online First: 2020/07/20]
19. Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet* 2020;395(10227):912-20. doi: 10.1016/s0140-6736(20)30460-8 [published Online First: 2020/03/01]
20. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation science : IS* 2011;6:42-42. doi: 10.1186/1748-5908-6-42
21. Ayakaka I, Ackerman S, Ggita JM, et al. Identifying barriers to and facilitators of tuberculosis contact investigation in Kampala, Uganda: a behavioral approach. *Implement Sci* 2017;12(1):33. doi: 10.1186/s13012-017-0561-4 [published Online First: 2017/03/10]
22. Barratt R, Wyer M, Hor SY, et al. Medical interns' reflections on their training in use of personal protective equipment. *BMC Med Educ* 2020;20(1):328. doi: 10.1186/s12909-020-02238-7 [published Online First: 2020/09/25]
23. Cassidy C, Bishop A, Steenbeek A, et al. Barriers and enablers to sexual health service use among university students: a qualitative descriptive study using the Theoretical Domains Framework and COM-B model. *BMC Health Serv Res* 2018;18(1):581. doi: 10.1186/s12913-018-3379-0 [published Online First: 2018/07/26]
24. Courtenay M, Rowbotham S, Lim R, et al. Examining influences on antibiotic prescribing by nurse and pharmacist prescribers: a qualitative study using the Theoretical Domains Framework and COM-B. *BMJ Open* 2019;9(6):e029177. doi: 10.1136/bmjopen-2019-029177 [published Online First: 2019/06/22]
25. Duan Z, Liu C, Han M, et al. Understanding consumer behavior patterns in antibiotic usage for upper respiratory tract infections: A study protocol based on the COM-B framework. *Res Social Adm Pharm* 2020 doi: 10.1016/j.sapharm.2020.07.033 [published Online First: 2020/08/25]
26. Eley CV, Lecky DM, Hayes CV, et al. Is sharing the TARGET respiratory tract infection leaflet feasible in routine general practice to improve patient education and appropriate antibiotic use? A mixed methods study in England with patients and healthcare professionals. *J Infect Prev* 2020;21(3):97-107. doi: 10.1177/1757177420907698 [published Online First: 2020/06/05]
27. Eley CV, Sharma A, Lecky DM, et al. Qualitative study to explore the views of general practice staff on the use of point-of-care C reactive protein testing for the management of lower respiratory tract infections in routine general practice in England. *BMJ Open* 2018;8(10):e023925. doi: 10.1136/bmjopen-2018-023925 [published Online First: 2018/10/27]
28. Herbec A, Chimhini G, Rosenberg-Pacareu J, et al. Barriers and facilitators to infection prevention and control in a neonatal unit in Zimbabwe - a theory-driven qualitative study to inform design of a behaviour change intervention. *J Hosp Infect* 2020;106(4):804-11. doi: 10.1016/j.jhin.2020.09.020 [published Online First: 2020/09/21]
29. Lambe K, Lydon S, Madden C, et al. Understanding hand hygiene behaviour in the intensive care unit to inform interventions: an interview study. *BMC Health Serv Res* 2020;20(1):353. doi: 10.1186/s12913-020-05215-4 [published Online First: 2020/04/27]

30. Lydon S, Grealley C, Tujjar O, et al. Psychometric evaluation of a measure of factors influencing hand hygiene behaviour to inform intervention. *J Hosp Infect* 2019;102(4):407-12. doi: 10.1016/j.jhin.2019.02.003 [published Online First: 2019/02/16]
31. McDonagh LK, Saunders JM, Cassell J, et al. Facilitators and barriers to chlamydia testing in general practice for young people using a theoretical model (COM-B): a systematic review protocol. *BMJ Open* 2017;7(3):e013588. doi: 10.1136/bmjopen-2016-013588 [published Online First: 2017/03/11]
32. McDonagh LK, Saunders JM, Cassell J, et al. Application of the COM-B model to barriers and facilitators to chlamydia testing in general practice for young people and primary care practitioners: a systematic review. *Implement Sci* 2018;13(1):130. doi: 10.1186/s13012-018-0821-y [published Online First: 2018/10/24]
33. Okello E, Kapiga S, Grosskurth H, et al. Factors perceived to facilitate or hinder handwashing among primary students: a qualitative assessment of the Mikono Safi intervention schools in NW Tanzania. *BMJ Open* 2019;9(11):e030947. doi: 10.1136/bmjopen-2019-030947 [published Online First: 2019/12/01]
34. Staniford LJ, Schmidtke KA. A systematic review of hand-hygiene and environmental-disinfection interventions in settings with children. *BMC Public Health* 2020;20(1):195. doi: 10.1186/s12889-020-8301-0 [published Online First: 2020/02/08]
35. Van Ginderdeuren E, Bassett J, Hanrahan C, et al. Health system barriers to implementation of TB preventive strategies in South African primary care facilities. *PLoS One* 2019;14(2):e0212035. doi: 10.1371/journal.pone.0212035 [published Online First: 2019/02/15]
36. Venkatesan S, Nguyen-Van-Tam JS, Siebers PO. A novel framework for evaluating the impact of individual decision-making on public health outcomes and its potential application to study antiviral treatment collection during an influenza pandemic. *PLoS One* 2019;14(10):e0223946. doi: 10.1371/journal.pone.0223946 [published Online First: 2019/10/18]
37. Witzel TC, Weatherburn P, Bourne A, et al. Exploring Mechanisms of Action: Using a Testing Typology to Understand Intervention Performance in an HIV Self-Testing RCT in England and Wales. *Int J Environ Res Public Health* 2020;17(2) doi: 10.3390/ijerph17020466 [published Online First: 2020/01/16]
38. Wodnik BK, Freeman MC, Ellis AS, et al. Development and Application of Novel Caregiver Hygiene Behavior Measures Relating to Food Preparation, Handwashing, and Play Environments in Rural Kenya. *Int J Environ Res Public Health* 2018;15(9) doi: 10.3390/ijerph15091994 [published Online First: 2018/09/16]
39. Castro-Sánchez E, Cm A, C A, et al. EVALUATION OF A PERSONAL PROTECTIVE EQUIPMENT (PPE) SUPPORT PROGRAMME ('PPE HELPERS') FOR STAFF DURING THE COVID-19 PANDEMIC IN LONDON. *J Hosp Infect* 2020;109:68-77. doi: 10.1016/j.jhin.2020.12.004 [published Online First: 2020/12/12]
40. Nibali L, Ide M, Ng D, et al. The perceived impact of Covid-19 on periodontal practice in the United Kingdom: A questionnaire study. *J Dent* 2020;102:103481. doi: 10.1016/j.jdent.2020.103481 [published Online First: 2020/09/27]
41. Spence JC, Rhodes RE, McCurdy A, et al. Determinants of physical activity among adults in the United Kingdom during the COVID-19 pandemic: The DUK-COVID study. *Br J Health Psychol* 2020 doi: 10.1111/bjhp.12497 [published Online First: 2020/12/19]
42. Smith LE, D'Antoni D, Jain V, et al. A systematic review of factors affecting intended and actual adherence with antiviral medication as treatment or prophylaxis in seasonal and pandemic flu. *Influenza and other respiratory viruses* 2016;10(6):462-78. doi: 10.1111/irv.12406 [published Online First: 2016/08/08]

43. Warsi S, Eelsey H, Boeckmann M, et al. Using behaviour change theory to train health workers on tobacco cessation support for tuberculosis patients: a mixed-methods study in Bangladesh, Nepal and Pakistan. *BMC Health Serv Res* 2019;19(1):71. doi: 10.1186/s12913-019-3909-4 [published Online First: 2019/01/27]
44. Hurt L, Ashfield-Watt P, Townson J, et al. Cohort profile: HealthWise Wales. A research register and population health data platform with linkage to National Health Service data sets in Wales. *BMJ Open* 2019;9(12):e031705. doi: 10.1136/bmjopen-2019-031705
45. World Health Organization. Listings of WHO's response to COVID-19, 2020.
46. UK Government. Coronavirus (COVID-19) in the UK 2020 [Available from: <https://coronavirus.data.gov.uk> accessed 15.12.20.
47. World Health Organization. Rolling updates on coronavirus disease (COVID-19) 2020 [Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen> accessed 15.12.20.
48. UK Government. Prime Minister's statement on coronavirus (COVID-19): 16 March 2020 2020 [Available from: <https://www.gov.uk/government/speeches/pm-statement-on-coronavirus-16-march-2020> accessed 15.12.20.
49. World Health Organization. Pandemic Influenza Preparedness and Response: A WHO Guidance Document. 4, THE WHO PANDEMIC PHASES. Geneva, 2009.
50. Ford DV, Jones KH, Verplancke J-P, et al. The SAIL Databank: building a national architecture for e-health research and evaluation. *BMC Health Services Research* 2009;9(1):157. doi: 10.1186/1472-6963-9-157
51. Lyons RA, Jones KH, John G, et al. The SAIL databank: linking multiple health and social care datasets. *BMC Medical Informatics and Decision Making* 2009;9(1):3. doi: 10.1186/1472-6947-9-3
52. Jones KH, Ford DV, Jones C, et al. A case study of the Secure Anonymous Information Linkage (SAIL) Gateway: a privacy-protecting remote access system for health-related research and evaluation. *J Biomed Inform* 2014;50(100):196-204. doi: 10.1016/j.jbi.2014.01.003 [published Online First: 2014/01/21]
53. Bults M, Beaujean DJMA, de Zwart O, et al. Perceived risk, anxiety, and behavioural responses of the general public during the early phase of the Influenza A (H1N1) pandemic in the Netherlands: results of three consecutive online surveys. *BMC Public Health* 2011;11(1):2. doi: 10.1186/1471-2458-11-2
54. de Zwart O, Veldhuijzen IK, Elam G, et al. Avian influenza risk perception, Europe and Asia. *Emerg Infect Dis* 2007;13(2):290-3. doi: 10.3201/eid1302.060303 [published Online First: 2007/05/08]
55. Brug J, Aro AR, Oenema A, et al. SARS risk perception, knowledge, precautions, and information sources, the Netherlands. *Emerg Infect Dis* 2004;10(8):1486-9. doi: 10.3201/eid1008.040283 [published Online First: 2004/10/22]
56. Ware JE, Jr., Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care* 1992;30(6):473-83. [published Online First: 1992/06/11]
57. Kroenke K, Spitzer RL, Williams JB, et al. An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics* 2009;50(6):613-21. doi: 10.1176/appi.psy.50.6.613 [published Online First: 2009/12/10]
58. Buckner JC. The development of an instrument to measure neighborhood cohesion. *American Journal of Community Psychology* 1988;16(6):771-91. doi: 10.1007/BF00930892
59. Rose G. Visual methodologies: A guide to the interpretation of visual materials: London: Sage Publications Ltd, 2001.
60. Tolman DL, Brydon-Miller M. From subjects to subjectivities: A handbook of interpretive and participatory methods: NYU Press 2001.

61. Pell B, Williams D, Phillips R, et al. Using Visual Timelines in Telephone Interviews: Reflections and Lessons Learned From the Star Family Study. *International Journal of Qualitative Methods* 2020;19:1609406920913675. doi: 10.1177/1609406920913675
62. Vasileiou K, Barnett J, Thorpe S, et al. Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology* 2018;18(1):148. doi: 10.1186/s12874-018-0594-7
63. Caress AL, Duxbury P, Woodcock A, et al. Exploring the needs, concerns and behaviours of people with existing respiratory conditions in relation to the H1N1 'swine influenza' pandemic: a multicentre survey and qualitative study. *Health Technol Assess* 2010;14(34):1-108. doi: 10.3310/hta14340-01 [published Online First: 2010/07/16]
64. McNulty C, Joshi P, Butler CC, et al. Have the public's expectations for antibiotics for acute uncomplicated respiratory tract infections changed since the H1N1 influenza pandemic? A qualitative interview and quantitative questionnaire study. *BMJ Open* 2012;2(2):e000674. doi: 10.1136/bmjopen-2011-000674
65. Rubin GJ, Amlôt R, Carter H, et al. Reassuring and managing patients with concerns about swine flu: qualitative interviews with callers to NHS Direct. *BMC Public Health* 2010;10:451. doi: 10.1186/1471-2458-10-451 [published Online First: 2010/08/04]
66. Akama Y, Cooper R, Vaughan L, et al. SHOW AND TELL: ACCESSING AND COMMUNICATING IMPLICIT KNOWLEDGE THROUGH ARTEFACTS. *Artifact* 2007;1(3):172-81. doi: 10.1080/17493460701800207
67. Grant A. Participant-created documents as an elicitation tool: Things we might not have otherwise been told. *Doing Excellent Social Research with Documents: Practical Examples and Guidance for Qualitative Researchers*: Routledge 2018:143-64.
68. Hope L, Mullis R, Gabbert F. Who? What? When? Using a timeline technique to facilitate recall of a complex event. *Journal of Applied Research in Memory and Cognition* 2013;2(1):20-24.
69. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research Psychology* 2006;3(2):77-101.
70. Michie S, Maartje M, West RM. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science* 2011;6(42)
71. Tonkin-Crine S, Anthierens S, Hood K, et al. Discrepancies between qualitative and quantitative evaluation of randomised controlled trial results: achieving clarity through mixed methods triangulation. *Implementation Science* 2016;11(1):66. doi: 10.1186/s13012-016-0436-0
72. O'Cathain A, Murphy E, Nicholl J. Three techniques for integrating data in mixed methods studies. *Bmj* 2010;341:c4587. doi: 10.1136/bmj.c4587 [published Online First: 2010/09/21]
73. Farmer T, Robinson K, Elliott SJ, et al. Developing and implementing a triangulation protocol for qualitative health research. *Qual Health Res* 2006;16(3):377-94. doi: 10.1177/1049732305285708 [published Online First: 2006/02/02]