# Clusters of behaviours and adherence

5th November 2020

# Executive summary

* Four distinct groups of behaviour were identified (general cleanliness, going out, response to symptoms, social distancing).
* Two distinct patterns of behaviour were identified. Groups largely differed by intention to self-isolate and request a test if symptomatic.
	+ The group that intended to self-isolate and request a test if symptomatic also reported engaging in general cleanliness and social distancing behaviours more frequently.
* People who knew the symptoms of COVID-19 and that COVID-19 can be spread even if asymptomatic were more likely to belong to the group intending to request a test and self-isolate if symptomatic.
* People who thought that testing was effective and being confident that you could request and return a test were more likely to belong to the group intending to request a test and self-isolate if symptomatic.
* Educating people about the symptoms of COVID-19 and how the virus can spread may increase intention to self-isolate request a test if symptomatic.
* Messaging emphasising the effectiveness and ease of testing may also increase intention to request a test if symptomatic.
	+ No questions were asked about perceived effectiveness and confidence that you could self-isolate in this wave of the survey.
* Women, people with a higher level of education and those reporting less financial hardship were more likely to belong to the group intending to request a test and self-isolate if symptomatic.
* Targeted messaging to men may be necessary.
* Greater support for those experiencing financial hardship may increase intention to self-isolate and request a test if symptomatic.

**Methods**

Design

Online cross-sectional survey conducted by BMG Research on behalf of the Department of Health and Social Care, England. Data were collected on 12 to 14 October 2020.

Participants

Participants who indicated that they had not 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 not experienced either a cough, high temperature / fever, or loss of sense of smell or taste were asked to imagine that they developed symptoms and were asked which actions they would take. 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).

Intention to quarantine if alerted by NHS Test and Trace was also investigated, with participants being able to select how long they would self-isolate for. Response options were for less than seven days, for seven days, for seven to ten days, for eleven to thirteen days, for fourteen days, for longer than fourteen days, would go out as usual but avoid close contact with other people, and would go out as usual.

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

*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). Multivariable regressions adjusted for region, gender, age (raw and quadratic term), presence of dependent child in household, being clinically vulnerable to COVID-19, having a household member who has a chronic illness, employment status, socio-economic grade, index of multiple deprivation, education, ethnicity, and living alone.

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. Response to symptoms – self-isolation and requesting a test
4. Social distancing – reducing the number of people one meets, avoiding social activities, avoiding public transport or taxis, socialising outdoors

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 |
| **Response to symptoms** |
| Imagine that tomorrow morning you develop symptoms of coronavirus (high temperature/fever, new, continuous cough, or a loss of taste/smell). What action would you take, if any? Stay at home for seven, ten or fourteen days (not leaving the home at all) | Imagine that tomorrow morning you develop symptoms of coronavirus (high temperature/fever, new, continuous cough, or a loss of taste/smell). What action would you take, if any? |
| **Social distancing** |
| In the past seven days, have you… avoided having guests come to your home | In the past seven days, have you… reduced the number of people you meet |

Cluster analysis

Cluster analysis produced two clusters of patterns of protective behaviour. These groups largely differed by intention to self-isolate and request a test if symptomatic (see Box 1).

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

|  |
| --- |
| Group 1 “Did not intend to self-isolate or request a test” (n=892). Members of this group did not intend to either self-isolate or request a test if symptomatic, or both. They also reported engaging in cleanliness and social distancing behaviours slightly less frequently.Group 2 “Intended to self-isolate and request a test” (n=908). Members of this group intended to self-isolate and request an antigen test if they developed symptoms. They also reported engaging in cleanliness and social distancing behaviours slightly more frequently. |

Regression analyses

People who belonged to the more adherent group (who intended to self-isolate and request a test if symptomatic) were more likely to be women; more educated; and report lesser financial hardship (see table 2).

People who belonged to the more adherent group (who intended to self-isolate and request a test if symptomatic) were more likely to perceive a greater risk of COVID-19 to people in the UK; think that antigen testing is an effective way to prevent the spread of COVID-19; be confident that they could book an test online or via telephone; be confident that they could return a completed home-testing kit for coronavirus via courier; think that someone could spread coronavirus to other people, even if they do not have symptoms yet; and think that their personal behaviour has an impact on how coronavirus spreads.

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Participant characteristics | Level | Did not intend to self-isolate or request a test (Group 1), n=892 | Intended to self-isolate and request a test (Group 2), n=908 | Odds ratio for being in Group 2 (95% CI) | p-value | Adjusted odds ratio for being in Group 2 (95% CI)† | p-value |
| Region | East Midlands | 76 (51) | 73 (49) | Reference | **-** | Reference | **-** |
| East of England | 104 (55.9) | 82 (44.1) | 0.82 (0.53 to 1.26) | .37 | 0.81 (0.51 to 1.27) | .35 |
| London | 96 (47.8) | 105 (52.2) | 1.14 (0.75 to 1.74) | .55 | 1.21 (0.77 to 1.92) | .41 |
| North East | 58 (55.8) | 46 (44.2) | 0.83 (0.50 to 1.37) | .46 | 0.84 (0.49 to 1.43) | .52 |
| North West | 88 (47.3) | 98 (52.7) | 1.16 (0.75 to 1.78) | .50 | 1.19 (0.76 to 1.87) | .45 |
| Northern Ireland | 11 (36.7) | 19 (63.3) | 1.80 (0.80 to 4.04) | .16 | 1.98 (0.85 to 4.61) | .12 |
| Scotland | 62 (44.6) | 77 (55.4) | 1.29 (0.81 to 2.06) | .28 | 1.33 (0.82 to 2.17) | .25 |
| South East | 95 (42.2) | 130 (57.8) | 1.42 (0.94 to 2.16) | .10 | 1.46 (0.94 to 2.25) | .09 |
| South West | 72 (45.6) | 86 (54.4) | 1.24 (0.79 to 1.95) | .34 | 1.19 (0.75 to 1.90) | .46 |
| Wales | 51 (54.8) | 42 (45.2) | 0.86 (0.51 to 1.44) | .56 | 0.83 (0.48 to 1.42) | .49 |
| West Midlands | 81 (54.7) | 67 (45.3) | 0.86 (0.55 to 1.36) | .52 | 0.83 (0.52 to 1.34) | .45 |
| Yorkshire and the Humber | 98 (54.1) | 83 (45.9) | 0.88 (0.57 to 1.36) | .57 | 0.84 (0.53 to 1.34) | .47 |
| Gender | Male | 429 (55.5) | 344 (44.5) | Reference | **-** | Reference | **-** |
| Female | 462 (45.2) | 561 (54.8) | **1.51 (1.25 to 1.83)** | **<.001** | **1.63 (1.33 to 1.99)** | **<.001** |
| Age | Raw age | M=50.04, SD=17.73 | M=50.21, SD=17.46 | 1.001 (0.995 to 1.006) | .84 | 1.00 (0.99 to 1.01) | .73 |
| Age – quadratic (age-mean)2 | **-** | **-** | **-** | **-** | **-** | 0.9998 (0.9995 to 1.0002) | .36 |
| Dependent child in household | None | 646 (50.0) | 647 (50.0) | Reference | **-** | Reference | **-** |
| Child present | 246 (48.5) | 261 (51.5) | 1.06 (0.86 to 1.30) | .58 | 1.01 (0.79 to 1.29) | .95 |
| Clinically vulnerable to COVID-19 | None | 700 (49.8) | 705 (50.2) | Reference | **-** | Reference | **-** |
| Present | 168 (47.3) | 187 (52.7) | 1.11 (0.88 to 1.40) | .40 | 1.07 (0.84 to 1.38) | .58 |
| Household member has chronic illness | None | 740 (50.1) | 738 (49.9) | Reference | **-** | Reference | **-** |
| Present | 128 (45.4) | 154 (54.6) | 1.21 (0.93 to 1.56) | .15 | 1.12 (0.85 to 1.48) | .42 |
| Employment status | Not working | 417 (49.3) | 428 (50.7) | Reference | **-** | Reference | **-** |
| Working | 458 (49.1) | 475 (50.9) | 1.01 (0.84 to 1.22) | .91 | 0.99 (0.78 to 1.26) | .93 |
| Socio-economic grade | ABC1 | 607 (48.3) | 650 (51.7) | Reference | **-** | Reference | **-** |
| C2DE | 263 (52.9) | 234 (47.1) | 0.83 (0.67 to 1.02) | .08 | 0.88 (0.70 to 1.11) | .27 |
| Index of multiple deprivation | 1st quartile (least deprived) | 200 (48.2) | 215 (51.8) | Reference | **-** | Reference | **-** |
| 2nd quartile | 191 (46.9) | 216 (53.1) | 1.05 (0.8 to 1.38) | .72 | 1.09 (0.81 to 1.45) | .58 |
| 3rd quartile | 240 (49.0) | 250 (51.0) | 0.97 (0.75 to 1.26) | .81 | 1.01 (0.76 to 1.33) | .97 |
| 4th quartile (most deprived) | 261 (53.5) | 227 (46.5) | 0.81 (0.62 to 1.05) | .11 | 0.95 (0.71 to 1.27) | .73 |
| Highest educational or professional qualification | GCSE/vocational/A-level/No formal qualifications | 637 (52.3) | 581 (47.7) | Reference | **-** | Reference | **-** |
| Degree or higher (Bachelors, Masters, PhD) | 255 (43.8) | 327 (56.2) | **1.41 (1.15 to 1.71)** | **.001** | **1.42 (1.13 to 1.78)** | **.002** |
| Ethnicity | White British | 754 (48.7) | 793 (51.3) | Reference | **-** | Reference | **-** |
| White other | 54 (54.0) | 46 (46.0) | 0.81 (0.54 to 1.22) | .31 | 0.74 (0.48 to 1.15) | .18 |
| Mixed | 22 (68.8) | 10 (31.3) | **0.43 (0.20 to 0.92)** | **.03** | 0.51 (0.23 to 1.14) | .10 |
| Asian / Asian British | 38 (50.0) | 38 (50.0) | 0.95 (0.60 to 1.51) | .83 | 0.78 (0.46 to 1.33) | .37 |
| Black / Black British | 15 (55.6) | 12 (44.4) | 0.76 (0.35 to 1.64) | .48 | 0.67 (0.30 to 1.51) | .33 |
| Arab / other | 4 (57.1) | 3 (42.9) | 0.71 (0.16 to 3.2) | .66 | 0.61 (0.13 to 2.92) | .54 |
| Don’t know / prefer not to say | 5 (45.5) | 6 (54.5) | 1.14 (0.35 to 3.75) | .83 | 1.11 (0.24 to 5.2) | .89 |
| Living alone | Not living alone | 702 (48.4) | 747 (51.6) | Reference | **-** | Reference | **-** |
| Living alone | 190 (54.1) | 161 (45.9) | 0.80 (0.63 to 1.01) | .06 | 0.80 (0.61 to 1.05) | .11 |
| Work in key sectors | No | 228 (50.3) | 225 (49.7) | Reference | **-** | Reference | **-** |
| Yes | 277 (48.4) | 295 (51.6) | 1.08 (0.84 to 1.38) | .55 | 1.08 (0.82 to 1.41) | .60 |
| Self-employed‡ | No | 429 (49.3) | 442 (50.7) | Reference | **-** | Reference | **-** |
| Yes | 29 (46.8) | 33 (53.2) | 1.10 (0.66 to 1.85) | .71 | 0.94 (0.53 to 1.66) | .83 |
| Marital status | Single/separated/divorced/widowed | 372 (52.6) | 335 (47.4) | Reference | **-** | Reference | **-** |
| Married/partnered | 514 (47.4) | 570 (52.6) | **1.23 (1.02 to 1.49)** | **.03** | 1.12 (0.86 to 1.45) | .40 |
| Ever had COVID-19 | Think have not had COVID-19 | 777 (49.1) | 804 (50.9) | Reference | **-** | Reference | **-** |
| Think or had COVID-19 confirmed | 115 (52.5) | 104 (47.5) | 0.87 (0.66 to 1.16) | .35 | 0.96 (0.7 to 1.31) | .79 |
| Financial hardship | Range 3 (least hardship) to 15 (most hardship) | M=8.01, SD=2.99 | M=7.41, SD=2.68 | **0.93 (0.90 to 0.96)** | **<.001** | **0.93 (0.89 to 0.96)** | **<.001** |
| Identified COVID-19 symptoms | No | 490 (62.2) | 298 (37.8) | Reference | **-** | Reference | **-** |
| Yes | 402 (39.7) | 610 (60.3) | **2.50 (2.06 to 3.02)** | **<.001** | **2.36 (1.93 to 2.90)** | **<.001** |
| Worry about COVID-19 | 5-point scale (1=not at all worried to 5=extremely worried) | N=888, M=3.44, SD=1.16 | N=907, M=3.54, SD=1.02 | 1.08 (0.99 to 1.18) | .07 | 1.07 (0.97 to 1.17) | .16 |
| Perceived risk of COVID-19 to self | 5-point scale (1=no risk at all to 5=major risk) | N=868, M=3.12, SD=1.15 | N=905, M=3.18, SD=1.01 | 1.05 (0.96 to 1.14) | .29 | 1.04 (0.95 to 1.15) | .41 |
| Perceived risk of COVID-19 to people in the UK | 5-point scale (1=no risk at all to 5=major risk) | N=879, M=3.67, SD=1.01 | N=905, M=3.82, SD=0.84 | **1.19 (1.08 to 1.32)** | **.001** | **1.20 (1.08 to 1.34)** | **.001** |
| 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=869, M=4.16, SD=1.00 | N=899, M=4.56, SD=0.68 | **1.78 (1.58 to 2.02)** | **<.001** | **1.74 (1.53 to 1.98)** | **<.001** |
| 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=848, M=3.81, SD=1.09 | N=891, M=4.01, SD=1.05 | **1.19 (1.09 to 1.30)** | **<.001** | **1.19 (1.08 to 1.31)** | **<.001** |
| 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=844, M=3.64, SD=1.24 | N=889, M=3.80, SD=1.20 | 1.11 (1.03 to 1.20) | .01 | 1.11 (1.02 to 1.21) | .01 |
| 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=850, M=3.71, SD=1.13 | N=877, M=3.90, SD=1.09 | **1.16 (1.06 to 1.26)** | **.001** | 1.15 (1.05 to 1.25) | .003 |
| 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=855, M=3.84, SD=1.06 | N=881, M=4.15, SD=0.95 | **1.36 (1.23 to 1.49)** | **<.001** | **1.33 (1.20 to 1.48)** | **<.001** |
| 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=880, M=4.25, SD=0.80 | N=901, M=4.52, SD=0.62 | **1.75 (1.52 to 2.01)** | **<.001** | **1.69 (1.45 to 1.96)** | **<.001** |
| My personal behaviour has an impact on how coronavirus spreads | 5-point scale (1=strongly disagree to 5=strongly agree) | N=884, M=3.83, SD=1.07 | N=905, M=4.19, SD=0.89 | **1.45 (1.31 to 1.60)** | **<.001** | **1.39 (1.25 to 1.54)** | **<.001** |
| Perceived credibility of government | Range 4 (lowest credibility) to 20 (highest credibility) | N=832, M=11.8, SD=3.07 | N=848, M=11.75, SD=2.64 | 0.99 (0.96 to 1.03) | .76 | 0.99 (0.95 to 1.02) | .54 |

† Adjusted for region, gender, age (raw and quadratic age term), presence of dependent child in household, being clinically vulnerable to COVID-19, having a household member who has a chronic illness, employment status, socio-economic grade, index of multiple deprivation, education, ethnicity, and living alone.

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

**Discussion**

* Four distinct groups of behaviour were identified (general cleanliness, going out, response to symptoms, social distancing).
* Two distinct patterns of behaviour were identified. Groups differed by intention to self-isolate and request a test if symptomatic.
	+ The group that intended to self-isolate and request a test if symptomatic also reported engaging in general cleanliness and social distancing behaviours more frequently.
* Women, people with a higher level of education and those reporting less financial hardship were more likely to belong to the group intending to request a test and self-isolate if symptomatic.
* Targeted messaging to men may be appropriate.
* Greater practical support for those experiencing financial hardship may increase intention to self-isolate request a test if symptomatic.
* People who perceived a greater risk of COVID-19 to people in the UK, but not oneself, were more likely to belong to the group intending to request a test and self-isolate if symptomatic.
* Greater perceived effectiveness of testing, and confidence that you can book and return a test was associated with belonging to the group intending to request a test and self-isolate if symptomatic.
* Knowledge of COVID-19 symptoms and that people can spread COVID-19 even if asymptomatic were associated with belonging to the group intending to request a test and self-isolate if symptomatic, as was thinking that your behaviour has an impact on how COVID-19 spreads.

**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.

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

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