RESEARCH ARTICLE

Tracking online searches for emotional wellbeing concerns and coping strategies in the UK during the COVID-19 pandemic: a Google Trends analysis [version 1; peer review: 2 approved with reservations]

Duleeka Knipe ^{1*}, Hannah Evans ^{2*}, Mark Sinyor ³, Thomas Niederkrotenthaler ⁴, David Gunnell ^{1,5*}, Ann John ^{2*}

¹Population Health Sciences, Bristol Medical School, University of Bristol, Bristol, UK

²Population Data Science, Swansea University Medical School, Swansea University, Swansea, UK

³Department of Psychiatry, University of Toronto, Toronto, Canada

⁴Department of Social and Preventive Medicine, Center for Public Health, Medical University of Vienna, Vienna, Austria

⁵National Institute of Health Research Biomedical Research Centre, University Hospitals Bristol and Weston NHS Foundation Trust, Bristol, UK

* Equal contributors

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Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic is the largest acute public health emergency of this century.

Government intervention to contain the virus focuses on non-pharmacological approaches such as physical distancing/lockdown (stay-at-home orders). As the situation develops, the impact of these measures on mental health and coping strategies in individuals and the population is unknown.

Methods: We used Google Trends data (01 Jan 2020 to 09 Jun 2020) to explore the changing pattern of public concern in the UK to government measures as indexed by changes in search frequency for topics related to mental distress as well as coping and resilience. We explored the changes of specific topics in relation to key dates during the pandemic. In addition, we examined terms whose search frequency increased most.

Results: Following lockdown, public concerns - as indexed by relative search trends - were directly related to COVID-19 and practicalities such as 'furlough' (paid leave scheme for people in employment) in response to the pandemic. Over time, searches with the most substantial growth were no longer directly or indirectly related to COVID-19. In contrast to relatively stable rates of searches related to mental distress, the topics that demonstrated a sustained increase were those associated with coping and resilience such as exercise and

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1. Yu-Hsuan Lin	National Health Research Institutes, Miaoli, Taiwan	
2. Finiki Nearchou	University College Dublin, Dublin, Ireland	
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learning new skills.

Conclusions: Google Trends is an expansive dataset which enables the investigation of population-level search activity as a proxy for public concerns. It has potential to enable policy makers to respond in real time to promote adaptive behaviours and deliver appropriate support.

Keywords

COVID-19, Pandemic, Mental health, Coping, Resilience, Depression, Suicide, Self-harm

This article is included in the [Coronavirus \(COVID-19\)](#) collection.

Corresponding author: Ann John (a.john@swansea.ac.uk)

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic is the largest acute, global public health emergency of the century with over 500,000 deaths and 10 million people infected worldwide at the time of writing¹. In the UK there were an estimated 43,550 deaths from COVID-19 by June 28th 2020.

Public health measures to control the spread of the virus have had wide ranging effects. In particular, the lockdowns (stay-at-home orders) that have been put in place in many countries have resulted in restrictions to everyday life, such as home confinement as well as school and work closures. Concerns have been raised about the impact of these measures, alongside those related to employment, the economy and the virus itself (secondary to infection, fear and bereavement), on population mental health and risk of suicide^{2,3}. It is crucial to track the societal impact of all these factors to identify effects and possible unintended consequences in order to respond appropriately. The World Health Organization has released guidelines outlining coping and resilience strategies after COVID-19 was declared to be a pandemic⁴. Other suggested initiatives to avoid the exacerbation of mental health struggles that prolonged isolation may foster include adapted safety plans, and more generalised coping plans tailored to options available during lockdown that identify positive coping skills and strategies⁵.

It is essential to monitor mental and psychological wellbeing of the population in these uncertain times and to understand the coping and resilience strategies that individuals adopt to plan appropriate responses, promote adaptive behaviours and evaluate the impact of public health advice²⁻⁶. In the absence of immediately available surveillance data on the impact of the COVID-19 pandemic on population mental health and coping strategies, several researchers have used Google search trends data as a potential early proxy measure⁷⁻¹⁰. Google Trends, is a publicly available source of near real-time internet search data which has been used for more than a decade by academics, including suicide prevention researchers, to investigate trends in health-related searching and the impact of population-level exposures such as celebrity suicides¹¹. In a recent study we used Google Trends to investigate the changing pattern of public concerns (as indexed by internet searches) in relation to sentinel dates during the COVID-19 pandemic worldwide and in specific countries in the early weeks of the pandemic up to 30 March 2020, when there had been around 200,000 global deaths (2,000 in the UK)⁸. In this early phase of the pandemic we found marked increases in relative search volumes (RSVs) for indicators of financial, employment and educational concerns, whereas RSVs for depression and suicide dropped temporarily as the number of COVID-19 deaths increased, with some evidence that RSVs for suicide returned to pre-pandemic levels in subsequent weeks. Findings from other investigations are mixed. Sinyor *et al.*, in their analysis of worldwide and US data, reported falls in searches for suicide, anxiety and hopelessness, but not depression in an analysis up to 4th April 2020⁷. Another analysis of Google Trend data for the US between 16th and 23rd March 2020 reported a rise in searches indicative of anxiety, negative thoughts and suicidal ideation in the weeks before lockdown, but these subsequently

levelled off¹⁰. By contrast, an analysis from India reported positive correlations between the number of COVID-19 deaths and searches depression, anxiety, insomnia and suicide between March 25, 2020, and May 16, 2020⁹.

In this analysis we focus on Google search trends in the UK up to 12 June 2020, a period covering 12 weeks of lockdown that began on 23 March 2020, with some slight relaxations in some UK regions announced on May 10th and implemented from May 17th. We extend our previous analysis to investigate trends in searching for topics related to coping and resilience, as well as mental distress, to assess how individuals were responding to the UK lockdown. In addition, we explored the search terms that experienced the most marked rises in search frequency during the pandemic.

Methods

Data source

We used Google Trends for this analysis, following the suggested checklist for documentation and development of our analysis¹¹.

Within Google Trends, search words are defined either as terms or topics. Search terms include matches for each word in a query entered into a Google search box. Topics, in comparison, are broader and comprised of an aggregated group - defined by Google - of related terms which share the same concept in any language.

The Google Trends explorer allows the user to request trend data for a specific term or topic, location (e.g. Italy, UK) and time period (e.g. last 12 months). It also allows users to specify which Google query categories (e.g. games, health), and types of search (i.e. web, news, Google shopping, and YouTube searches) they are interested in. If the user doesn't specify a term or topic in the explorer, Google Trends will return results for the top and rising terms and topics, for the specified time period and location, and will include data for all categories and for web searches.

Google Trends uses a sampling method to produce a representative dataset of all Google searches each time data are extracted and therefore results may vary each time a query is made on Google Trends¹². Google does not provide information on absolute numbers of searches. Instead it provides a normalised value to display search activity for a given term or topic at a specific period and location. Each data point is divided by the total volume of searches for a given area at the specified time period. The resulting number is then indexed between 0 and 100, where 100 is the maximum search interest for the topic/term during that time in that location. These are called relative search volumes (RSVs). RSVs tell us how popular that topic was in a particular location during a specific time period.

Search strategy

Searches were carried out on June 12th 2020. All searches included all Google query categories and included all web searches in the UK.

Time trends: In our previous analysis, we explored the change in trends of key topics related to mental distress⁸. For the current analysis we excluded previously investigated mental distress topics which had low to moderate RSVs and were stable over time (loneliness and fear) and included the topic of self-harm given that self-harm is a strong predictor of future suicide^{13,14}. We also explored topics related to coping and resilience. The topics identified for inclusion in this study were selected based on the considerations highlighted by the World Health Organisation⁴ and those that mapped onto Google defined topics. We selected nine topics associated with coping and resilience, divided into two categories: those that were associated with self-agency (exercise, helpline, how-to, videotelephony, volunteering) and abstract themes associated with feelings and long-term goals (coping, hope, kindness and rainbow). The former topics were related to searches associated with learning new skills (how-to), changing behaviours (exercise) and connecting with people (helpline, videotelephony, volunteering). ‘Rainbow’ was included as a topic to indicate community and social connection during a period of separation. This referred to images of rainbows displayed by many UK households in their windows indicating solidarity with National Health Service (NHS) workers and the community. Hope, coping and kindness were included to examine potential signs of optimism in contrast to the developing pandemic and the restrictions associated with it. These topics were intended as a proxy measurement of individual responses to a period of disruption combined with coping and resilience strategies associated with psychological wellbeing.

In addition to exploring specific search terms, we also examined the related Google-defined search topics (Table 1). Some topics have overlapping related search terms (e.g. “anxiety” is in both anxiety and depression topics).

Daily RSV data between 01/01/2020 and 09/06/2020 were downloaded, and this formed the basis of our main analysis. Periods with very low search volumes (i.e. RSVs <1) are identified as zero activity. Based on previous recommendations, we also repeated all searches on different days using the same search parameters¹⁵. There is no recommended standard for the number of days on which to repeat the searches, but consistent with our previous analysis, we did so on 7 different days⁸. These additional data downloads were used to create our validation dataset (see sensitivity analysis).

Rising searches: In addition to providing trend data on search activity, Google Trends also provides data on the 25 searches which have shown significant growth in popularity during the date range specified, compared to the preceding time period. They are calculated in percentage increases rather than normalised into an index¹⁶. We used the rising search terms to investigate terms which have marked increases in popularity during different stages of the pandemic. We explored the rising search terms during the following periods: i) pre UK lockdown (01/01/2020–22/03/2020); ii) post UK lockdown (23/03/2020–09/06/2020); and iii) fortnightly post UK lockdown (23/03/2020–05/04/2020; 06/04/2020–19/04/2020; 20/04/2020–03/05/2020;

Table 1. Topics included and the top three related searches in Google.

Included topic	Related search terms ^a
Depression	Depression, depressed, anxiety
Anxiety	Anxiety, anxious, depression
Suicide	Suicide, suicidal, commit suicide
Self-harm	Self harm, cutting, selfharm
Exercise	Workout, exercises, exercise bike
Helpline	Helpline uk, hmrc ^b helpline, hmrc
How-to	How to ^c
Videotelephony	Video call, whatsapp, video chat
Volunteering	Volunteer, nhs ^b , volunteering
Coping	Coping, cope ^c
Hope	Hope, rainbow ^c
Kindness	Kindness, kind, mental health awareness week
Rainbow	Rainbow, nhs ^b rainbow, rainbow riches

^a Spelling errors were ignored, as were related terms which would have been captured in another related term e.g. “suicide” and “suicide uk”, the latter was ignored.

^b HMRC – Her Majesty’s Revenue and Customs, UK’s tax, payments and customs authority, NHS – National Health Service.

^c less than three related searches are shown as the ones listed captured all other related searches.

04/05/2020–17/05/2020; and 18/05/2020–31/05/2020). Figure 1 highlights key dates on this timeline.

Data analysis

Time trends: We provide graphical presentations of Google Trends data between 01/01/2020 and 09/06/2020 for mental distress topics (depression, anxiety, suicide and self-harm). Two graphs are presented for topics related to coping and resilience based on whether the topics relate to action and/or short-term distractions or abstract themes related to feelings and long-term goals. Key dates related to the pandemic are marked on the graphs and relate to the first UK death (05/03/2020), UK lockdown (23/03/2020), and the easing of lockdown measures (10/05/2020). When peaks in the time trends were observed, we explored what people were searching for by looking at the related search queries.

Rising terms: For each rising search term identified, a percentage value is provided for the increase of that term in the given period of study. However, for terms that experienced growth in excess of 5000% within Google Trends (i.e. breakout terms), data were not available to calculate an exact percentage increase. In order to make meaningful comparisons, we approximated the percentage increase value of each rising term that was a breakout term. For each breakout term we obtained the average RSVs

Figure 1. Google searches for coronavirus in the UK with key dates for study timeline. Showing figures for daily searches.

for that term for the period under investigation and multiplied this by 5000. This ensured that the breakout terms maintained approximately their relative weight compared to the other breakout terms for each specified time period and were displayed (see below) appropriately. For example, the rising breakout term “furlough” (UK government’s paid leave scheme) had a more sustained increase in search frequency during the post-lockdown period compared to the breakout term “boris johnson hospitalised” (following the UK Prime Minister’s hospitalisation for coronavirus) (Figure 2).

Word clouds are a way of graphically representing text data and are often used to provide a visual representation of the frequency of words/text appearing in a text document. Words with a larger font-size in a word cloud have a higher associated frequency. We utilise word clouds to graphically represent the rising terms from each of the specific time periods, where the increase in search popularity (i.e. percentage change) is used as the frequency value typically used in word clouds. For periods where there was a wide range in the percentage changes in the 25 rising search terms, we scaled the word cloud to allow terms with lower values to be visible. Breakout terms appear in red.

All analyses were conducted in R version 4.0 and word clouds were created using the R ‘wordcloud’ package version 2.6. Data used to generate Figure 1–Figure 7 are available as *Underlying data*¹⁷.

Sensitivity analysis

Using data downloaded from seven different days (detailed above), we created an averaged dataset. We took the average

value for each search topic (13 topics) on each of the 161 datapoints, as it was recorded on each of the 7 separate days. We then correlated (using Pearson’s correlation test) that 7-day average with values for the 161 days (01/01/2020–09/06/2020) used in the main analysis (which used values as they stood when the data were extracted on 12/06/2020) using Excel (Microsoft Office 365 ProPlus). We checked to see whether the use of the averaged dataset would have altered our overall conclusions.

Results

Google searches for the mental distress topics investigated are shown in Figure 3. Relative searches for the topics depression and self-harm were highest in February 2020, then appear to drop and then start to rise again in the post-lockdown period. Relative searches for anxiety have remained fairly stable throughout the time period under investigation, with an apparent peak in relative search interest on the 28th April 2020. Exploration of the related search queries indicated a sudden rise in searches for “feeling of worry or anxiety crossword” which related to a crossword that appeared in the Scottish Daily Mail. Apart from a spike in relative searches for suicide on the 15th Feb 2020, the trend line is not indicative of either an increase or decrease in suicide related searches. The peak in searching on the 15th Feb 2020 is related to an increase in searching for the suicide death of television presenter Caroline Flack.

Prior to the first COVID-19 death in the UK, the relative searches for the search topics related to self-agency (markers of coping and resilience) appear to have remained stable (Figure 4). However, as the number of COVID-19 deaths started to rise, searches related to exercise, how-to, helpline and videotelephony

Figure 2. Google search terms for “boris johnson hospitalised” and “furlough”. Showing figures for daily searches.

Figure 3. Google searches for key topics in the UK with key dates identifying mental distress. Showing figures for daily searches.

also started to increase. There was a relative peak in the searching for helplines when lockdown was announced in the UK, and the related searches on this day were related to the

“coronavirus helpline”. There was also a spike in relative searching for volunteering immediately post-lockdown which was related to searches for “nhs volunteers”. Apart from the topics of

Figure 4. Google searches for key topics in the UK with key dates identifying resilience. Showing figures for daily searches.

Figure 5. Google searches for key topics in the UK with key dates identifying resilience. Showing figures for daily searches.

volunteering and helpline, the relative searching for the other topics remained elevated in the post-lockdown period. With the

exception of volunteering, we observed a “sawtooth pattern” in trends reflecting weekday versus weekend searching.

Word clouds of rising queries

Figure 6. Word clouds of rising queries before (01/01/2020–22/03/2020) and after lockdown (23/03/2020–09/06/2020). Red words denote breakout items; word size increases with search volume activity.

Fortnightly word clouds of rising queries

Figure 7. Fortnightly word clouds of rising queries between 23/03/2020 to 31/05/2020. Red words denote breakout items; word size increases with search volume activity.

Abstract topics related to coping and resilience are presented in Figure 5. Relative searching for the topics of coping and hope started to rise as the number of COVID-19 deaths increased in the UK. The rise in relative searches for rainbow started a little later, just before the lockdown was announced. Exploration of the related search queries indicated searching for rainbow

was related to the NHS rather than the weather or PRIDE (the promotion of the self-affirmation dignity, equality, and increased visibility of lesbian, gay, bisexual and transgender people). Relative search interest for coping, hope and rainbow remain elevated during the post-lockdown period, with a peak in relative searching on Easter Sunday for the topic of hope – it was

not, however, possible to extract related searches from Google Trends on this day for this topic. Changes in the trend line for the topic kindness does not appear to be related to the pandemic, and remained fairly stable during the time period, with the exception of two peaks. The first peak (16/02/2020) was related to searches for “in a world where you can be anything be kind” and may be associated with the public’s response to the death of Caroline Flack, and the second peak (18/05/2020) for the topic of kindness was related to an increase in searches for “mental health awareness week” where kindness was chosen by the Mental Health Foundation as the focus of the week for 2020.

During the period before lockdown (01/01/2020–22/03/2020) the search terms which experienced the greatest increase in searching were directly related to the virus. After the lockdown was officially announced (23/03/2020–09/06/2020) Google searches in the UK which showed substantial increases were related to practical matters related to the public health measures introduced. The searches with the most substantial growth were “furlough” (government paid leave scheme), “popular google doodle games” (online games), and “george floyd”. George Floyd was an African-American man killed during his arrest on May 25th 2020 whose death sparked protests around the world (Figure 6).

We also explored the searches which experienced considerable growth in fortnightly intervals during the post-lockdown period (Figure 7). Similar to Figure 6, in the two weeks immediately after the lockdown was announced, searching for terms related to practical issues in response to the pandemic started to rise (e.g. “furlough”, “home delivery”). As the period of lockdown continued (06/04/2020–09/06/2020) the rising terms changed to be less directly related to COVID-19 (e.g. “captain tom” –a 100-year-old ex-army officer who raised money for NHS charities during lockdown). Towards the end of the period studied, the searches which appeared to have the most substantial searching growth were no longer directly or indirectly related to COVID-19 (e.g. “george floyd”), with the exception of searches for “dominic cummings” (chief advisor to the UK prime minister alleged to have broken lockdown rules).

Our sensitivity analysis confirmed the findings of our main analysis, and the validation dataset was well correlated with our main dataset (Table 2). The dataset used for sensitivity analysis is available as *Underlying data*¹⁷.

Discussion

In this study we examined trends in mental distress, coping and resilience related searches, and search terms with significant growth in popularity, associated with the COVID-19 pandemic to the 9th of June 2020, using data from Google Trends in the United Kingdom. While we found dynamic patterns of searching as the pandemic progressed, demonstrating the public’s evolving responses to the unfolding crisis, the increase in searches related to self-agency and coping strategies was the most striking and sustained. Over time, searches with the most substantial growth were no longer directly or indirectly related to COVID-19.

Table 2. Correlation between single day verses seven-day averaged Google Trends data.

Topic	Pearson’s Correlation coefficient
Anxiety	0.87
Depression	0.95
Self-Harm	0.80
Suicide	0.99
Exercise	1.00
Helpline	0.98
How-to	1.00
Videotelephony	1.00
Volunteering	1.00
Coping	0.90
Hope	0.90
Kindness	0.99
Rainbow	1.00

Relative searches for depression and self-harm initially decreased following the first death in the UK but then rose over time to levels found in the early part of 2020, whereas searches related to anxiety and suicide remained relatively stable throughout. Other studies based on convenience-sampled repeat cross-sectional surveys showed declining anxiety and depression in the weeks following lockdown¹⁸. In contrast, relative search volumes for topics related to coping and resilience increased notably during the period after the first death in the UK. Those that remained elevated in the following 13 weeks and demonstrated a sustained increase, were the topics ‘how-to’, ‘exercise’, ‘videotelephony’ and ‘rainbow’. During the period before lockdown search terms directly related to the virus experienced the greatest increase in searching. After the lockdown, Google searches which showed substantial increases were related to more practical responses to the public health measures introduced, such as ‘furlough’. Towards the end of our study the searches which appeared to have the most substantial searching growth were no longer directly or indirectly related to COVID-19 (e.g. “george floyd”), with the exception of searches for “dominic cummings” potentially illustrating adaptation to the pandemic and life circumstances.

The value of understanding population mental health, coping and resilience strategies and public concerns during the COVID-19 pandemic has been highlighted by the World Health Organization⁴. Governments need both to be responsive to evolving population needs through public health messaging¹⁹ and resources but also to monitor the effect of any actions taken. Google Trends data potentially offer a near-real time tool to do this in the absence of immediately available surveillance data and there is an emerging evidence base on its use during the COVID-19 pandemic^{7–10}.

The patterns we observed in the early stages of the pandemic have been replicated elsewhere⁷. Sinyor *et al.*⁷ suggest that the focus on resilience and survival may mean that suicide rates in the early phase of the pandemic may behave more like wars, in which rates decrease rather than in recessions, where the opposite is seen. However, whether the changes we observed in search patterns are associated with actual rates of suicide or diagnosable disorder and real uptake of exercise and new skills requires further investigation building on initial studies exploring these correlations²⁰. Similarly, it will be important to explore whether the topics associated with coping and resilience that demonstrated a sustained rise from pre-lockdown levels reflect a change in population agency and self-management is real and the long term.

Strengths and limitations

There are a number of limitations in the use of Google Trends data to characterise population responses to the pandemic. Certain population groups, often the more vulnerable, are less likely to access the internet so are potentially underrepresented in our findings, these groups include those such as those in digital poverty, the economically inactive, older adults, and those with disabilities which includes those with mental health conditions and in suicidal distress²¹. There is no way to assess this sort of response bias since Google Trends does not provide demographic data. More practically we found limited data available related to the methodology and contributory factors used to construct topics. More rigorous studies would be possible in the future if Google expands the metadata they make available. Our sensitivity analysis demonstrated that the time series differ from day to day despite the use of identical parameters (time, location or topic). This is likely related to the sampling method Google Trends uses to produce a representative sample each time data are extracted. Additionally, Google Trends do not provide data on actual volume of searching. Therefore, it is not possible to confirm whether changes in relative search volumes in the trend lines during the pandemic are related to real changes in search activity of that topic, or are attributable to changes in the denominator (i.e. total number of Google searches). As such, we did not conduct any formal time-series analysis because the interpretation of any statistical tests would be more meaningful in the presence of search volume data. Right now, it remains unclear if and to what extent total search behaviour has changed in the time period analysed. As such our study is a descriptive analysis aimed at understanding the impact of the pandemic on peoples' searches in the context of societal events and seasonal changes which may be impacting results.

Implications for research/policy

Google Trends is a free, open-access expansive dataset that provides a means of monitoring public concerns, responses and interventions to the COVID-19 pandemic. The reactive nature of search activity and its timely availability are huge strengths.

However, the limitations associated with the methodology, topic construction and inconsistencies in the datasets in Google Trends, mean that findings should be triangulated with other sources and detailed surveys to expand on the social narrative and inform policy currently. Public Health England are currently using weekly Google Trends data, derived from our study⁸, as part of a suite of measures from a variety of difference sources to track the mental health of the UK population. Given the divergence of policies related to the relaxation of lockdown in the nations of the UK there may be potential to explore the impacts of these on public concerns in the future.

Conclusion

Google trends shows promise as a tool to gauge public responses to the COVID-19 pandemic. Over time, searches with the most substantial growth were no longer directly or indirectly related to COVID-19 potentially illustrating adaptation to the pandemic and life circumstances as a consequence of it. In contrast to relatively stable rates of searches related to mental distress, the topics that demonstrated a sustained increase were those associated with coping and resilience.

Data availability

Source data

All data are freely available directly from Google Trends (<https://trends.google.com/trends/>).

Underlying data

Open Science Framework: Tracking online searches for emotional wellbeing concerns and coping strategies in the UK during the COVID-19 pandemic: a Google Trends analysis. <https://doi.org/10.17605/OSF.IO/KQ2D6>¹⁷.

This project contains the following underlying data:

- Averages UK.xlsx (Averaged dataset for sensitivity analysis).
- Main Dataset Fig 1 to 5.xlsx (Combined downloaded data from Google Trends (2020)).
- Wordcloud Fig 6.xlsx (Combined downloaded data from Google Trends (2020)).
- Wordcloud Fig 7.xlsx (Combined downloaded data from Google Trends (2020)).

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

Author information

Duleeka Knipe and Hannah Evans are joint first authors. David Gunnell and Ann John are joint senior authors.

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Version 1

Reviewer Report 15 December 2021

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Finiki Nearchou

School of Psychology, University College Dublin, Dublin, Ireland

This paper applied a Google Trend analysis to identify online searches related to psychological distress and coping strategies in the UK during the COVID-19 pandemic. While I believe that this research has the potential to make some important contributions, I think that clarifying/addressing my concerns below will strengthen the manuscript.

Introduction

- The authors state that there are no surveillance data on the mental health impact of pandemic. However, to date there several systematic reviews and meta-analyses documenting this, as well as living systematic reviews that provide updates relevant evidence constantly or even daily. (e.g. <https://www.depressd.ca/>). Authors should revise this statement(s) to capture the current trends on the COVID-19 mental health related research as well as add more clarity to their argument.
- I wonder whether there is more updated evidence considering that 2020 references were used. If have not done so, an updated search of the literature would be required.

Method

- Coping and resilience are two different constructs. Resilience refers to the dynamic process of coping and adaptation when there is exposure to adversity (Luthar et al., 2000¹). It also refers to people's capacity to navigate themselves to resources and supports to sustain their well-being (Ungar, 2013²). The authors do not clarify which category taps onto which construct (resilience or coping). The authors should provide an elaboration about resilience and coping. Drawing from up-to-date evidence, these should be discussed within the context of the mental health impact of the pandemic. This section should be added in the introduction.
- Why mental health awareness week was included under kindness? (I see from reading through that this is explained later in the results, but it would help the reader follow the flow if these clarifications were provided earlier in the manuscript).

- I think that an update in searches to capture 2021 would methodologically benefit this paper. As we are heading to 2022 this paper will essentially present data from about two years ago.

Results

- Please report when the first COVID-19 death in the UK was in parenthesis.
- Authors report (here and later in the discussion) increase and decrease in searches, however without a statistical analysis these statements should be avoided as may mislead the readers. These statements should be revised for more clarity or omitted.

Discussion

- It would be helpful for readers to indicate dates when referring to events e.g. first death in the UK, during the period before lockdown etc.

Minor comments

The manuscript should avail from a thorough proofreading as there are typos, syntax, and other issues. For instance:

1. 'The coronavirus disease 2019 pandemic' - I suggest to drop the word disease.
2. Change to 'after the COVID-19 was declared as a...' pandemic.
3. The sentence 'Other suggested initiatives ...' is lengthy and does not read well', e.g. may foster include.
4. Please avoid using contractions in a formal scientific document.
5. Please rephrase the last sentence of the discussion.

References

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Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: resilience, chronic illness, mental health, statistical modelling, psychometric research

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 09 August 2021

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Yu-Hsuan Lin

Institute of Population Health Sciences, National Health Research Institutes, Miaoli, Taiwan

The present study investigated population-level search activities as a proxy for public concerns, such as emotional wellbeing and coping strategies, by google trends data during the covid-19 pandemic. However, I suggested authors have to clarify the following five questionable methodological issues in this manuscript.

1. The authors emphasized that "Google trends potentially offer a nearly real-time tool..." for several times in this manuscript. However, as of this writing of the review comments on Aug 9th, 2021, there is more than one year from the data collection (June 12th 2020), and the dataset (Jan 1st to Jun 9th, 2020). Given that real-time data is one of the greatest strengths of Google Trends, is it possible to analyze the data till June 2021? The authors might consider comparing the emotional wellbeing outcomes in the current study to suicide trends during the early months of COVID-19 pandemic. Reference: Pirkis J et al. Suicide trends in the early months of the COVID-19 pandemic: an interrupted time-series analysis of preliminary data from 21 countries. *Lancet Psychiatry*. 2021 Jul;8(7):579-588. doi: 10.1016/S2215-0366(21)00091-2.
2. It is necessary to specify the word to health-related category to isolate the search volume for clinical depression. The word "depression" could refer to many different ideas besides meaning mentally depressed, e.g., economic depression and tropical depression.
3. It is unclear whether the authors searched the keywords together or separately. Please clarify in the *Methods* section. If the authors conducted the searches together (e.g.,

searching for anxiety, depression, self-harm, and suicide altogether), it is considered inappropriate, because the relative search volumes for all 4 keywords (anxiety, depression, self-harm, and suicide) will then be based on the largest total search volumes of one of the keywords (e.g., anxiety).

4. It is inappropriate to state the "increase in search" or "decrease in search" without conducting any statistical analysis.
5. As stated above, the claims of increase or decrease should have adequate comparison with a baseline. For example, using a statistical method, like difference in differences, can mimic an experimental research design using observational study data. Given that the search volume for depression and suicide may be influenced by seasons, the authors may consider using methods such as seasonal autoregressive integrated moving average (SARIMA) model to counteract the seasonality issue.

References

1. Pirkis J, John A, Shin S, DelPozo-Banos M, et al.: Suicide trends in the early months of the COVID-19 pandemic: an interrupted time-series analysis of preliminary data from 21 countries. *The Lancet Psychiatry*. 2021; **8** (7): 579-588 [Publisher Full Text](#)

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

No

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

No

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Sleep medicine, Cyberpsychology, Clinical trial

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.