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RESEARCH ARTICLE

# Face covering adherence is positively associated with better mental health and wellbeing: a longitudinal analysis of the CovidLife surveys [version 1; peer review: 1 approved, 1 approved with reservations]

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## Abstract





**Background:** Face masks or coverings are effective at reducing airborne infection rates, yet pandemic mitigation measures, including wearing face coverings, have been suggested to contribute to reductions in quality of life and poorer mental health. Complaints of inconvenience, discomfort, and other issues have been repeatedly and loudly voiced by critics, and adherence in many nations is not strong enough to suppress viral spread. We wished to see whether wearing face coverings is associated with mental health and wellbeing.

**Methods:** We analysed survey 1 and 2 of the CovidLife study, a sample of more than 18,000 individuals living in the UK. The study asked a variety of questions about participants' psychological, economic, and social lives while living under the coronavirus disease 2019 (COVID-19) pandemic in 2020. We measured individuals' adherence to following guidance on wearing face coverings, as well as several mental health outcomes: depression, anxiety, wellbeing, life satisfaction, and loneliness.

**Results:** We found no association between lower adherence to face covering guidelines and poorer mental health. The opposite appears to be true. Even after controlling for behavioural, social, and psychological confounds, including measures of pre-pandemic mental health, individuals who wore face coverings "most of the time" or

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Approval Status  

	1	2
<b>version 1</b> 18 Mar 2021	 <a href="#">view</a>	 <a href="#">view</a>
1. <b>Trish Greenhalgh</b>  ,	University of Oxford, Oxford, UK	
2. <b>Agata Chudzicka-Czupala</b>  ,	SWPS University of Social Sciences and Humanities, Katowice, Poland	

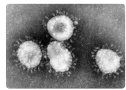
Any reports and responses or comments on the article can be found at the end of the article.

“always” had better mental health and wellbeing than those who did not. Individuals who wore masks only “some of the time” or “never” tended to be male, lower income, and already had COVID-19 or COVID-19-like symptoms.

**Conclusions:** These results suggest that wearing face coverings more often does not negatively impact mental health. Wearing a face covering more often is actually linked to better mental health and wellbeing. Implications are discussed and we highlight the potential pathways for addressing a lack of face covering that this study reveals.

### Keywords

COVID-19, mental health, depression, anxiety, loneliness, wellbeing, life satisfaction, masks, face coverings



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

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## Introduction

Regulatory bodies and governments around the world recommend wearing face masks, termed ‘face coverings’ by the United Kingdom (UK) government, to control the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Klompas *et al.*, 2020) because face coverings are an effective low-cost measure for reducing the spread of infectious aerosols and droplets (Fischer *et al.*, 2020). Wearing face coverings thus helps protect others from catching coronavirus, reducing spread (Howard *et al.*, 2020; Lyu & Wehby, 2020), although high adherence to face covering guidelines is necessary for this to have an impact at the population level (Eikenberry *et al.*, 2020; Howard *et al.*, 2020).

Many of the most effective measures that reduce coronavirus transmission, such as distancing, have negative impacts on individual wellbeing and mental health at the population level (Qiu *et al.*, 2020; Rossi *et al.*, 2020). Since the coronavirus disease 2019 (COVID-19) pandemic began, increases in loneliness, stress, anxiety, and depression, and decreases in life satisfaction and wellbeing have been reported (Kwong *et al.*, 2020; Luchetti *et al.*, 2020; Salari *et al.*, 2020; Satici *et al.*, 2020). Wearing face coverings does not have obvious, direct links to negative experiences such as self-isolation or quarantine (Brooks *et al.*, 2020), but might induce negative experiences through physical discomfort, communication difficulties, or stigmatisation (Czypionka *et al.*, 2020). This has been the topic of public and informal debates (Czypionka *et al.*, 2020; Howard *et al.*, 2020), which often do not take evidence into account. The public confusion this debate creates may in turn drive non-compliance (Lyu & Wehby, 2020). Evidence for or against an impact of wearing face coverings on individuals’ lived experience would be valuable.

The CovidLife surveys<sup>1</sup> are a longitudinal UK-wide study of over 18,000 individuals begun during the early stages of the 2020 lockdown. Here, we used CovidLife data across surveys to investigate the relationships between adherence to guidelines on face coverings and wellbeing, life satisfaction, anxiety, depression, and loneliness.

## Methods

### Questionnaire and development

The CovidLife questionnaire was developed using Qualtrics survey software (Snow & Mann, 2013). Data collection was limited to remote online assessments. Two online surveys (Altschul, 2021) were sent out between April and August 2020 and designed to be suitable for completion on a range of different devices, including desktop computers, tablets and smartphones.

The surveys were developed and tested by the Generation Scotland team with expert advice from collaborators in health economics. Before launching the study, we sought feedback from collaborators and other research groups, and piloted

the surveys on a small sample of participants tested by some members of the general public, then adjusted before launching study.

Survey 1 included modules on background demographics, general health, health issues relevant to COVID-19, one’s household, help & social support, mood, COVID-19’s impact on life, health behaviours, personality, health literacy, finding information, how one spends one’s time, employment, and public involvement. Survey 2 repeated many questions and introduced some new questions. Modules included health issues relevant to COVID-19, partner details, mood, COVID-19’s impact on life, coping, finding information, behaviour changes, keeping in touch, employment, partner’s employment, benefits, finances, COVID-19 impact on healthcare, events, children & relationships, and public involvement. Both surveys are included as extended data.

No question in the survey required an answer. If participants left a question unanswered, they were informed that there were unanswered questions on the page and were asked whether they wanted to “Continue without Answering” or “Answer the Question”. Many sensitive questions also had a “prefer not to answer” option. We also included the option to skip certain sections that may be especially upsetting for participants during the COVID-19 pandemic. The skip section option was included for the sections asking about social support, mood, and employment.

### Recruitment

Anyone aged 18 years and over and residing in the UK were able to take part in the CovidLife study. Adults who were resident in the UK but were temporarily elsewhere in the world because of travel restrictions were also eligible to take part. As this was an online survey, individuals without access to the internet were not able to take part.

Multiple methods were used to recruit participants into CovidLife. The survey was open to any adult resident in the UK. Traditional media (television and radio new programs) and social media (Facebook, Twitter, and Instagram) were used to advertise the study to the general public.

Generation Scotland (Smith *et al.*, 2013) participants for whom an email address was known were sent an email inviting them to take part in the CovidLife Study. Reminder emails were also sent. Postal invites were sent to Generation Scotland participants for whom a postal address was known but no email address was known.

Researchers from the Aberdeen Children of the 1950s (ACONF) (Leon *et al.*, 2006) study also contacted their participants who could be reached through email or Facebook to invite them to complete the CovidLife survey. The Aberdeen Children of the 1950s consists of a sample of 12,150 individuals who were born in Aberdeen between 1950 and 1956 and who completed the Aberdeen Child Development Survey when in primary school and who have been followed up in adulthood.

<sup>1</sup><https://www.ed.ac.uk/generation-scotland/covidlife-volunteers/what-is-covidlife>

Two health research registers in the UK were also used as a method of recruitment. The Scottish Health Research Register (SHARE) (McKinstry *et al.*, 2017) is a research register of people aged 11 and over who are interested in taking part in health research in Scotland. SHARE emailed members of the register with information about the CovidLife study and a link to take part in the study. We also used Discover North West London's health researcher register to advertise our study. This is a register of adults aged 18 years and older living in the North West of London who were interested in taking part in health research. Discover register members were sent emails inviting them to take part in CovidLife with two reminders sent in the following two weeks.

### Data collection and study sample

Data collection for Survey 1 commenced on 17 April 2020 and closed to new responses on 7 June 2020. This period overlapped with the first period of UK-wide 'lockdown'. Survey 2 data were collected between 21 July to 17 August 2020. This corresponded to the period when the UK government made face coverings mandatory on public transport and in many shops. More than 18,000 individuals responded to Survey 1, and of those that shared their email contact address, more than 11,000 returned to participate in Survey 2. The CovidLife sample was a convenience sample for the purposes of this work; the initial sample size was determined purely by the number of volunteers who completed the survey during the available dates. The follow-up sample was a subset of the original sample; again, size was purely determined by the number of volunteers who responded to our emails and completed the second survey. We did not attempt to control potential biases at this stage but focused on maximising sample size.

### Variables and data processing

All mental health outcome measures used here were asked in Survey 2 (Figure 1). In Survey 1, we asked individuals about their sense of loneliness and life satisfaction before and during lockdown. Mental health was assessed using common self-report instruments (e.g. Patient Health Questionnaire for depression – see below), which could be scored to create continuous outcomes (except loneliness, which was ordinal).

Unless otherwise stated, the variables with  $n \sim 18,000$  were collected during Survey 1 (e.g. pre-COVID-19 mental health) and variables with  $n \sim 11,000$  were collected during Survey 2 (e.g. adherence to face covering guidance). Complete case analyses were carried out; no observations were otherwise excluded. Using the most observations available for each analysis gave us at least 9,544 observations for every analysis. These are enough observations to detect biserial correlations  $\rho > 0.037$ , with 95% power at  $\alpha = 0.05$  in a two-tailed test.

**Depression.** Depression was assessed with the Patient Health Questionnaire (PHQ-9) (Kroenke *et al.*, 2001), which consisted of 9 questions asking about depressive symptoms. Each question was scored from 1 to 4, with higher values indicating increased frequency of symptoms. The PHQ-9 was

administered in both Surveys 1 and 2. Sum scores were created which ranged from 0 to 27. Binary categorisation used the recommended cut-off for possible depression ( $\geq 10$ ).

**Anxiety.** Anxiety was assessed with the Generalized Anxiety Disorder assessment (GAD-7) (Spitzer *et al.*, 2006), which consisted of 7 questions asking about the presence of generalized anxiety disorder symptoms. Each question was scored from 1 to 4, with higher values indicating increased frequency of symptoms. The GAD-7 was administered in Surveys 1 and 2. Sum scores were created which ranged from 0 to 21. Binary categorization used the recommended cut-off for possible anxiety ( $\geq 10$ ).

**Wellbeing.** Subjective psychological wellbeing was assessed with the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant *et al.*, 2007), which consisted of 7 items. Each question was scored from 1 to 5, with higher values indicating better wellbeing. The WEMWBS was administered in surveys 1 and 2. Sum scores were created which ranged from 7 to 35. Binary categorization used the recommended cut-off ( $\leq 17$ ).

**Loneliness.** Loneliness was assessed with a single question asking "How often have you felt lonely during the past week?" (Altschul *et al.*, 2020; Solano, 1980). Loneliness prior to lockdown was assessed with a similar question: "Think back to before COVID-19 measures were introduced (i.e., January 2020), how often did you feel lonely then?" Participants could choose between "None, or almost none of the time", "Some of the time", "Most of the time", "All, or almost all of the time", "Don't know", "Prefer not to answer" in response to both questions. For the purposes of binary categorization, individuals who answered "most of the time", or "all, or almost all of the time" were classified as being lonely, and others were not.

**Life satisfaction.** Life satisfaction (Mazaheri & Theuns, 2009; Pavot *et al.*, 1991) was assessed with a single question asking "how satisfied are you with your life nowadays?" Life satisfaction prior to the pandemic was assessed with the question "Thinking back to just before the COVID-19 measures were introduced (i.e., January 2020), how satisfied were you with your life then?" Participants were asked to answer the question using a 0 to 10 scale, where 0 indicated being not at all satisfied with life, and 10 indicated being extremely satisfied with life.

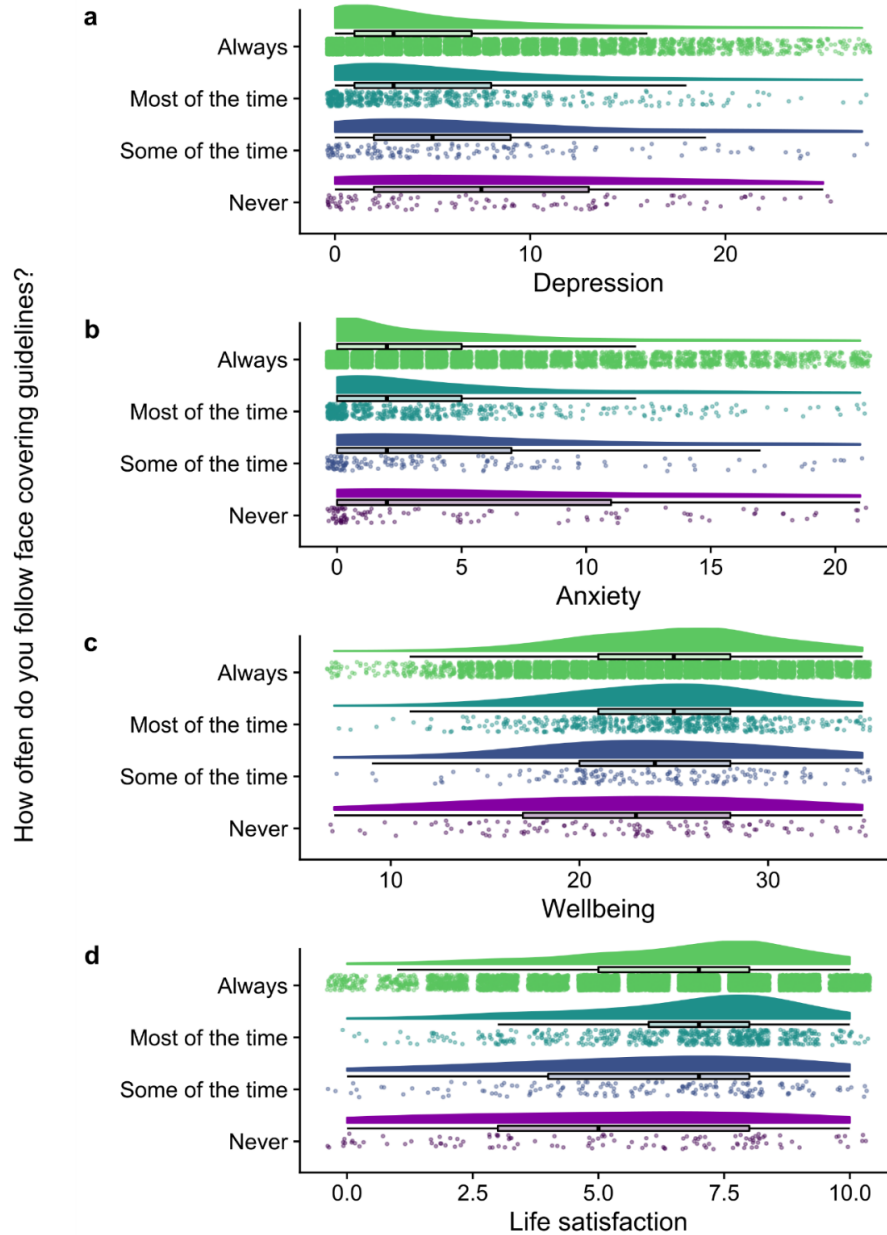
**Prior mental health diagnoses.** In Survey 1, participants were categorized as having a mental diagnosis relevant to anxiety or depression if they reported being diagnosed with any of the following: "Anxiety, nerves or generalised anxiety disorder", "Depression", "Mania, hypomania, bipolar or manic-depression", "Panic attacks", or "Social anxiety or social phobia".

**Face covering.** In a response matrix, participants were asked about various government guidelines: "Have you been following the government guidance on" and a list followed. The particular prompt under study was "Wearing face

coverings on public transport and in shops”. Participants could respond “Always”, “Most of the time”, “Some of the time”, and “Never”

**Age & sex.** Participants were asked their date of birth in Survey 1 and age was calculated from this. After this, participants were asked “What is your sex? As assigned at birth” and could answer “Male” (coded 1), “Female” (coded 2), or “Prefer not to answer”.

**Personality.** 30 questions from the 50-item International Personality Item Pool 5 factor instrument (Goldberg *et al.*, 2006; Gow *et al.*, 2005), those used to assess conscientiousness, extraversion, and emotional stability, were asked during Survey 1. These three personality dimensions were assessed because we were limited in how many total questions we could include in the survey, and these dimensions were deemed to be the most relevant to health, economic, and social factors during the COVID-19 pandemic.



**Figure 1.** Raincloud plots of adherence to face coverings and main outcome variables wellbeing, life satisfaction, anxiety, and depression. The cloud portion of each plot is the smoothed distribution of all members of each category. The rain portions below show the raw, jittered observations that constitute the distributions. Boxplots illustrate the means, hinges represent the first and third quartiles, and the whiskers represent 1.5x the inter-quartile range. **a.** depression scored from 0 to 27, **b.** anxiety scored 0 to 21, **c.** subjective wellbeing scored from 7 to 35, **d.** life satisfaction scored from 0 to 10. Loneliness was not plotted in this manner due to the ordered nature of the data.

**Psychological resilience.** Resilience was measured using the Brief Resilience Scale (Smith *et al.*, 2008), which consists of 6 questions rated from 1 (“strongly agree”) to 5 (“strongly disagree”). A sum score of these items was constructed to represent overall trait resilience.

**Living circumstances.** In Survey 1, participants were asked “Including yourself, how many people live in your household?” and could answer anywhere between 1 and 12+. In Survey 1, participants were asked “What type of accommodation do you live in?” and could choose from options: “House or bungalow”, “Flat or apartment”, “Hostel”, “Mobile home or caravan”, “Sheltered housing”, “Homeless”, “Other”, and “Prefer not to answer”. More affluent accommodations were lower in value (e.g. “house” was recorded as 1, the lowest value on the scale). In Survey 2, participants were asked “How many rooms are there in your house? Count living rooms, bedrooms, kitchens, utility rooms and studies. Do not count toilets, bathrooms, halls, landings, or cupboards”. Participants could answer anywhere from 1 to 15+. In Survey 2, participants were asked “Do you have a partner that you live with? This could be someone you are married to/in a civil relationship with, or a person with whom you are co-habiting”. Participants could answer “Yes, I live with a partner” (coded 1), “No, I do not live with a partner” (coded 0), and “Prefer not to say”.

**Student status.** Whether a participant reported being a student (coded 0), a part-time student (coded 1), or a full-time student (coded 2).

**Self-rated health.** Both general and mental health were assessed. Participants were asked “In general, would you say your health is?” and “In general, would you say your emotional or mental health is?” and could answer between “excellent” (1) and “poor” (5).

**Educational qualification.** Participants were asked “What is the highest educational qualification you have obtained?” Responses available were “Postgraduate degree”, “Undergraduate degree”, “Other professional or technical qualification”, “NVQ or HND or HNC or equivalent”, “Higher grade, A levels, AS levels or equivalent”, “Standard grade, National 4 or 5, O levels, GCSEs or equivalent”, “CSEs or equivalent”, “School leavers certificate”, “Other (please specify)” with an attached open field to indicate the type of other, non-high school qualification, “No qualifications”, and “Prefer not to answer”. The scale ran from 1 to 10, with 1 representing “No qualifications” and 10 representing “Postgraduate degree”.

**Contact outside your household.** In Survey 2, participants were asked “When leaving your home, how likely are you to come into close contact with someone not living in your household? By close contact, we mean coming within 2 metres of someone”. Participants could answer “I don’t leave my home” (1), “Not at all likely” (2), “Not that likely” (3), “Somewhat likely” (4) or “Very likely” (5). Participants were also separately asked “How regularly do you do these activities now?” about the several social activities. The answers available were “Every day/almost every day” (6), “3–4 days a week”

(5), “1–2 days a week” (4), “Less than once a week” (3), “Rarely” (2), and “Never” (1). The particular prompts relevant to the study at hand were “meet[ing] with family members face-to-face” and “meet[ing] with friends face-to-face”.

**Risk from getting COVID-19.** In both Survey 1 and 2 participants were asked “Do you think that you have had, or currently have COVID-19?” Possible responses were “Yes, confirmed by a positive test”, “Yes, suspected COVID-19 but was not tested”, and “No”. Participants were also asked “Have you been contacted by letter or text message to say you are at severe risk from COVID-19 due to an underlying health condition and should be shielding?” and could answer “Yes” or “No”.

**Income.** In survey 1, participants were asked to give their annual pre-tax household income from before the pandemic. Response options were categorical: “less than £10,000”, “between £10,000 and £15,000”, “between £15,000 and £20,000”, “between £20,000 and £30,000”, “between £30,000 and £50,000”, “between £50,000 and £70,000”, “more than £70,000”. Participants were also asked if they were working as key workers.

**Area deprivation.** Using postcode information, we were able to derive Scottish Index of Multiple Deprivation (Executive, 2006) scores, ranging from 1 to 10, low to high. These scores provide a general picture of the deprivation in the neighborhood an individual lives in.

**Mental or physical health conditions.** Participants were asked (in separate questions) if they had a wide variety of mental and physical health conditions. In addition to the anxiety and depression relevant conditions discussed above, we also constructed a variable that indicated if a participant had any mental health diagnosis at all. We followed a very similar procedure for physical health conditions, constructing a different variable indicating if an individual had any physical condition diagnosis.

### Statistical analyses

Both linear and logistic regression models were used to investigate the associations between following guidance on wearing face coverings and measures of mental health and wellbeing. These models were longitudinal in that they allowed us to control for potential confounders including assessments of the outcomes (mental health and wellbeing) measured earlier, as well as age, sex, personality, living circumstances, education, resilience, physical health, and behavioral factors such as frequency of leaving one’s home, and meeting others (see section above). Where appropriate, *t* and  $\chi^2$  tests were used to assess whether or not there were group level differences among individuals who adhered to face covering guidance to different degrees. All analyses were conducted using the R programming language, version 3.6.1 (Ihaka & Gentleman, 1996). Analytic code is available on Zenodo (Altschul, 2021).

### Ethical standards

The CovidLife study was approved by the East of Scotland Research Ethics Committee (Reference: 20/ES/0021 AM02).

## Results

A total of 20,662 individuals started survey 1; anyone with a survey completion rate of  $\geq 5\%$  was included in the final analytic sample of 18,423 for survey 1. 11,507 of these individuals started survey 2; again, individuals who completed  $\geq 5\%$  of survey 2 were included in the analytic sample for that survey, which totaled 11,312 individuals. The total number of mental health and wellbeing, and adherence to face covering guidance responses determined the final analytic sample for our regression models – see below for the complete case *ns* for these variables.

### Sample description

**Mental health and wellbeing.** Sum scores of depression ranged from 0 to 27;  $M = 4.53$ ,  $SD = 5.20$ ,  $n = 10,408$ , with 162 missing for scores assessed in Survey 2. Anxiety scores ranged from 0 to 21;  $M = 3.65$ ,  $SD = 4.66$ ,  $n = 10,608$ , with 182 missing. Wellbeing scores ranged from 7 to 35;  $M = 24.82$ ,  $SD = 5.03$ ,  $n = 11,084$ , 189 missing. For the period before COVID-19, 13,560 people (77%) reported being lonely “almost none of the time”, 3,781 (21%) were lonely “some of the time”, 240 ( $>1\%$ ) were lonely “most of the time” and 72 ( $<1\%$ ) were lonely “all, or almost all the time”. By the time of Survey 2, 7,957 people (77%) were lonely “almost none of the time”, 2,703 (24%) were lonely “some of the time”, 331 (3%) were lonely “most of the time” and 143 ( $>1\%$ ) were lonely “all, or almost all the time”. Note that the number of respondents in Survey 2 ( $n=11,134$ , 124 missing) was less than in Survey 1 ( $n=17,653$ , 770 missing). Life satisfaction scores ranged from 0 to 10;  $M = 6.71$ ,  $SD = 2.17$ ,  $n = 11,130$ , 182 missing. In Survey 1, participants were categorized as having a mental diagnosis relevant to anxiety or depression if they reported being diagnosed with any of the following: “Anxiety, nerves or generalised anxiety disorder”, “Depression”, “Mania, hypomania, bipolar or manic-depression”, “Panic attacks”, or “Social anxiety or social phobia”. In Survey 1, 5,729 individuals had at least one such diagnosis, and 12,016 did not. 311 chose not to answer.

**Face covering.** When asked “Have you been following the government guidance on ... Wearing face coverings on public transport and in shops”, 10,180 participants could responded “Always” (92%), 592 responded “Most of the time” (5%), 172 responded “Some of the time”, (2%), and 120 responded “Never” (1%). 226 did not respond to this question.

**Sociodemographic covariates.** Mean age of the sample was 56.6 ( $SD = 14.34$ ,  $n = 18,328$ ). The total sample consisted of 5,999 males, 12,299 females, and 125 preferred not to answer. In giving their income, 382 respondents chose “less than £10,000” (3%), 653 responded “between £10,000 and £15,000” (5%), 778 responded “between £15,000 and £20,000” (7%), 1,951 responded “between £20,000 and £30,000” (16%), 3,358 responded “between £30,000 and £50,000” (28%), 2,218 responded “between £50,000 and £70,000” (18%), and 2,622 responded “more than £70,000” (22%). 3,465 (19%) individuals reported that they were designated as key workers, 5,076 (27%) indicated that they were not. Scottish Index of Multiple

Deprivation scores, ranged from 1 to 10, low to high, with a mean of 7.08 ( $SD = 2.59$ ,  $n = 16,724$ ). The average number of people living in a respondent’s household was 1.28 ( $SD = 1.11$ ,  $n = 17,955$ ). Accommodation, with more affluent accommodation being at the low end of the scale (1), averaged 1.23 ( $SD = 0.48$ ,  $n = 17,172$ ). The average number of rooms is an individual’s accommodation was 6.01 ( $SD = 2.06$ ,  $n = 17,185$ ). 8,327 participants lived with a partner, 2,864 did not, 311 preferred not to answer. 314 were part-time students and 378 were full-time students. On a scale from 1 to 10, with 1 representing “No qualifications” and 10 representing “Post-graduate degree” the average educational attainment was 7.88 ( $SD = 2.18$ ,  $n = 17,059$ ).

**Personality & resilience covariates.** Personality traits were scored on a scale from 10 to 50. Mean conscientiousness was 37.85 ( $SD = 6.16$ ,  $n = 17,356$ , 94% completed the questions), mean extraversion was 30.58 ( $SD = 8.02$ ,  $n = 17,424$ , 95% completed), and mean emotional stability was 33.56 ( $SD = 8.45$ ,  $n = 17,425$ , 95% completed). Resilience was scored on a scale from 6 to 30, with a mean of 21.34 ( $SD = 4.94$ ,  $n = 11,107$ , 98% completed).

**Behavioural covariates.** When responding on a scale from 1 (“I don’t leave my home”) to 5 (“Very likely [to encounter others when I leave my home]”) the mean response was 3.70 ( $SD = 0.99$ ,  $n = 11,267$ ). When participants were asked how regularly they engaged in activities on a scale from 1 (“Never”) to 6 (“Every day/almost every day”), the average response to “meet with family members face-to-face” was 3.32 ( $SD = 1.46$ ,  $n = 11,046$ ) and the average response to “meet with friends face-to-face” was 2.88 ( $SD = 1.19$ ,  $n = 11,044$ ).

**Health covariates.** 5,994 (33%) participants had a mental health condition of any sort and 8,367 (46%) had a physical health condition. Self-rated general ( $M = 2.45$ ,  $SD = 1.01$ ,  $n = 18,307$ ) and mental ( $M = 2.42$ ,  $SD = 1.03$ ,  $n = 18,305$ ) health responses were comparable. 60 participants reported having COVID-19, “confirmed by a positive test”, 1,205 responded “Yes, suspected COVID-19 but was not tested”, and 10,020 said they had not had COVID-19. 1,423 were shielding (8%) and 16,881 were not (92%).

### Associations between face covering and mental wellbeing

Mean mental health and wellbeing scores were poorer for individuals who adhere to face covering guidance less often (depression:  $t = -6.89$ ,  $p < 0.001$ ; anxiety:  $t = -4.75$ ,  $p < 0.001$ ; loneliness:  $t = -6.43$ ,  $p < 0.001$ ; life satisfaction:  $t = 8.53$ ,  $p < 0.001$ ; wellbeing:  $t = 6.45$ ,  $p < 0.001$ ), although mean anxiety did not appear to differ by face covering category (Figure 1). In general, mental health among less adherent groups also appears to be more broadly distributed.

Linear (and ordinal for loneliness) regression models of mental health outcomes are presented in Table 1. These models were fully adjusted for pre-COVID-19 mental health, which was operationalized through depression or anxiety relevant



**Table 1. Standardised regression coefficients and 95% confidence intervals for fully adjusted linear regression models of following government guidance on wearing face coverings and mental health and wellbeing outcomes.**

Variable	Depression		Anxiety		Outcomes		Life satisfaction		Wellbeing	
	ordinary least squares	ordinary least squares	ordinary least squares	ordered logistic	ordinary least squares	ordered logistic	ordinary least squares	ordinary least squares	ordinary least squares	ordinary least squares
<b>Following guidance on wearing face coverings (higher values indicate more adherence)</b>	<b>-0.04*** (-0.05, -0.02)</b>	<b>-0.02* (-0.04, -0.005)</b>	<b>-0.11* (-0.21, -0.02)</b>	<b>0.04*** (0.02, 0.06)</b>	<b>0.04*** (0.02, 0.06)</b>	<b>0.02** (0.01, 0.03)</b>	<b>0.02** (0.01, 0.03)</b>	<b>0.06*** (0.04, 0.08)</b>	<b>0.06*** (0.04, 0.08)</b>	<b>0.02** (0.01, 0.03)</b>
Age	-0.15*** (-0.17, -0.13)	-0.08*** (-0.11, -0.06)	0.0001 (-0.13, 0.13)	0.04*** (0.03, 0.06)	0.02 (-0.01, 0.04)	0.08 (-0.03, 0.18)	0.02 (-0.01, 0.04)	0.06*** (0.04, 0.08)	0.01 (-0.01, 0.02)	0.19*** (0.17, 0.21)
Sex (female)	0.04*** (0.03, 0.06)	0.02 (-0.0001, 0.03)	0.08 (-0.03, 0.18)	0.04*** (0.02, 0.06)	-0.01 (-0.03, 0.01)	0.03*** (0.01, 0.05)	-0.05*** (-0.07, -0.03)	-0.01 (-0.02, 0.01)	-0.02* (-0.04, -0.003)	-0.03*** (-0.04, -0.01)
Conscientiousness	-0.05*** (-0.06, -0.03)	0.03*** (0.01, 0.05)	0.11* (0.004, 0.21)	0.02* (0.005, 0.04)	-0.03*** (-0.05, -0.01)	0.04*** (0.03, 0.06)	-0.01 (-0.02, 0.01)	0.06*** (0.05, 0.08)	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)
Extraversion	0.01 (-0.005, 0.02)	0.04*** (0.03, 0.06)	0.34*** (0.24, 0.45)	-0.01 (-0.03, 0.004)	-0.05*** (-0.06, -0.03)	-0.29*** (-0.31, -0.27)	-0.05*** (-0.06, -0.03)	0.01 (-0.01, 0.02)	0.19*** (0.17, 0.21)	0.01 (-0.01, 0.02)
Emotional stability	-0.25*** (-0.27, -0.23)	-0.29*** (-0.31, -0.27)	-0.60*** (-0.74, -0.45)	0.04*** (0.02, 0.06)	0.06*** (0.04, 0.08)	0.04*** (0.02, 0.06)	0.06*** (0.04, 0.08)	0.01 (-0.01, 0.02)	0.19*** (0.17, 0.21)	0.01 (-0.01, 0.02)
Number of people living with	-0.004 (-0.02, 0.01)	0.04*** (0.02, 0.06)	-0.07 (-0.20, 0.06)	0.02* (0.005, 0.04)	-0.01 (-0.03, 0.01)	0.04*** (0.02, 0.06)	-0.01 (-0.03, 0.01)	0.01 (-0.01, 0.02)	0.19*** (0.17, 0.21)	0.01 (-0.01, 0.02)
Accommodation type	0.02* (0.004, 0.04)	0.02* (0.005, 0.04)	0.07 (-0.04, 0.17)	-0.01 (-0.03, 0.004)	-0.03*** (-0.05, -0.01)	0.02* (0.005, 0.04)	-0.03*** (-0.05, -0.01)	0.01 (-0.01, 0.02)	0.19*** (0.17, 0.21)	0.01 (-0.01, 0.02)
Rooms in house	-0.01 (-0.03, 0.005)	-0.01 (-0.03, 0.004)	-0.18** (-0.30, -0.05)	0.04*** (0.02, 0.06)	-0.01 (-0.02, 0.01)	-0.01 (-0.03, 0.004)	-0.01 (-0.02, 0.01)	0.01 (-0.01, 0.02)	0.19*** (0.17, 0.21)	0.01 (-0.01, 0.02)
Student (yes)	0.04*** (0.02, 0.06)	0.04*** (0.02, 0.06)	0.09 (-0.02, 0.20)	0.04*** (0.02, 0.06)	-0.003 (-0.02, 0.02)	0.04*** (0.02, 0.06)	-0.003 (-0.02, 0.02)	0.01 (-0.01, 0.02)	0.19*** (0.17, 0.21)	0.01 (-0.01, 0.02)
General health	0.10*** (0.08, 0.12)	0.02 (-0.004, 0.04)	-0.02 (-0.15, 0.10)	0.02 (-0.004, 0.04)	-0.03*** (-0.05, -0.01)	-0.02 (-0.15, 0.10)	-0.03*** (-0.05, -0.01)	-0.05*** (-0.06, -0.03)	0.19*** (0.17, 0.21)	-0.05*** (-0.06, -0.03)
Mental health	0.22*** (0.19, 0.24)	0.15*** (0.12, 0.17)	0.68*** (0.53, 0.83)	0.15*** (0.12, 0.17)	-0.11*** (-0.13, -0.08)	0.68*** (0.53, 0.83)	-0.11*** (-0.13, -0.08)	-0.16*** (-0.18, -0.13)	0.19*** (0.17, 0.21)	-0.16*** (-0.18, -0.13)
Do you live with a partner? (yes)	-0.06*** (-0.07, -0.04)	-0.04*** (-0.06, -0.02)	-0.92*** (-1.03, -0.82)	-0.04*** (-0.06, -0.02)	0.07*** (0.05, 0.09)	-0.92*** (-1.03, -0.82)	0.07*** (0.05, 0.09)	0.08*** (0.06, 0.09)	0.19*** (0.17, 0.21)	0.08*** (0.06, 0.09)
Resilience	-0.11*** (-0.12, -0.09)	-0.21*** (-0.23, -0.19)	-0.74*** (-0.87, -0.61)	-0.21*** (-0.23, -0.19)	0.24*** (0.22, 0.26)	-0.74*** (-0.87, -0.61)	0.24*** (0.22, 0.26)	0.34*** (0.32, 0.36)	0.19*** (0.17, 0.21)	0.34*** (0.32, 0.36)
Educational qualification	0.003 (-0.01, 0.02)	-0.001 (-0.02, 0.02)	-0.13* (-0.23, -0.03)	-0.001 (-0.02, 0.02)	-0.02** (-0.04, -0.01)	-0.13* (-0.23, -0.03)	-0.02** (-0.04, -0.01)	-0.03*** (-0.05, -0.02)	0.19*** (0.17, 0.21)	-0.03*** (-0.05, -0.02)
Loneliness before lockdown			1.14*** (1.04, 1.24)			1.14*** (1.04, 1.24)			0.19*** (0.17, 0.21)	
Life satisfaction before lockdown					0.27*** (0.25, 0.29)		0.27*** (0.25, 0.29)		0.19*** (0.17, 0.21)	

Variable	Depression			Anxiety			Outcomes		
	ordinary least squares	ordered logistic	Life satisfaction	ordinary least squares	ordered logistic	Life satisfaction	ordinary least squares	ordered logistic	Life satisfaction
Has an anxiety or depression diagnosis (yes)	0.05*** (0.03, 0.07)			0.04*** (0.02, 0.06)					
How regularly do you meet with family?	0.001 (-0.01, 0.02)			-0.01 (-0.02, 0.01)			0.04*** (0.02, 0.05)		0.06*** (0.04, 0.07)
How regularly do you meet with friends?	-0.04*** (-0.05, -0.03)			-0.07*** (-0.09, -0.05)			0.06*** (0.04, 0.07)		0.05*** (0.03, 0.06)
When leaving your home, how likely are you to come into close contact with others?	-0.003 (-0.02, 0.01)			-0.001 (-0.02, 0.01)			0.01 (-0.01, 0.03)		0.02* (0.004, 0.03)
Have you had COVID? (yes)	0.04*** (0.02, 0.05)			0.04*** (0.02, 0.05)			-0.03*** (-0.04, -0.01)		-0.02*** (-0.03, -0.01)
Are you at severe risk from COVID? (yes)	0.01 (-0.01, 0.02)			0.02** (0.01, 0.04)			-0.03*** (-0.05, -0.02)		-0.01 (-0.03, 0.003)
Intercept	0.01*** (0.004, 0.02)			0.03*** (0.02, 0.04)			-0.01*** (-0.02, -0.01)		-0.02*** (-0.03, -0.01)
Observations	9,544			9,745			10,268		10,370
R <sup>2</sup>	0.48			0.40					0.34
Adjusted R <sup>2</sup>	0.48			0.40					0.34
Residual Std. Error	0.34 (df = 9522)			0.38 (df = 9723)			0.40 (df = 10348)		0.36 (df = 10352)
F Statistic	415.70*** (df = 21; 9522)			314.61*** (df = 21; 9723)			259.31*** (df = 21; 10348)		468.47*** (df = 20; 10352)

Note: \*p<0.05; \*\*p<0.01; \*\*\*p<0.005

diagnoses for post-COVID-19 depression and anxiety scores, and through self-reported assessment of pre-COVID-19 loneliness and life satisfaction for those outcomes. Only subjective psychological wellbeing could not be adjusted in this way. Models included potentially confounding sociodemographic (e.g. age, sex, income), personality (e.g. conscientiousness, resilience), behavioural (e.g. how often an individual leaves their home and encounters others), and health covariates (e.g. having had COVID-19, shielding status). The full selection of confounders is given in [Table 1](#) and described in the methods and earlier in the results. After adjustment better adherence to guidance on wearing face coverings was significantly associated with better mental health and wellbeing across all measures (depression:  $t = -3.78$ ,  $p < 0.001$ ; anxiety:  $t = -2.52$ ,  $p = 0.012$ ; loneliness:  $t = -2.34$ ,  $p = 0.014$ ; life satisfaction:  $t = 5.03$ ,  $p < 0.001$ ; wellbeing:  $t = 2.78$ ,  $p = 0.006$ ), even controlling for prior mental health and wellbeing, as well as other potentially confounding covariates.

The outcomes can also categorise individuals as having either poor mental health in a particular domain or not ([Kwong et al., 2020](#)). We fit logistic regression models with these outcomes, which give the odds of having poor mental health or wellbeing depending on degree of adherence. For each outcome, we fit basic and fully adjusted models. Basic logistic regression models controlled for age and sex. Fully adjusted models controlled for all the variables described in the methods section, as with our linear regression models. The results of the logistic regression models (depression:  $z = -2.16$ ,  $p = 0.031$ ; anxiety:  $z = -2.85$ ,  $p = 0.004$ ; loneliness:  $z = -2.93$ ,  $p = 0.003$ ; life satisfaction:  $z = -4.33$ ,  $p < 0.001$ ; wellbeing:  $z = -2.27$ ,  $p = 0.023$ ) accord well with those presented in [Table 1](#) and [Figure 1](#). Except for depression, there were significant associations between wearing a face covering “most of the time” or “always” and better mental health. Odds ratio are illustrated in [Figure 2](#), and the fully adjusted odds ratios are described in the following paragraphs.

The odds of feeling anxious were 58% lower among individuals who “always” adhered to guidance on wearing face coverings (adjusted OR=0.42, 95% CI=0.24 to 0.76,  $p=0.004$ ), whilst the odds of having depressive symptoms were 25% lower among individuals who “always” adhered to guidance on face coverings (adjusted OR=0.75, 95% CI=0.40 to 1.42,  $p=0.36$ ). The odds of feeling lonely most or all of time were 67% lower among individuals who always wore face coverings (adjusted OR=0.33, 95% CI=0.17 to 0.64,  $p<0.001$ ), the odds of being satisfied with life were 60% higher among individuals who “always” wore face coverings (adjusted OR=0.40, 95% CI=0.25 to 0.65,  $p<0.001$ ), and the odds of low wellbeing were 62% lower among individuals who “always” wore face coverings (adjusted OR=0.38, 95% CI=0.21 to 0.71,  $p=0.001$ ).

Wearing a face covering “some of the time” was associated with 74% lower odds of poor wellbeing compared to those who “never” adhered (OR=0.26, 95% CI=0.10 – 0.67,  $p=0.006$ ), but otherwise, wearing a face covering only “some of the time”

was not significantly associated with good mental health. Although adhering to guidance on wearing face coverings “most of the time” was significantly associated with good mental health and wellbeing for all the same outcomes as “always” adhering, the associations were not as strong, except for loneliness and anxiety. Wearing face coverings “most of the time” appeared to have a slightly stronger association with less loneliness (OR=0.32, 95% CI=0.15 – 0.72,  $p=0.005$ ) and anxiety (OR= 0.41, 95% CI=0.21 – 0.82,  $p=0.011$ ).

### Characteristics of individuals who do not adhere to face covering guidance

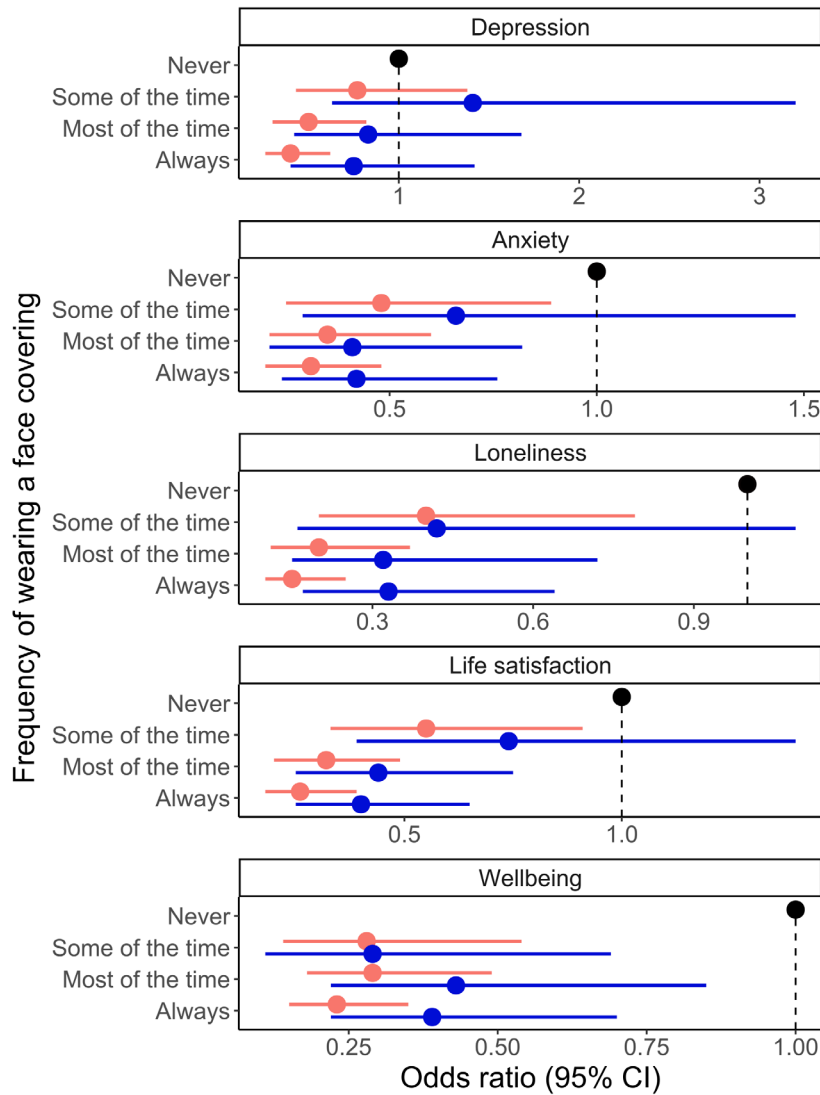
To better understand what characterizes individuals who do not often wear face coverings we dichotomised this variable: non-coverers were individuals who reported adhering to guidance “some of the time” or “never” and coverers were individuals who reported adhering “most of the time” or “always”. We then examined univariate associations between membership in non-covering group and key sociodemographic variables.

In a series of  $t$  and  $\chi^2$  tests we found the associations presented in [Table 2](#): Not wearing a face covering was associated with being male, living with fewer people (including living alone), living in smaller, less secure homes, reporting either a physical or mental health diagnosis, being at severe risk (i.e. shielding), having already had COVID-19, having lower income, and living in more deprived areas. These significant variables were entered into a logistic regression model predicting category of face covering behavior ([Table 3](#)). In this model, being male, having had COVID, and having lower income were the only significant predictors of not adhering to guidance on wearing face coverings.

### Discussion

Adhering to government guidance on wearing face coverings was not associated with poorer mental health or wellbeing, nor with a negative impact on mental wellbeing, all else being equal. Indeed, the opposite appears to be the case: stronger adherence to guidelines is associated with less anxiety and loneliness, and higher life satisfaction and wellbeing. Moreover, the relationships among wearing face coverings and having better mental health and wellbeing could not be explained by relevant psychological, medical, sociodemographic, or behavioral factors.

Many of our control variables were associated with multiple aspects of mental health and wellbeing ([Table 1](#)), yet the associations between wearing face coverings and mental health outcomes survived adjustment. For instance, trait extraversion, a measure of an individual’s overall sociality, as well as frequency of leaving one’s home for personal encounters or how often one meets with friends or family, are all indicators of how often an individual is likely to leave their home to interact with people. Close (unshielded) person-to-person interaction is far and away the most common way the coronavirus is spread ([Desai & Patel, 2020](#); [World Health Organization, 2020](#)); it has a strong bearing on international guidance on the value of face coverings as an easily adopted, low



**Figure 2. Minimally and fully adjusted odds ratios and confidence intervals for associations between wearing face coverings and mental health or wellbeing.** All outcomes were categorised such that a positive event represented having poor mental health for that measure, so odds ratios (ORs) less than 1 indicate lower odds of having poor mental health or wellbeing. Light red dots and bars indicate ORs and 95% confidence intervals (CIs) for models adjusted for only age and sex, whereas blue dots and bars indicate ORs and 95% CIs for models fully adjusted for all relevant covariates (see methods and Table 1 for listings of covariates). Black dots indicate the reference category, which was always “never”.

cost mitigation measure. Nevertheless, including socialization variables as controls did not remove the association between wearing face coverings and mental wellbeing, suggesting that what a person does while wearing a face covering cannot be wholly responsible for mental wellbeing differences. Similarly, whether an individual already had poor mental health or wellbeing, or was predisposed to having poor mental wellbeing – either through low psychological resilience or having a previous mental health diagnosis – did not eliminate the association between wearing a face covering and better mental wellbeing. All this holds true for the range

of socioeconomic and demographic variables we included that are known to relate to mental health and wellbeing outcomes (Stewart-Brown *et al.*, 2015; Yu & Williams, 1999). There may simply be something about wearing a face covering that makes people feel safer and reassured that they are “doing the right thing” for themselves and their community.

Relationships with wearing face coverings were found across all mental health and wellbeing measures, thus implying an underlying commonality. The only measure that was not fully

**Table 2. Tests of univariate associations between face covering category membership and key variables.**

Variable	t or $\chi^2$		df
Age	1.63		304
Sex (female)	6.84	**	1
Number of people living with	2.66	**	304
Accommodation type	-2.60	**	290
Rooms in house	4.51	***	294
Any physical health condition	8.85	***	1
Any mental health condition	12.54	***	1
Do you live alone?	14.42	***	1
Educational qualification	1.91		291
Have you had COVID?	5.15	*	1
Are you at severe risk from COVID?	11.76	***	1
Are you a key worker?	2.44		1
Income	3.82	***	194
Area deprivation	3.88	***	230

Note: df=1 indicates a  $\chi^2$  test, all others are *t* tests. \**p*<0.05; \*\**p*<0.01; \*\*\**p*<0.005

**Table 3. Standardised regression coefficients and 95% confidence intervals for logistic regression model predicting non-face covering behaviour.**

Variable	
Sex (female)	-0.54 *** (-0.87, -0.22)
Number of people living with	-0.28 (-0.77, 0.21)
Accommodation type	0.04 (-0.29, 0.38)
Rooms in house	-0.39 (-0.84, 0.06)
Any physical health condition	0.26 (-0.09, 0.62)
Any mental health condition	0.20 (-0.13, 0.54)
Do you live alone?	-0.18 (-0.58, 0.22)
Have you had COVID?	0.31 * (0.03, 0.60)
Are you at severe risk from COVID?	0.12 (-0.21, 0.44)
Income	-0.42 * (-0.79, -0.05)
Area deprivation	-0.33 (-0.67, 0.01)
Constant	-4.01 (-4.20, -3.82)
Observations	6912
Log Likelihood	-670.61

Note: \**p*<0.05; \*\**p*<0.01; \*\*\**p*<0.005

consistent was depression, which may be due to relatively fewer reports of increased depressive symptoms post-pandemic, compared to other mental health and wellbeing measures (Kwong *et al.*, 2020).

The type of individual who was not inclined to wear face coverings tended to more often be male, have low income, and have already had COVID-19. Public health messaging targeted at males is one potential approach to closing this gap. Individuals who have low income might not have disposable income they want to spend on face coverings or may not have the time to make face coverings at home. Making face coverings easily available and free of charge could help with this. Individuals who believe they already had COVID-19 may understandably believe that they will not be at risk for future infection, although the vast majority of individuals in our sample only believed they had COVID-19; this was not confirmed by a test. Again, clear public health messaging that emphasizes that reinfection and asymptomatic transmission are possible, particularly in light of novel variants (Stokel-Walker, 2021), could help.

There are several limitations to this study. The study is observational, not experimental, and while every effort has been made to control for all available characteristics that might influence mental health, this type of evidence is not as strong as evidence from experimental interventions. Unfortunately, there may be difficult logistical and ethical concerns with carrying out an experiment on face covering use. While large, this study's generalisability may be limited by the fact that participants were only from the UK; furthermore, most participants lived in Scotland. While this research was able to take advantage of the longitudinal structure of the CovidLife surveys, all measures were self-reported, and were unable to look at change in face covering use over time.

This study accords with earlier work that found that not adhering to guidance on wearing face coverings can be viewed negatively by others (Betsch *et al.*, 2020). It reveals another side to adherence behaviour: regardless of whether stigmatisation or discomfort felt while wearing a face covering do or do not harm mental health and wellbeing, people who do not wear face coverings have lower mental health than those who do. Again, our results cannot be entirely explained by prior mental health or other factors.

Wearing face coverings in public can protect others from contracting coronavirus infections (Howard *et al.*, 2020), but high uptake is necessary to prevent deaths from COVID-19 (Eikenberry *et al.*, 2020; Howard *et al.*, 2020) and reduce stigma (Betsch *et al.*, 2020), and voluntary policy does not appear to meet these thresholds (Eikenberry *et al.*, 2020). Our findings from the CovidLife Surveys countermand speculation that face coverings may have a negative effect on mental health and wellbeing. Our data in fact provide strong evidence that following government guidance on face coverings

is associated with better rather than poorer mental health and wellbeing. This evidence could be an important motivator for continued advocacy and messaging by policy makers and adherence by members of the public.

## Data availability

### Underlying data

CovidLife data access is through a system of managed open access. The steps below highlight how to apply for access to CovidLife data. Non-identifiable information from CovidLife is available to researchers in the UK and to international collaborators through application to the Generation Scotland Access Committee ([access@generationscotland.org](mailto:access@generationscotland.org)). The Generation Scotland data access process includes an application form, and proposals are reviewed by the Generation Scotland Access Committee. The data collected by the CovidLife surveys have been incorporated in the main Generation Scotland dataset and governance process. Summary information to help researchers assess the feasibility and statistical power of a proposed project is available on request by contacting [resources@generationscotland.org](mailto:resources@generationscotland.org).

## Extended data

Zenodo: Primary analysis script for “Face covering adherence is positively associated with better mental health and wellbeing: a longitudinal analysis of the CovidLife surveys”. <https://doi.org/10.5281/zenodo.4577697> (Altschul, 2021).

This project contains the following extended data:

- Analysis script
- CovidLife questionnaires 1 and 2

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/) (CC-BY 4.0).

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# Open Peer Review

Current Peer Review Status: ? ✓

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## Version 1

Reviewer Report 07 July 2021

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✓ **Agata Chudzicka-Czupala** 

Faculty of Psychology, SWPS University of Social Sciences and Humanities, Katowice, Poland

The manuscript addresses a very interesting topic, analyzing an issue of whether wearing face masks or other face coverings during the COVID-19 pandemic is associated with mental health and well-being. Authors underline that face coverings which are effective at reducing airborne infection rates are the source of complaints of inconvenience and discomfort. This may suggest they reduce quality of life and may be connected with poorer mental health.

So the main aim of the study was to check the possible connection between individuals' adherence to following guidance on wearing face coverings and several mental health outcomes: depression, anxiety, wellbeing, life satisfaction, and loneliness. Some sociodemographic, economic and social variables were also measured and included into study model.

### Introduction and objectives:

In my opinion, the study is well justified in Introduction and the objectives of it are clear. The sources chosen by Authors are adequate.

### Method:

The tools used in this study are well described. They were claimed with psychometric properties. However, it is not clearly mentioned in the current manuscript.

### Results:

All the steps, analyses, both measures, and results are well described.

### Discussion and conclusions:

The discussion section offers some interesting ideas for the practice (public health messaging targeted at men, making face coverings easily available and free of charge ).

The Authors point some limitations of their study and show future research directions.

The article has been written clearly. The language of the paper meets the standards of academic English used in scientific journals.

My only doubt is connected with using some wording that may suggest discovering causal relations between variables. This may lead to misinterpretation of the meaning of the results and



may be slightly confusing for the reader.

The Authors collected correlational data and I think they properly described the results, but they should check the language of the manuscript more carefully to avoid using words and sentences suggesting an interpretation of their own findings as causation (effect, influence, etc.). That is why I would suggest changing some sentences regarding the aim of the study and its results, e.g. "Evidence for or against an impact of wearing face coverings on individuals' lived experience would be valuable" (Introduction), or „Adhering to government guidance on wearing face coverings was not associated with poorer mental health or wellbeing, nor with a negative impact on mental wellbeing..“ (Discussion), and "These results suggest that wearing face coverings more often does not negatively impact mental health" (Abstract).

Summing up, I found the manuscript and the study itself very interesting. More studies are needed to fully understand the factors which influence human behaviour during the pandemic. I believe this study is an important step in this direction. Thank you for the opportunity to review this work.

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

Yes

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

Yes

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

Yes

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

Yes

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

Yes

**Are the conclusions drawn adequately supported by the results?**

Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** clinical psychology, social psychology, work and organizational psychology

**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.**

Reviewer Report 24 March 2021

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**Trish Greenhalgh**

Nuffield Department of Primary Care Health Sciences, University of Oxford, Oxford, UK

Most interesting paper. I am not a quantitative researcher but my concern is that the association of mask compliance with mental health/wellbeing may be due to confounding variables (notably SES) that are not fully controlled for. Mask compliance from the outset was seen as (quoting Allyson Pollock here) "very middle class". Being poor predicts mask noncompliance, and also links with poor mental health. Not enough is made of this. The ASSOCIATION between masking and higher wellbeing cannot be assumed to be causal - indeed it is I think more likely to be incidental. I may be wrong but I'd like to see this discussed in a more circumspect way.

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

Yes

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

Yes

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

Yes

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

I cannot comment. A qualified statistician is required.

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

Partly

**Are the conclusions drawn adequately supported by the results?**

Partly

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Qualitative research, public health

**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.**

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