# Clusters of self-reported behaviours and adherence in those who had COVID-19 symptoms

4th December 2020

# Executive summary

* For these analyses, we selected only individuals who reported having had symptoms of COVID-19 (cough, high temperature / fever, loss of sense of smell, loss of sense of taste) in the last 7 days.
* Four distinct groups of self-reported behaviour were identified (general cleanliness, going out, wearing protective items, and response to symptoms).
* Two distinct patterns of behaviour were identified. Groups differed by self-reported self-isolation behaviour.
	+ The group that self-isolated also reported going shopping less frequently and engaging in cleanliness behaviours more frequently.
* When controlling for socio-demographic characteristics, the only factor strongly associated with belonging to the group that self-isolated after developing symptoms was lower credibility of the government. This is likely confounded by a range of other attitudes towards government and the pandemic.
* Due to small sample sizes in regression analyses, we had limited power to detect smaller effects.

**Methods**

Design

Online cross-sectional survey conducted by BMG Research on behalf of the Department of Health and Social Care, England. Data were collected between 3 August 2020 (wave 26) and 14 October 2020 (wave 30).

Participants

Participants who indicated that they had experienced symptoms of COVID-19 (cough, high temperature / fever, loss of sense of smell, loss of sense of taste) in the last seven days.

Study materials

*Behaviour items*

Participants were asked how often in the last seven days they had completed a range of protective behaviours from a list of twenty-one behaviours. Behaviours included hand washing, cleaning and disinfecting surfaces, reducing the number of people you meet, avoiding social gatherings, socialising indoors rather than outdoors, carrying, using and disposing of tissues, and wearing a face covering or protective gloves.

We asked participants how often in the last seven days they had left their home for a number of reasons including to go to the shops for groceries/pharmacy, to go to the shops for other things, and to go for a walk or some other exercise.

We asked participants to select which modes of transport they had used in the last seven days from a list including public transport, someone else’s car, and taxi.

Participants who reported that they had experienced either a cough, high temperature / fever, or loss of sense of smell or taste were asked which actions they had taken. This list included staying at home for seven, ten, or fourteen days (not leaving the home at all) and requesting a test to confirm whether you had COVID-19. Participants who indicated that a household member had not experienced symptoms in the last seven days were asked what they would do if their household member were to develop symptoms. Response options including self-isolating for seven, ten, or fourteen days (not leaving the home at all).

We also asked participants if they had downloaded the new COVID-19 app.

*Personal and clinical characteristics*

Participants were asked to report their age, gender, employment status, socio-economic grade, highest educational or professional qualification, ethnicity, how many people lived in their household and their marital status. Participants also reported whether: there was a dependent child in the household; they or a household member had a chronic illness; they worked in a key sector; and whether they were self-employed (question only asked if participants indicated they were employed). Participants were asked for their full postcode, from which region and indices of multiple deprivation were determined.(1)

We created a quadratic term for age, to test for a non-linear relationship. We coded participants as having a chronic illness that made them clinically vulnerable to COVID-19 using guidance from the NHS website.(2) Participants were categorised as working in a key sector if they worked in health or social care; education and childcare; key public services; local or national Government; food and essential goods; public safety and national security; transport; or utilities, communication and financial services.(3)

We asked participants if they thought they had had COVID-19, and what they thought the most common symptoms of COVID-19 were. As a measure of financial hardship, participants were asked to what extent in the past seven days they had been struggling to make ends meet, skipping meals they would usually have, and were finding their current living situation difficult.

### Psychological factors

We asked participants how worried they were about COVID-19, and to what extent they thought COVID-19 posed a risk to themselves and others in the UK.

Participants were asked to what extent they agreed that an effective way to prevent the spread of COVID-19 was to test people with symptoms to confirm whether they had COVID-19. We also asked participants to what extent they agreed that if they wanted to they could book an antigen test online or by telephone, go to a drive-through testing centre, get a home-testing kit for coronavirus delivered, and return a completed home-testing kit for coronavirus by courier.

We asked participants to what extent they agreed that someone could spread coronavirus to other people even if they did not have symptoms yet, and that their personal behaviour had an impact on how coronavirus spreads.

An adapted form of the Meyer Credibility Index was used to measure perceived credibility of the Government.(4)

Analyses

Due to smaller sample sizes when considering only people who reported recent COVID-19 symptoms, we pooled data collected between 3 August and 14 October 2020 (waves 26 to 30). Given the large number of independent variables, we are using a significance level of *p* < 0.001.

*Feature identification*

To aid feature identification, we used dimension reduction techniques. We used an exploratory factor analysis, using a direct oblimin rotation as we expected factors to be correlated. All behaviour and intended behaviour items were included in the factor analysis. We determined the number of factors by using a scree plot.

We then chose two representative items from each factor identified to calculate dissimilarities. Items were selected based on their loadings on to each factor and the validity of the behaviours. All items were transformed to a 0 to 1 scale and squared Euclidean distances were used.

*Cluster analysis*

We took an inductive approach, using hierarchical cluster analysis to identify patterns of uptake or intended uptake of protective behaviours. Ward’s method of clustering was used.

*Regression analyses*

Having identified two clusters, to identify personal and clinical characteristics and psychological factors associated with membership of those clusters, we used logistic regression analyses (univariable and multivariable). Due to small sample sizes, multivariable regressions adjusted for socio-demographic factors associated with cluster in univariable analyses (p<.05; age, employment status, education, ethnicity).

All analyses were conducted in SPSS 26.

**Results**

## Factor analysis

We identified four factors:

1. General cleanliness – hand washing, disinfecting surfaces, limiting the amount you touch your face
2. Going out – number of times one has been out in the last week for various reasons
3. Wearing protective items – wearing a face covering, protective gloves
4. Response to symptoms – self-isolation and requesting a test

For each factor, we selected two items for the cluster analysis (see table 1).

Table 1. Items included in cluster analysis

|  |
| --- |
| **General cleanliness** |
| In the past seven days, have you…washed your hands thoroughly and regularly with soap and water  | In the past seven days, have you…cleaned or disinfected surfaces you might touch (such as door knobs or hard surfaces) |
| **Going out** |
| Please enter the number of times you have been out of your home in the last seven days, for each of the following reasons? To go to the shops for groceries/pharmacy | Please enter the number of times you have been out of your home in the last seven days, for each of the following reasons? To go to the shops for things other than groceries / pharmacy |
| **Wearing protective items** |
| In the past seven days, have you…worn a homemade, cloth or improvised face covering (such as a scarf) when out and about | In the past seven days, have you… worn protective gloves when out and about |
| **Response to symptoms** |
| You said that you have had [insert symptoms] in the past seven days. While you had these symptoms, which actions, if any, did you take? I am currently staying at home for seven, ten or fourteen days (not leaving the home at all) | You said that you have had [insert symptoms] in the past seven days. While you had these symptoms, which actions, if any, did you take? I requested a test to confirm whether I have coronavirus |

## Cluster analysis

Cluster analysis produced two clusters of patterns of protective behaviour. These groups differed by self-isolation behaviour (see Box 1).

Box 1. Patterns of self-reported protective behaviour identified by inductive cluster analysis.

|  |
| --- |
| Group 1 “Did not self-isolate” (n=465). Members of this group did not self-isolate after developing symptoms. They also reported going shopping more frequently and engaging in cleanliness behaviours less frequently.Group 2 “Self-isolated” (n=90). Members of this group self-isolated after developing symptoms. They also reported going shopping less frequently and engaging in cleanliness behaviours more frequently. |

## Regression analyses

People who belonged to the more adherent group (who self-isolated) were more likely to be older; less educated; be able to identify key symptoms of COVID-19; and perceive lower credibility of the government (see table 2).

Table 2. Socio-demographic factors associated with group membership.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Participant characteristics | Level | Did not self-isolate (Group 1), n=465 | Self-isolated (Group 2), n=90 | Odds ratio for being in Group 2 (95% CI) | p-value | Adjusted odds ratio for being in Group 2 (95% CI)† | p-value |
| Survey wave | Overall | - | - | χ2(4)=9.1 | .06 | χ2(4)=9.2 | .06 |
| 3 to 5 August 2020 (wave 26) | 91 (87.5) | 13 (12.5) | Reference | **-** | Reference | **-** |
| 1 to 2 September 2020 (wave 27) | 98 (80.3) | 24 (19.7) | 1.71 (0.82 to 3.57) | .15 | 1.64 (0.74 to 3.63) | .22 |
| 14 to 16 September 2020 (wave 28) | 105 (87.5) | 15 (12.5) | 1.00 (0.45 to 2.21) | 1.00 | 0.71 (0.30 to 1.68) | .43 |
| 28 to 30 September 2020 (wave 29) | 97 (87.4) | 14 (12.6) | 1.01 (0.45 to 2.26) | .98 | 0.82 (0.35 to 1.94) | .65 |
| 12 to 14 October 2020 (wave 30) | 74 (75.5) | 24 (24.5) | 2.27 (1.08 to 4.77) | .03 | 1.77 (0.80 to 3.94) | .16 |
| Region | Overall | - | - | χ2(3)=1.8 | .61 | χ2(3)=0.8 | .84 |
| England – Midlands (East and West) | 84 (82.4) | 18 (17.6) | Reference | **-** | Reference | **-** |
| North England (North East, North West, Yorkshire and the Humber) | 107 (83.6) | 21 (16.4) | 0.92 (0.46 to 1.83) | .80 | 0.75 (0.36 to 1.58) | 0.46 |
| South England (South East, South West, London, East of England) | 216 (85.7) | 36 (14.3) | 0.78 (0.42 to 1.44) | .43 | 0.88 (0.46 to 1.7) | 0.71 |
| Northern Ireland / Scotland / Wales  | 58 (79.5) | 15 (20.5) | 1.21 (0.56 to 2.59) | .63 | 1.04 (0.46 to 2.37) | 0.92 |
| Gender | Male | 262 (86.8) | 40 (13.2) | Reference | **-** | Reference | **-** |
| Female | 202 (80.2) | 50 (19.8) | 1.62 (1.03 to 2.55) | .04 | 1.59 (0.98 to 2.58) | .06 |
| Age | Raw age | N=465, M=35.2, SD=13.7 | N=90, M=41.5, SD=16.2 | **1.03 (1.01 to 1.04)** | **<.001** | 1.02 (1.00 to 1.04) | .02 |
| Age – quadratic (age-mean)2 | **-** | **-** | **-** | **-** | **-** | 1.000 (0.999 to 1.001) | .58 |
| Dependent child in household | None | 186 (79.8) | 47 (20.2) | Reference | **-** | Reference | **-** |
| Child present | 279 (86.6) | 43 (13.4) | 0.61 (0.39 to 0.96) | .03 | 0.86 (0.51 to 1.43) | .55 |
| Clinically vulnerable to COVID-19 | None | 321 (82.9) | 66 (17.1) | Reference | **-** | Reference | **-** |
| Present | 140 (86.4) | 22 (13.6) | 0.76 (0.45 to 1.29) | .31 | 0.67 (0.38 to 1.21) | .18 |
| Household member has chronic illness | None | 357 (82.8) | 74 (17.2) | Reference | **-** | Reference | **-** |
| Present | 104 (88.1) | 14 (11.9) | 0.65 (0.35 to 1.20) | .17 | 0.68 (0.36 to 1.30) | .25 |
| Employment status | Not working | 129 (76.8) | 39 (23.2) | Reference | **-** | Reference | **-** |
| Working | 331 (87.1) | 49 (12.9) | 0.49 (0.31 to 0.78) | .003 | 0.68 (0.41 to 1.14) | .14 |
| Socio-economic grade | ABC1 | 259 (82.7) | 54 (17.3) | Reference | **-** | Reference | **-** |
| C2DE | 200 (86.2) | 32 (13.8) | 0.77 (0.48 to 1.23) | .27 | 0.99 (0.59 to 1.66) | .97 |
| Index of multiple deprivation | Overall | - | - | χ2(3)=5.6 | .13 | χ2(3)=5.6 | .13 |
| 1st quartile (least deprived) | 71 (86.6) | 11 (13.4) | Reference | **-** | Reference | **-** |
| 2nd quartile | 89 (83.2) | 18 (16.8) | 1.31 (0.58 to 2.94) | .52 | 1.23 (0.52 to 2.89) | .63 |
| 3rd quartile | 127 (88.8) | 16 (11.2) | 0.81 (0.36 to 1.85) | .62 | 0.94 (0.40 to 2.23) | .89 |
| 4th quartile (most deprived) | 178 (79.8) | 45 (20.2) | 1.63 (0.80 to 3.33) | .18 | 1.86 (0.87 to 3.98) | .11 |
| Highest educational or professional qualification | GCSE/vocational/A-level/No formal qualifications | 262 (78.9) | 70 (21.1) | Reference | **-** | Reference | **-** |
| Degree or higher (Bachelors, Masters, PhD) | 203 (91.0) | 20 (9.0) | **0.37 (0.22 to 0.63)** | **<.001** | 0.44 (0.25 to 0.77) | .004 |
| Ethnicity | Overall | - | - | χ2(2)=12.9 | .002 | χ2(2)=9.3 | .01 |
| White British | 311 (79.9) | 78 (20.1) | Reference | **-** | Reference | **-** |
| White other | 81 (93.1) | 6 (6.9) | 0.30 (0.12 to 0.70) | .01 | 0.36 (0.15 to 0.88) | .03 |
| Mixed / Black / Asian / Arab / other | 73 (92.4) | 6 (7.6) | 0.33 (0.14 to 0.78) | .01 | 0.33 (0.12 to 0.86) | .02 |
| Living alone | Not living alone | 399 (84.7) | 72 (15.3) | Reference | **-** | Reference | **-** |
| Living alone | 66 (78.6) | 18 (21.4) | 1.51 (0.85 to 2.70) | .16 | 1.42 (0.73 to 2.76) | .30 |
| Work in key sectors | No | 78 (75.0) | 26 (25.0) | Reference | **-** | Reference | **-** |
| Yes | 289 (89.8) | 33 (10.2) | **0.34 (0.19 to 0.61)** | **<.001** | 0.46 (0.25 to 0.86) | .01 |
| Self-employed‡ | No | 304 (86.1) | 49 (13.9) | Reference | **-** | Reference | **-** |
| Yes | 27 (100) | 0 (0.0) | § | § | § | § |
| Marital status | Single/separated/divorced/widowed | 179 (81.7) | 40 (18.3) | Reference | **-** | Reference | **-** |
| Married/partnered | 269 (85.1) | 47 (14.9) | 0.78 (0.49 to 1.24) | .30 | 0.67 (0.4 to 1.14) | .14 |
| Ever had COVID-19 | Think have not had COVID-19 | 249 (78.1) | 70 (21.9) | Reference | **-** | Reference | **-** |
| Think or had COVID-19 confirmed | 216 (91.5) | 20 (8.5) | **0.33 (0.19 to 0.56)** | **<.001** | 0.43 (0.25 to 0.76) | .004 |
| Financial hardship | Range 3 (least hardship) to 15 (most hardship) | N=440, M=10.4, SD=2.7 | N=81, M=9.7, SD=3.0 | 0.92 (0.84 to 1.00) | .05 | 0.97 (0.88 to 1.06) | .49 |
| Identified COVID-19 symptoms | No | 377 (87.5) | 54 (12.5) | Reference | **-** | Reference | **-** |
| Yes | 88 (71.0) | 36 (29.0) | **2.86 (1.76 to 4.62)** | **<.001** | 2.06 (1.22 to 3.47) | .01 |
| Worry about COVID-19 | 5-point scale (1=not at all worried to 5=extremely worried) | N=461, M=3.7, SD=1.2 | N=89, M=3.9, SD=1.1 | 1.18 (0.97 to 1.45) | .10 | 1.21 (0.97 to 1.51) | .09 |
| Perceived risk of COVID-19 to self | 5-point scale (1=no risk at all to 5=major risk) | N=457, M=3.3, SD=1.1 | N=88, M=3.6, SD=1.2 | 1.26 (1.02 to 1.54) | .03 | 1.21 (0.97 to 1.50) | .09 |
| Perceived risk of COVID-19 to people in the UK | 5-point scale (1=no risk at all to 5=major risk) | N=456, M=3.7, SD=1.1 | N=89, M=3.9, SD=1.1 | 1.22 (0.97 to 1.52) | .08 | 1.15 (0.91 to 1.46) | .25 |
| An effective way to prevent the spread of COVID-19 is to test people with symptoms to confirm whether they have coronavirus | 5-point scale (1=strongly disagree to 5=strongly agree) | N=457, M=3.8, SD=1.1 | N=88, M=4.2, SD=0.9 | 1.46 (1.14 to 1.88) | .003 | 1.30 (1.01 to 1.68) | .04 |
| Confidence that you could book a test online or via telephone to confirm whether you have coronavirus | 5-point scale (1=strongly disagree to 5=strongly agree) | N=457, M=3.7, SD=1.1 | N=87, M=3.9, SD=1.1 | 1.20 (0.96 to 1.49) | .11 | 1.15 (0.91 to 1.45) | .24 |
| Confidence that you could go to a drive-through centre to get tested for coronavirus | 5-point scale (1=strongly disagree to 5=strongly agree) | N=451, M=3.6, SD=1.2 | N=87, M=3.9, SD=1.1 | 1.24 (1.00 to 1.53) | .05 | 1.27 (1.02 to 1.58) | .03 |
| Confidence that you could get a home-testing kit for coronavirus delivered to your home | 5-point scale (1=strongly disagree to 5=strongly agree) | N=455, M=3.7, SD=1.1 | N=88, M=3.8, SD=1.1 | 1.13 (0.91 to 1.40) | .25 | 1.07 (0.86 to 1.33) | .53 |
| Confidence that you could return a completed home-testing kit for coronavirus via courier (e.g. UPS, Hermes) | 5-point scale (1=strongly disagree to 5=strongly agree) | N=456, M=3.8, SD=1.1 | N=84, M=3.9, SD=1.2 | 1.10 (0.89 to 1.37) | .38 | 1.06 (0.85 to 1.33) | .59 |
| Someone could spread coronavirus to other people, even if they do not have symptoms yet | 5-point scale (1=strongly disagree to 5=strongly agree) | N=459, M=3.9, SD=1.0 | N=89, M=4.2, SD=1 | 1.43 (1.10 to 1.86) | .01 | 1.21 (0.91 to 1.60) | .19 |
| My personal behaviour has an impact on how coronavirus spreads | 5-point scale (1=strongly disagree to 5=strongly agree) | N=460, M=3.8, SD=1.0 | N=90, M=3.9, SD=1.1 | 1.13 (0.90 to 1.42) | .28 | 1.01 (0.80 to 1.28) | .93 |
| Perceived credibility of government | Range 4 (lowest credibility) to 20 (highest credibility) | N=431, M=13.6, SD=3.5 | N=85, M=12, SD=3.3 | **0.87 (0.81 to 0.93)** | **<.001** | **0.88 (0.82 to 0.95)** | **.001** |

† Adjusted for age (raw), employment status, education and ethnicity.

‡ Not adjusting for employment status, as by definition, everyone who was asked this question was employed.

§ Cannot be calculated due to lack of cases.

**Discussion**

* Four distinct groups of behaviour were identified (general cleanliness, going out, wearing protective items, response to symptoms).
* Two distinct patterns of behaviour were identified. Groups differed by self-isolation behaviour.
	+ The group that self-isolated also reported going shopping less frequently and engaging in cleanliness behaviours more frequently.
* When controlling for socio-demographic characteristics, belonging to the group that self-isolated after developing symptoms was strongly associated with was lower credibility of the government.
	+ It may be that this association is confounded by a range of other attitudes towards government and the pandemic.(5)
* Due to small sample sizes in regression analyses, we had limited power to detect smaller effects.
* When controlling for other socio-demographic characteristics, no individual characteristics reached our threshold for a significant association.
* Approaching significance were associations between belonging to the group that self-isolated after developing symptoms and thinking you had not previously had COVID-19 and lower education.
	+ Other UK research has also found an association between higher education and poorer following of government guidance.(6)
* Approaching significance was the overall association between belonging to the group that self-isolated after developing symptoms and not identifying as white British and working in a key sector.
	+ Targeted messaging to these groups may be considered.

**References**

1. Ministry of Housing Communities and Local Government. The English Indices of Deprivation 2019 (IoD2019) 2019 26 September 2019.

2. NHS. Who's at higher risk of coronavirus 2020 [updated 14 August 2020. Available from: https://www.nhs.uk/conditions/coronavirus-covid-19/people-at-higher-risk/whos-at-higher-risk-from-coronavirus/.

3. Cabinet Office, Department for Education. Critical workers who can access schools or educational settings 2020 [updated 16 June 2020. Available from: https://www.gov.uk/government/publications/coronavirus-covid-19-maintaining-educational-provision/guidance-for-schools-colleges-and-local-authorities-on-maintaining-educational-provision#critical-workers.

4. Meyer P. Defining and Measuring Credibility of Newspapers - Developing an Index. Journalism Quart. 1988;65(3):567-88.

5. Duffy B, Allington D, Beaver K, Meyer C, Moxham-Hall V, Murkin G, et al. The Trusting, the Dissenting and the Frustrated: how the UK is dividing as lockdown is eased 2020 [updated 7 June 2020. Available from: https://www.kcl.ac.uk/policy-institute/assets/how-the-uk-is-dividing-as-the-lockdown-is-eased.pdf.

6. Fancourt D, Bu F, Mak HW, Steptoe A. Covid-19 Social Study; Results Release 25. 2020 19 November 2020.

*Please note that this work has been conducted rapidly and has not been peer reviewed or subject to normal quality control measures.*

Dr Louise E. Smith (KCL), Professor Nicola T. Fear (KCL), Professor Susan Michie (UCL), Professor Richard Amlȏt (PHE), Dr G James Rubin (KCL), Professor Henry W.W. Potts (UCL)

Contact details: louise.e.smith@kcl.ac.uk, richard.amlot@phe.gov.uk, gideon.rubin@kcl.ac.uk, h.potts@ucl.ac.uk