

Factors Associated with Non-Adherence to Social Distancing Rules During The COVID-19 Pandemic: A Logistic Regression Analysis

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Research article

Keywords: COVID-19, London, pandemic, social distancing, behaviours, non-adherence

Posted Date: October 12th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-86174/v1>

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Version of Record: A version of this preprint was published on February 13th, 2021. See the published version at <https://doi.org/10.1186/s12889-021-10379-7>.

Abstract

Background: On March 23, 2020, the government of the United Kingdom told the British people to stay home, an unprecedented request designed to limit the spread of the COVID-19 virus and stop the National Health Service from being overwhelmed.

Methods: This study undertook a cross-sectional design to survey a convenience sample of 681 residents of North London on their social distancing behaviours, demographics, housing situation, politics, psychology and social support using an online questionnaire. Logistic regression was used to measure the associations between these explanatory factors and non-adherence to all social distancing rules and intentional non-adherence to social distancing rules.

Results: The majority (92.8%) of participants did not adhere to all social distancing rules and nearly half (48.6%) engaged in intentional non-adherence of rules. The odds of not adhering to all social distancing rules increased if a participant was not identified as highly vulnerable to COVID-19 [OR=4.5], had lower control over others' distancing [OR=.724], had lower control over responsibilities for which coming into contact with others was unavoidable [OR=.642], and if social distancing behaviours were reported after lockdown was first relaxed [OR=.261]. The odds of intentionally not adhering to social distancing rules increased if a participant had a lower intention to socially distance [OR=.468], had lower control over others' distancing [OR=.829], had a doctoral degree compared to a master's degree [OR=.332], a professional qualification [OR=.307], a bachelor's degree [OR=.361] or work-related qualification [OR=.174], voted for the UK Government compared to not voting for the Government [OR=.461], perceived higher normative pressure from neighbours [OR=1.121] and had greater support from friends [OR=1.465].

Conclusions: Non-adherence to all social distancing rules had a stronger association with vulnerability to COVID-19 and control over social distancing, whereas intentional non-adherence had a stronger association with intention and anti-social psychological factors. It is recommended that people living in high-risk environments, such as those living in houses of multiple occupancy, should be specially supported to not have to leave their home, that public health messaging should emphasise shared responsibility and public consciousness and that there should be greater policing, larger fines and more direct issuing of fines.

Background

On March 23, 2020, the government of the United Kingdom (UK) introduced unprecedented public health measures to slow the spread of COVID-19, a virus which transfers rapidly from human to human (1). A policy of suppression (commonly known as 'lockdown' measures) aimed to halt the spread of the epidemic and the number of cases (2) and included social distancing (SD) behaviours. The UK guidelines required the public to stay at home and only leave to exercise once a day, to travel to and from work when work from home was not possible, to shop for essential items, and to fulfil any medical or care needs. When leaving their home for permitted reasons, people were asked to minimise the time spent outdoors and to keep a minimum distance of two metres away from others outside their household. In addition, a shielding policy for extremely vulnerable people as well as self-isolation for seven days (for those who develop symptoms) and quarantine for 14 days (for those without symptoms but in contact with someone who did) were also part of the SD measures introduced (3). The Police were given powers to enforce this policy dispersing gatherings in parks, ensuring physical distancing in crowded shops or break up a house party, including powers to issue people with fines for flouting the rules (4).

A critical aspect of non-pharmaceutical interventions, such as SD, is that they primarily rely on population behaviour change, which requires acceptance and more importantly, adherence to the measures. In the UK, there has been a perceived sense of people's adherence to SD rules, as observed in the Government's declarations that "The overwhelming majority of the British public have complied with the regulations and guidance" (5, para. 6) and the Independent Sage Group's observation of "the impressively sustained high levels of adherence to lockdown the public has achieved" (6, p. 22). Yet early data in May 2020 started to show an increase in peoples' mobility even before the Government relaxation of lockdown measures on the 13th of May: according to Google Mobility report, visits to parks exceeded pre-lockdown rates (7) and data from the Department of Transport showed the use of cars was increasing to a 50% of that observed before SD rules by the 18th of May (8).

Physical distancing and movement restrictions to reduce the spread of a virus have been previously used by many countries to tackle other respiratory pandemics, and there is a body of evidence assessing population responses to various preventative measures. It is well established that several demographic, psychological and social factors are associated with engagement of SD behaviours during a pandemic, even when findings suggests caution in generalisations. Women are more likely to avoid crowds and use of public transport than men (9, 10); older age is often associated to engagement with SD behaviours (9–11), though other studies have found no conclusive evidence (12, 13). Black, Asian and Minority Ethnic (BAME) populations in the UK have been found to be at greater risk of dying from COVID-19 compared to the white population (14), and evidence suggest this is multi-factorial (material deprivation, increased exposure to risk and structural racism amongst others (15), yet findings from previous pandemics and COVID-19 suggest that this is not due to poorer adherence to SD measures (16, 17). Higher socio-economic status and higher educational attainment are often related to engagement in SD behaviours (10–12, 18), although both low income and having no qualifications have also been associated with greater adherence to SD behaviours in a UK study (16).

In terms of psychological factors, perceived susceptibility to becoming infected by the virus is usually considered to increase the likelihood of compliance with SD behaviours (13, 19–21), though some studies did not find consistent associations (9, 22). As perceived severity increases (i.e. an individual's perceived fatality or potential health seriousness if infected), so does engagement with preventative behaviours (10, 13, 16, 23). Insight into this relationship comes from Teasdale and Yardley (24), who found that if risk is perceived to be low, stay at home messages were perceived to be extreme and inappropriate. Also, engaging in a preventative behaviour is more likely if an individual believes that it will be effective, if they do not perceive barriers to engagement and if they perceive themselves to be competent in successfully performing the preventative behaviour (16, 21, 22).

Greater knowledge about a disease, in particular about symptoms and SD measures, is positively associated with adherence (12, 25, 26), although some studies (11, 19, 27) have shown that knowledge alone is not sufficient and other factors such as perceived susceptibility, perceived behavioural control and intention may play a more determinant role. In addition, a low sense of social responsibility and social consciousness coupled with self-interest values, such as individuals being more concerned about the risk to themselves rather than the risk they would pose to others, have also been associated with non-adherence to SD measures (23, 28).

More recently, political factors have been associated with SD behaviours during the COVID-19 pandemic as shown in the United States where it became a bipartisan issue, whereby supporters of the Republican government were found to engage in less SD behaviours than the Democrats due to a lower perception of risk associated with the virus (29–31).

Primary research and reviews on previous pandemics alongside emerging research in COVID-19 collectively have evidenced a range of variables and often contested behavioural and demographic associations in terms of adherence to SD measures, thus indicating that responses to global pandemics are context-specific. Yet studies on adherence remain reduced to discrete variables and often embedded in research analysing preventative hygiene-related behaviours (hand washing, use of masks, covering cough and sneeze). In this sense, to the best of our knowledge, there is no literature that has sought to understand the interplay of demographic, housing, health, political, psychological and social factors in influencing people's adherence to SD rules during the COVID-19 pandemic, a gap this study aims to address. In modelling the explanatory variables previously found to be significant predictors of adherence, we drew on different constructs within the behavioural sciences, such as the Protection Motivation Theory (PMT) (32), the Theory of Planned Behaviour (TPB) (33) and the Socio-Ecological Model (SEM) (34). Whilst PMT and TPB informed the exploration of psychological variables, this study also sought to contextualise intrapersonal level factors by analysing socio-environmental factors, as proposed by SEM, that could be associated with behavioural adherence.

In addition, this study uniquely distinguished between non-adherence to all SD rules (intentional and unintentional), and intentional non-adherence to SD rules: Unintentional non-adherence indicates inability to follow the rules due to practical issues (perceived behavioural control e.g. keeping two metres apart at all times, or not controlling other's distance), and to individual's capacity (self-efficacy e.g. misunderstanding of the rules, or even forgetting the rules); whilst intentional non-adherence refers to individuals consciously and deliberately not following SD rules or following them partially, due to beliefs, preferences or priorities (35). Due to the different psychological and social-environmental processes involved in intentional and unintentional non-adherence, it was hypothesised that significant differences will be observed between the two models, and different interventions would be needed to tackle them.

By using a convenience sample of North London residents, the aim of this study was to analyse the key demographic and psycho-social factors associated with non-adherence to SD measures. The research questions the study explored were: 1) What are the demographic, housing, health, political, psychological and social factors associated with non-adherence of all SD rules by North London residents?; 2) What are the demographic, housing, health, political, psychological and social factors associated with intentional non-adherence of SD rules by North London residents?

Methods

Design

The study was designed as a cross-sectional survey to be administered via convenience sampling among adults in North London. To be included in the study, participants were required to be aged ≥ 18 years and a resident in the London boroughs of Islington, Haringey, Camden, Hackney, Barnet or Enfield. The total population of the qualifying boroughs is 1,777,666 (36). In specifying a 99% confidence level and 5% margin of error, the minimum sample size required for this population is 663 (37). Data were collected via a digital questionnaire using JISC's online surveys software, which meets information security standards and is GDPR compliant (38). The questionnaire went live on 1st of May, 2020, and was closed on 31st of May, 2020, at midnight, coincidentally at the point when lockdown was eased for the second time. An incentive of a random prize draw to win one of four £100 vouchers for the Aldi supermarket was used to encourage questionnaire completion. The study and the questionnaire were promoted via the authors' university website, local newspapers and social media.

Instrument

To collect the study data, researchers developed a 15-min self-report questionnaire that covered seven groups of factors using previous scientific literature and scales and self-developed items and scales.

- 1. Social distancing behaviours.** Social distancing behaviours were measured via six items, which asked participants to recall social distancing behaviours from the previous two weeks. The first three items captured how many times participants had gone out for permitted reasons (i.e., for grocery shopping, medication, exercise or work) and not been able to maintain social distancing (i.e., they came within two metres of someone not lived with). The next two items captured how many times participants broke social distancing rules to meet up with others (i.e., extended family or friends). The final item captured how many times participants went out for unpermitted reasons. To create the outcome variable of non-adherence to all social distancing rules, all violations were summed to create a total violations variable, which was then re-coded to create a binary variable of adherence (coded 0) and non-adherence (coded 1) to all social distancing rules. To create the outcome variable of intentional non-adherence to SD rules, violations from the final three items, which covered going out for unpermitted reasons and breaking social distancing rules to meet up with friends and family, were summed to create a total intentional violations variable, which was then re-coded to create a binary variable of intentional adherence (coded 0) and non-adherence (coded 1).
- 2. Demographic factors.** Demographic data was collected about gender, age, ethnicity, whether or not English was the participant's first language, religion, highest qualification obtained, employment status, key worker status, and deprivation. Item wording and categories were taken directly from the England Census Rehearsal Household Questionnaire (39) where possible. Furthermore, participants were asked whether, as defined by the UK Government, they were a key or essential worker. Also, participants were asked to input their post code, which was then input to the English indices of deprivation tool (40), which returned deprivation data. From this, the index of multiple deprivation decile for each participant's postcode was recorded, a score from one to ten,

with one representing most deprived and ten representing least deprived, which was treated as continuous data in the analysis. London Borough was also recorded from the tool, which was subsequently used to verify if a participant was a resident from a target London Borough and their data excluded if not, although this was not used as a variable in the analysis.

3. **Housing factors.** Participants were asked to identify their housing situation, in terms of whether they lived in their own home, a rented home, or a rented room in a multiple occupancy house, how many people they lived with, and whether they lived with someone vulnerable to COVID-19, such as someone over 70 years old or with a health condition that made them more vulnerable.
4. **Health factors.** Participants were asked whether, as defined by the UK Government, they had a medical condition which made them more vulnerable to COVID-19 and whether they had experienced COVID-19 symptoms. Perceived susceptibility (PMT) was measured via a single item, adjusted from a single item measuring perceived susceptibility to cancer (41).
5. **Political factors.** Participants were asked which political party they voted for in the 2019 General Election with response options for all major political parties. Due to the low number of responses for parties other than Labour or the Conservatives this data was recoded as not voting for the Government (i.e., not voting Conservative) or voting for the Government (i.e. voting Conservative). Trust in the Government (3 items, $\alpha = .888$) was self-developed and covered trust in the response to COVID-19 and trust in the scientific advice. During data collection, lockdown restrictions were relaxed by the Government. Hence, to control for this and measure any effect of this change, the dates of participants' submission of response were coded as total lockdown if submitted by the final day of total lockdown on Tuesday 12th May, 2020. Given that participants were asked to recall SD behaviours over two weeks, responses up to Tuesday 26 May were coded as overlap of total and first relaxation. Responses from Wednesday 27th May recalled behaviours that were specific to the first relaxation phase and were coded as such. Further relaxation of lockdown rules occurred on 1st June, 2020, but as planned, data collection ended on 31st of May.
6. **Psychological factors.** COVID-19 and SD knowledge were measured via a self-developed quiz. Nine statements were developed from the World Health Organization's COVID-19 myth busters web portal and from the UK Government's guidance on SD rules, some true and some false, against which participants had to select true, false or do not know. Single items for self-interest and social responsibility were adjusted from Oosterhoff and Palmer (23). Using the TPB (33) as a guide, a scale was self-developed for SD behavioural intention (3 items, $\alpha = .854$), three items covering perceived behavioural control and three items covering normative pressure from family, friends and neighbours. Control items (3 items, $\alpha = .354$) and normative pressure items (3 items, $\alpha = .254$) were modelled separately due to Cronbach's alpha scores being below the threshold of 0.7 for sufficient internal consistency (42).
7. **Social factors.** Informed by the SEM, participants were asked to report if during the lockdown they were receiving financial and community support if needed. Social support was measured using the multidimensional scale of perceived social support (43), with items clarified to refer to the lockdown period. Sub-scales for support from a special person (3 items, $\alpha = .939$), family (3 items, $\alpha = .937$) and friends (3 items, $\alpha = .94$) were used.

Statistical analysis

To measure the associations between explanatory variables (i.e., demographic, housing, health, political, psychological and social factors) and outcome variables (i.e., non-adherence of all SD rules and intentional non-adherence of SD rules) univariate, multivariate and mapping analysis were undertaken. For univariate analysis, Pearson's chi-square tests were ran to identify statistically significant univariate associations between categorical explanatory variables and the binary outcome variables. Independent sample t-tests were ran to detect statistically significant univariate differences between the means of continuous explanatory variables for participants that did not adhere to all SD and those that did. A logistic regression model was run to measure the multivariate associations between explanatory variables and the two binary outcome variables, from which odds ratios for each explanatory variable with the corresponding 95% confidence interval (CI) and *P*-value were presented. Where there were significant univariate analysis associations that were not found in multivariate analysis further mapping analysis was conducted to determine the significant explanatory variable that better accounted for variation in the outcome variable in the multivariate analysis, providing a more vivid understanding of non-adherence to SD rules. To identify associations between two categorical variables Pearson's chi-square tests were used, between categorical and continuous variables independent sample t-tests were used where there were two categories and ANOVA where there were more than two categories and between two ordinal variables Spearman correlations were used.

Results

Participants

There were a total of 701 responses to the study's questionnaire. Of these, 20 responses came from locations other than the specified North London boroughs and so were removed from the dataset, leaving a sample of 681 participants. The sample was highly skewed to females, with 82.8% of respondents being female. The average age was 42.43 years old, 14.4% of participants came from BAME populations and 14.5% did not have English as their first language. The majority of participants (61.7%) had no religion and the majority of participants had either a bachelor's (34.7%) or master's (29.1%) degree. The most common employment status was working as an employee from home (39.4%) and 22.5% of participants were key workers. Twelve per cent of participants lived in a rented room in a house of multiple occupancy, the average number of people each participant lived with was 2.57 and 15.3% of participants lived with a person of vulnerable health status. Fifteen per cent of participants were vulnerable to COVID-19 and 30.7% had previously had COVID-19 symptoms. The average level of perceived susceptibility was 4.4 on a scale of a 1-7. The vast majority (91%) of participants did not vote for the Government and the sample had relatively low level of trust (2.96 on a scale of 1-7) in them. SD behaviours were distributed evenly across the three categories of lockdown phase. Knowledge about COVID-19 and SD rules was, on average, high (7.03 out of 9). Social responsibility was high (6.19 out of 7) and self-interest was low (1.81). Intention to socially distance (5.95 out of 7), control over leaving the house (5.34), control over others' distancing (5.48) were all high, but control over responsibilities was relatively low (2.81). Normative pressure to socially distance was highest from family (6.29 out of 7), followed by friends (5.52) and neighbours (4.69). Twenty percent of participants were not getting the financial support they needed and 12% were not getting the community support they needed.

Non-Adherence of Social Distancing Rules

The vast majority of participants (92.8%) did not adhere to all SD rules. Similarly, 90.7% of participants were unable to always maintain two metres distance from others when they went out for permitted reasons indicating significant overlap between non-adherence of all rules and unintentional non-adherence. Slightly less than half (48.6%) of participants intentionally did not adhere to SD rules. The more common intentional violation was unpermitted leaving of the house, which a third of participants did not adhere to. Less frequent were unpermitted meeting of others with 28.8% of participants not adhering to this rule.

Factors Associated with Non-Adherence of All SD Rules

Univariate Analysis. There was a statistically significant univariate association between the following categorical explanatory variables and non-adherence to all SD rules: employment status ($\chi(10)=36.986, p=.000$); housing situation ($\chi(2)=7.659, p=.022$); living with a person of vulnerable health status ($\chi(1)=7.218, p=.007$); and vulnerable health status ($\chi(2)=23.48, p=.000$). There were no statistically significant univariate associations ($p>.05$) between the explanatory variables of gender, ethnicity language, religion, highest qualification obtained, key worker status, COVID-19 symptoms, voting for the Government, lockdown phase, financial support and community support and non-adherence of all SD rules.

Participants that did not adhere to all SD rules had statistically significantly: lower age (41.69 ± 13.313) compared to those who adhered (52.05 ± 14.016), $t(679)=5.226, p=.000$; higher perception of susceptibility (4.79 ± 1.543) compared to those who adhered (4 ± 1.586), $t(679)=-3.461, p=.001$; lower intention to socially distance (5.91 ± 1.168) compared to those who adhered (6.42 ± 1.924), $t(679)=2.943, p=.003$; lower control over leaving the house (5.28 ± 1.923) compared to those who adhered (6.08 ± 1.187), $t(679)=2.863, p=.004$; lower control over others' distancing to them (2.45 ± 1.516) compared to those who adhered (3.41 ± 1.813), $t(679)=4.208, p=.000$; lower control over their responsibilities (5.1 ± 2.228) compared to those who adhered (6.35 ± 1.285), $t(679)=3.852, p=.000$; and lower perception of normative pressure from friends (5.47 ± 1.718) compared to those who adhered (6.24 ± 1.234), $t(679)=3.101, p=.002$. There were no statistically significant differences ($p>.05$) in deprivation, number of people living with, trust in government, knowledge, social responsibility, self-interest, normative pressure from family, normative pressure from neighbours, support from a special person, support from family and support from friends.

Multivariate analysis. The logistic regression model was statistically significant, $\chi^2(57) = 125.288, p = .000$, explained 41.6% (Nagelkerke R^2) of the variance in non-adherence to all SD rules and correctly classified 93.4% of cases. When holding other factors constant, the odds of not adhering to all SD rules are 73.9% lower if reporting after lockdown rules had been relaxed for the first time than if reporting during total lockdown. When holding other factors constant, the odds of not adhering to all SD rules are 350.6% higher if the person is not vulnerable than if vulnerable. An additional level of agreement on a 7-point Likert scale about perception of control over others' distancing decreases the odds of not adhering to all SD rules by 27.6%. An additional level of agreement on a 7-point Likert scale about perception of control over responsibilities for which coming into contact with others outside the household is unavoidable decreases the odds of not adhering to all SD rules by 35.8%.

There were no statistically significant multivariate associations ($p>.05$) between the explanatory variables of gender, age, ethnicity, language, religion, highest qualification obtained, employment status, key worker status, deprivation, housing situation, number of people living with, living with a vulnerable person, COVID-19 symptoms, perceived susceptibility, voting for the Government, trust in the Government, knowledge, social responsibility, self-interest, control over leaving the house, normative pressure from family, normative pressure from friends, normative pressure from neighbours, financial support, community support, support from a special person and support from family and the outcome variable of non-adherence of all SD rules.

Mapping analysis. In the multivariate analysis, vulnerable health better accounted for variance in non-adherence of all SD rules than age (participants that were not vulnerable were of a statistically significantly lower age (41.49 ± 13.321) compared to participants that were vulnerable (47.75 ± 14.083), $t(679)=4.33, p=.000$), employment status (there was a statistically significant relationship between employment status and vulnerable health ($\chi(10)=46.825, p = .000$) and 50% of long-term sick or disabled were also being classified as vulnerable), living with a vulnerable person (significantly associated with vulnerable health ($\chi(1)=11.628, p=.001$) whereby twice as many vulnerable participants lived with another vulnerable person than non-vulnerable participants) and intention to socially distance (participants that were vulnerable had greater intention to socially distance ($6.2908\pm .95403$) compared to participants that were not vulnerable (5.8877 ± 1.18212), $t(160.967)=3.786, p=.000$).

In the multivariate analysis, control over others' distancing better accounted for variance in non-adherence of all SD rules than housing situation (categories differed significantly in terms of control over others' distancing, $F(2,678)=5.313, p=.005$) and perceived susceptibility (there was a weak negative correlation between perceived susceptibility and sense of control over others' distancing, which was statistically significant, $r_s(679)=-.231, p=.000$).

In the multivariate analysis, control over responsibilities better accounted for variance in non-adherence of all SD rules than control over leaving the house (there was a weak, positive correlation between sense of control over leaving the house and sense of control over responsibilities, which was statistically significant, $r_s(679)=.263, p=.000$) and normative pressure from friends (there was a weak, positive correlation between normative pressure from friends and control over responsibilities, which was statistically significant, $r_s(679)=.186, p=.000$).

Factors Associated with Intentional Non-Adherence of SD Rules

Univariate analysis. There were statistically significant univariate associations between the following categorical variables and intentional non-adherence to SD rules: employment status ($\chi(10)=20.248, p=.027$), housing situation ($\chi(2)=7.542, p=.023$) and vulnerable health status ($\chi(1)=6.187, p=.013$). There were no statistically significant univariate associations ($p>.05$) between the categorical explanatory variables of gender, ethnicity, language, religion, highest qualification obtained, key worker status, living with a vulnerable person, COVID-19 symptoms, voting for the Government, lockdown phase, financial support and community support and intentional non-adherence of SD rules.

Participants that intentionally did not adhere to SD rules had statistically significantly: higher perception of susceptibility (4.87 ± 1.543) compared to those that did (4.61 ± 1.562), $t(679) = -2.147$, $p = .032$; lower social responsibility (6.1 ± 1.001) compared to participants that did (6.29 ± 1.015), $t(679) = -2.445$, $p = .015$; higher self-interest (1.93 ± 1.131) compared to participants that did (1.69 ± 1.118), $t(679) = -2.705$, $p = .007$; lower intention to socially distance (5.49 ± 1.248) compared to those that did (6.38 ± 1.875), $t(679) = 10.623$, $p = .000$; less control over leaving the house (5.16 ± 1.955) compared to those that did (5.51 ± 1.815), $t(679) = 2.883$, $p = .017$; less control over others' distancing to them (2.34 ± 1.457) compared to those that did (2.68 ± 1.632), $t(679) = 4.208$, $p = .004$; less control over their responsibilities that would require them to come into contact with others (4.95 ± 2.236) compared to those that did (5.42 ± 2.138), $t(679) = 2.776$, $p = .006$; lower perceptions of normative pressure from family (6.09 ± 1.186) compared to those that did (6.47 ± 1.923), $t(679) = 4.656$, $p = .000$; lower perceptions of normative pressure from friends (5.19 ± 1.772) compared to those that did (5.84 ± 1.568), $t(679) = 5.011$, $p = .000$. There were no statistically significant differences ($p > .05$) between participants that intentionally did not adhere to SD rules and those that did in terms of age, deprivation, number of people living with, trust in government, knowledge, normative pressure from neighbours, support from a special person, support from family and support from friends.

Multivariate analysis. A logistic regression was performed to ascertain the multivariate association between demographic, housing, health, political, psychological and social factors and the likelihood that participants intentionally did not adhere to SD rules. The logistic regression model was statistically significant, $\chi^2(57) = 205.963$, $p = .000$. The model explained 34.8% (Nagelkerke R^2) of the variance in intentional non-adherence of SD rules and correctly classified 72.5% of cases. When holding other factors constant, the odds of intentionally not adhering to SD rules are 66.8% lower if a participant's highest qualification is a masters degree, 69.3% lower if a professional qualification, 63.9% lower if a bachelors degree and 82.6% lower if a vocational or work-related qualification, than if a doctoral degree. The odds of intentionally not adhering to SD rules are 53.9% lower if not having voted for the government than if having voted for the government. An additional level of agreement on a 7-point Likert scale about intention to socially distance decreases the odds of intentionally not adhering to SD rules by 53.2%. An additional level of agreement on a 7-point Likert scale about perception of control over others' distancing decreases the odds of intentionally not adhering to SD rules by 17.1%. An additional level of agreement on a 7-point Likert scale about perceiving normative pressure from neighbours increases the odds of intentionally not adhering to SD rules by 12.1%. An additional level of agreement on a 7-point Likert scale about having support from friends increases the odds of intentionally not adhering to SD rules by 46.5%.

There were no statistically significant multivariate associations ($p > .05$) between the explanatory variables of gender, age, ethnicity, language, religion, employment status, key worker status, deprivation, housing situation, number of people living with, living with a vulnerable person, vulnerable health, COVID-19 symptoms, perceived susceptibility, trust in the Government, lockdown phase, knowledge, social responsibility, self-interest, control over leaving the house, control over responsibilities, normative pressure from family, normative pressure from friends, financial support, community support, support from a special person and support from family and the outcome variable of intentional non-adherence of SD rules.

Mapping analysis. In the multivariate analysis, intention to socially distance better accounted for variance in intentional non-adherence of SD rules than vulnerable health (participants that were vulnerable had greater intention to socially distance (6.2908 ± 1.95403) compared to participants that were not vulnerable (5.8877 ± 1.18212), $t(679) = 3.786$, $p = .000$), social responsibility (there was a moderate, positive correlation between social responsibility and intention to socially distance, which was statistically significant, $r_s(679) = .311$, $p = .000$), self-interest (there was a weak, negative correlation between self-interest and intention to socially distance, which was statistically significant, $r_s(679) = -.257$, $p = .000$), control over leaving the house (there was a weak, positive correlation between control over leaving the house and intention to socially distance, which was statistically significant, $r_s(679) = .28$, $p = .000$), control over responsibilities (there was a weak, positive correlation between control over responsibilities and intention to socially distance, which was statistically significant, $r_s(679) = .152$, $p = .000$), normative pressure from family (there was a moderate, positive correlation between normative pressures from family and intention to socially distance, which was statistically significant ($r_s(679) = .39$, $p = .000$) and normative pressure from friends (there was a moderate, positive correlation between normative pressure from family and intention to socially distance, which was statistically significant, $r_s(679) = .384$, $p = .000$).

In the multivariate analysis, control over others' distancing better accounted for variance in intentional non-adherence of SD rules than housing situation (categories differed significantly in terms of control over others' distancing, $F(2,678) = 5.313$, $p = .005$) and perceived susceptibility (there was a weak, positive correlation between control over others' distancing and perceived susceptibility, which was statistically significant ($r_s(679) = .231$, $p = .000$).

In the multivariate analysis, highest qualification obtained better accounted for variance in intentional non-adherence of SD rules than employment status (there was a statistically significant relationship between employment status and highest qualification obtained, $\chi(70) = 184.373$, $p = .000$).

Discussion

Adherence to all SD rules appears highly challenging for the majority of participants in our sample with only 7.2% reporting being able to adhere to all SD rules over a two-week period. The odds of not adhering to all SD rules increased if a participant was not identified as highly vulnerable to COVID-19, had lower control over others' distancing, had lower control over responsibilities for which coming into contact with others was unavoidable and if social distancing behaviours were reported after lockdown was first relaxed. Not being vulnerable was associated with a lower intention to socially distance, lower age, not being retired, long-term sick or disabled, and not living with a person of vulnerable health status. Our findings on vulnerability is consistent with a cross-sectional UK study (44), which found that being clinically vulnerable was associated with fewer outings. Lower control over others' distancing was associated with living in a rented room in a house of multiple occupancy and with higher perceived susceptibility. The former could indicate unintentional non-adherence due to the physical impossibility of keeping distance from others in overcrowded houses and the latter may suggest a sense of inevitability of becoming infected with COVID-19. Lower control over responsibilities, such as work or childcare, for which coming into contact with others is unavoidable was associated with lower control over leaving the house and a lower perception of normative pressure from friends.

Nearly half of participants (48.6%) intentionally broke SD rules. The odds of intentional non-adherence increased if a participant had a lower intention to socially distance, had lower control over others' distancing, had a doctoral degree, voted for the UK Government, perceived higher normative pressure from neighbours and had greater support from friends. Lower intention to socially distance is associated with not being vulnerable to COVID-19, being less socially responsible, having higher self-interest, lower control over leaving the house, lower control over responsibilities for which coming into contact with others was unavoidable, lower normative pressure from family and lower normative pressure from friends. Lower control over others' distancing is associated with living in a rented room in a house of multiple occupancy and higher perceived susceptibility. Highest qualification obtained is associated with employment status. Perceived susceptibility and breaking SD rules was also found elsewhere (9,22) and in a UK study (27), where those who expressed more fear for the disease left the house more often for non-essential activities.

In comparing the two models, non-adherence to all SD rules has a stronger association with vulnerability to COVID-19 and control over SD, whereas intentional non-adherence has a stronger association with intention and anti-social psychological factors. Participants who were vulnerable to COVID-19 were 88% less likely to not adhere to all SD rules, which was the most powerful predictor in the model and was associated with four significant factors in the univariate analysis; being older, being retired or long-term sick or disabled, living with someone else who was also vulnerable and a greater intention to socially distance. Lower control over others' distancing and responsibilities were also significant predictors in the model of non-adherence to all SD rules. Being identified as vulnerable to COVID-19 may lead to greater control over social distancing as vulnerable individuals received special support, such as priority slots for supermarket deliveries and help from NHS Volunteer Responders to deliver prescriptions, essential items and food.

Intentional non-adherence has a stronger association with intention and anti-social psychological factors. For each additional level of intention to socially distance, the odds of intentionally not adhering to SD rules decreased by 53%, which was the strongest predictor of intentional non-adherence and associated with seven significant factors in the univariate analysis, including a weaker sense of social responsibility and a greater sense of self-interest. Intention to socially distance was also associated with constructs from the TPB, notably, normative pressure from family and friends. Counterintuitively, an additional level of support from friends increased the odds of intentionally not adhering to social distancing rules by 47%, which can be understood as a risk factor for meeting up with others outside the household when coupled with a greater sense of self-interest and lower sense of social responsibility. Other significant variables associated with intentional non-adherence were political orientation, i.e. not voting for the Conservative Government as opposed to voting for a Socialist-led Labour party in particular, decreased the odds of intentionally not adhering to SD rules by 54%; and educational attainment, i.e. PhD holders had the highest rates (64%) of deliberately breaking SD rules compared to other categories of highest qualification achieved. Both resonates with a sense of elitism and self-interest that has been anecdotally evident in high profile cases of individuals in the UK who have intentionally broken SD rules. Overall, the finding on higher degree qualification contrasts with the large body of research that associates greater educational attainment with adherence (12,18), although of note is an exception from the UK-Swine Flu pandemic (16). Whilst political preference is in line with a study that found British people with more progressive beliefs as observing more physical distancing behaviour (27), although another study on political preference provided no association to compliance (45). The latter is rather a new topic and more research on these relationships is necessary to establish its precise nature before any specific recommendations can be made for improving adherence in these subgroups.

Policy implications

Non-adherence of all rules. Our findings suggest that adherence to all SD rules appears highly challenging for the majority of participants with only 7.2% of participants being able to adhere over a two-week period. Those that could adhere were more likely to be vulnerable to COVID-19 with greater control over SD behaviours, as vulnerable individuals received special support, such as priority slots for supermarket deliveries and help from NHS Volunteer Responders to deliver prescriptions, essential items and food. In this sense, it is recommended that people living in houses of multiple occupancy should be specially supported to enable personal protective behaviours ensuring support for residents to access online groceries and medication, and that local authorities or community organisations ensure the distribution of food for people living in high-risk environments.

Intentional non-adherence. Nearly half of participants intentionally broke social distancing rules, which was associated with anti-social psychological factors such as a lower sense of social responsibility, a higher sense of self-interest and lower normative pressure from family and friends. As such, interventions to lower intentional non-adherence should seek to achieve pro-social attitude and behaviour change. Recent COVID-19 studies have argued that public messages instilling empathy and altruistic sentiments (i.e. the significance of keeping those most vulnerable safe) can enhance compliance with self-isolation (46,47). As the easing of lockdown measures continued but, at the same time, lockdown in local areas is being reinstated, it is important that public health messaging emphasise the significance of shared responsibility and public consciousness to protect those most vulnerable to the disease. In addition, local authorities should take advantage of rising levels of community engagement and participation, observed during the full lockdown, to continue building social trust and sense of belonging (community attachment).

Finally, despite the rate of intentional non-adherence reported in this study (48.6%), as of 8th June, 2020, only 1,060 fines were issued by the London Metropolitan Police for breaking social distancing rules (48), which if assuming one fine per person, equates to 0.0001% of the population of London being issued with a fine. To provide a stronger deterrent of intentional non-adherence, it is recommended that the Government consider greater policing, such as the use of travel certificates as used in France and Italy, larger fines and more direct issuing of fines.

Study Limitations

Given the observational nature of the study, it is not possible to control the variables so to discern causal relationships. Although a wide range of explanatory variables were modelled and controlled for, there is evidence of omitted variable bias. Specifically, 58.4% of variance in non-adherence to all social distancing rules and 65.2% of variance in intentional non-adherence was not accounted for in the logistic regression models. That said, the unpredictability of human behaviour (49,50) and risk-taking (51) is well-established, thus the predictive power of these models is reasonable. Furthermore, without controlled manipulation of the explanatory variables, simultaneity bias is a threat. For example, contrary to the TPB, not intentionally breaking social distancing rules

was associated with weaker normative pressure from neighbours, which can be understood by the theory of downward social comparisons (52) that individuals often compare themselves with others who are performing poorly to enhance their self-esteem, such that the comparisons participants made depended upon their own social distancing behaviours. In other words, variance was happening at the same time, rather than independently or dependently. Furthermore, this study made use of a non-probability convenience sample, resulting in differences between the sample and the population of interest, such as disproportionate representation of females in the sample. That the convenience sample had a local focus on residents in North London means that findings cannot be confidently generalised to the UK.

Conclusions

Contrary to a perceived sense of people's adherence to SD, the vast majority of participants did not adhere to all SD rules and nearly half intentionally did not adhere. Given the lack of vaccine and treatment for COVID-19 and the threat of a second wave of cases, it is essential to understand the true extent of non-adherence and the factors which predict it, so that policy and interventions can limit the threat. Participants identified as vulnerable to COVID-19 and with greater control over social distancing were more likely to adhere to all social distancing rules, suggesting that services which provide greater control over social distancing, such as delivery of groceries, essential goods and medicines, should be extended to others, in particular those who live in a rented room in a house of multiple occupancy. Intentional non-adherence to social distancing rules was more associated with psychological factors than non-adherence to all rules, including a lower intention to SD, which was associated with a lower sense of social responsibility, a higher sense of self-interest and lower normative pressure from family and friends. To counter intentional non-adherence it is recommended that public health messages more strongly emphasise the significance of shared responsibility and public consciousness to protect those most vulnerable to the disease, enforced by greater policing of and larger deterrents for intentional non-adherence.

Abbreviations

PMT: Protection Motivation Theory

SD: Social distancing

SEM: Socio-Ecological Model

TBP: Theory of Planned Behaviour

Declarations

Ethics approval and consent to participate

The ethics committee of London Metropolitan University approved the study (Ethics ID: GSBL200401), and written informed consents were obtained from all of the participants before data collection.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated during and/or analysed during the current study are not publicly available due to GDPR regulations but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This study was elicited from a research proposal and was funded by London Metropolitan University, London, UK, who covered the cost of the incentives for participants to complete the questionnaire.

Authors' contributions

SH and YE made main contributions to conception and design of this study, drafted and revised the manuscript, contributed to obtaining the data and performed the statistical analyses. All authors have read and approved the manuscript.

Acknowledgements

The authors would like to thank all North London residents who participated in this study. In addition, we acknowledge the official support of London Metropolitan University.

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Tables

Table 1
Sample items of research variables

| Variables | Sample Items |
|--|--|
| Social Distancing | |
| Non-adherence | In the past two weeks, how many times have you gone out for groceries and come within two metres (approx. 3 steps) of someone (e.g. cashier, other shoppers) you don't live with? |
| Intentional non-adherence (unpermitted meeting of others) | In the past two weeks, how many times have you broken social distancing rules to meet friends that don't live with you? |
| Intentional non-adherence (unpermitted leaving of the house) | In the past two weeks, how many times have you gone out for reasons other than to work, to buy groceries, for medical reasons (e.g. to collect a prescription) to enjoy parks or public spaces or to exercise? |
| Health Factors | |
| Perceived Susceptibility | There is a good chance that I will get coronavirus (COVID-19) |
| Political Factors | |
| Trust in Government | I trust the UK Government in their response to COVID-19 |
| Psychological Factors | |
| COVID-19 and Social Distancing Knowledge | Wearing latex gloves is more effective than hand washing at protecting against coronavirus (COVID-19) |
| Social Responsibility | Before I act, I think about how my actions might have a negative effect on others |
| Self-Interest | I do what I want, regardless of what others want me to do |
| Intention to Socially Distance | I will only leave my home for permitted reasons for as long as the lockdown measures are in place |
| Control over Leaving the House | During lockdown, I do not need to leave my home if I don't want to |
| Control over Others' Distancing | When I go out for permitted reasons, I cannot stop others from coming within two metres of me* |
| Control over Responsibilities | I have responsibilities (e.g., work, childcare) for which I cannot avoid coming into contact with others that I do not live with* |
| Family Normative Pressure | My family support staying at home and social distancing |
| Friends Normative Pressure | My friends are keen to meet up in person, despite the lockdown* |
| Neighbours Normative Pressure | I see my neighbours keeping social distancing rules when they are out in my street |
| Social Factors | |
| Support from a Special Person | During lockdown, there is a special person who is around when I am in need |
| Support from Family | During lockdown, my family really tries to help me |
| Support from Friends | During lockdown, I can talk about my problems with my friends |
| *Reversed items | |

Table 2
Characteristics of sample

| Explanatory Variables | n | % | Mean | S.D. | Min. | Max. |
|--|-----|------|-------|-------|------|------|
| Demographic Factors | | | | | | |
| Gender | | | | | | |
| Female | 564 | 82.8 | | | | |
| Male | 111 | 16.3 | | | | |
| Other | 6 | 0.9 | | | | |
| Age | | | 42.43 | 13.62 | 19 | 77 |
| Ethnicity | | | | | | |
| White | 583 | 85.6 | | | | |
| BAME | 98 | 14.4 | | | | |
| Language | | | | | | |
| English as First Language | 582 | 85.5 | | | | |
| English Not as First Language | 99 | 14.5 | | | | |
| Religion | | | | | | |
| No Religion | 420 | 61.7 | | | | |
| Christian | 154 | 22.6 | | | | |
| Buddhist | 9 | 1.3 | | | | |
| Hindu | 3 | 0.4 | | | | |
| Jewish | 53 | 7.8 | | | | |
| Muslim | 14 | 2.1 | | | | |
| Sikh | 2 | 0.3 | | | | |
| Other | 26 | 3.8 | | | | |
| Highest Qualification Obtained | | | | | | |
| Doctoral Degree | 39 | 5.7 | | | | |
| Masters Degree | 198 | 29.1 | | | | |
| Professional Qualification | 81 | 11.9 | | | | |
| Bachelors Degree | 236 | 34.7 | | | | |
| Vocational / Work-related Qualification | 40 | 5.9 | | | | |
| A Levels or equivalent | 44 | 6.5 | | | | |
| GCSEs or equivalent | 30 | 4.4 | | | | |
| No Qualifications | 13 | 1.9 | | | | |
| Employment Status | | | | | | |
| Long-term sick or disabled | 28 | 4.1 | | | | |
| Retired | 56 | 8.2 | | | | |
| Working as an employee from home | 268 | 39.4 | | | | |
| Self-employed or freelance from home | 66 | 9.7 | | | | |
| Looking after home or family | 29 | 4.3 | | | | |
| Unemployed | 36 | 5.3 | | | | |
| A furloughed employee | 64 | 9.4 | | | | |
| A student | 20 | 2.9 | | | | |
| Working as an employee in my normal place of work (not home) | 67 | 9.8 | | | | |
| Self-employed or freelance in my normal place of work (not home) | 16 | 2.3 | | | | |

| Explanatory Variables | n | % | Mean | S.D. | Min. | Max. |
|---|----------|----------|-------------|-------------|-------------|-------------|
| Other | 31 | 4.6 | | | | |
| Key Worker Status | | | | | | |
| Not Key Worker | 528 | 77.5 | | | | |
| Key Worker | 153 | 22.5 | | | | |
| Deprivation (1–10) | | | 4.42 | 2.126 | 1 | 10 |
| Housing Factors | | | | | | |
| Housing Situation | | | | | | |
| Live in Own Home | 349 | 51.2 | | | | |
| Live in Rented Home | 250 | 36.7 | | | | |
| Live in Rented Room of Multiple Occupancy House | 82 | 12 | | | | |
| Number of People Living With | | | 2.57 | 1.368 | 0 | 9 |
| Living with a Vulnerable Person | | | | | | |
| Living with Person of Vulnerable Health Status | 104 | 15.3 | | | | |
| Not Living with Person of Vulnerable Health Status | 577 | 84.7 | | | | |
| Health Factors | | | | | | |
| Health | | | | | | |
| Vulnerable | 102 | 15 | | | | |
| Not Vulnerable | 579 | 85 | | | | |
| COVID-19 Symptoms | | | | | | |
| Not Had | 472 | 69.3 | | | | |
| Had | 209 | 30.7 | | | | |
| Perceived Susceptibility (1–7) | | | 4.74 | 1.557 | 1 | 7 |
| Political Factors | | | | | | |
| 2019 General Election | | | | | | |
| Voted for Government | 61 | 9 | | | | |
| Did Not Vote for Government | 620 | 91 | | | | |
| Trust in Government (1–7) | | | 2.96 | 1.541 | 1 | 7 |
| Lockdown Phase | | | | | | |
| Total Lockdown | 259 | 38 | | | | |
| Overlap of Total and First Relaxation | 255 | 37.4 | | | | |
| First Relaxation | 167 | 24.5 | | | | |
| Psychological Factors | | | | | | |
| COVID-19 and Social Distancing Knowledge (out of 9) | | | 7.03 | 1.055 | 3 | 9 |
| Self-Control (1–7) | | | 6.19 | 1.012 | 1 | 7 |
| Self-Interest (1–7) | | | 1.81 | 1.13 | 1 | 7 |
| Intention to Socially Distance (1–7) | | | 5.95 | 1.16 | 1.67 | 7 |
| Control over Leaving the House (1–7) | | | 5.34 | 1.891 | 1 | 7 |
| Control over Others' Distancing (1–7) | | | 5.48 | 1.558 | 1 | 7 |
| Control over Responsibilities (1–7) | | | 2.81 | 2.197 | 1 | 7 |
| Family Normative Pressure (1–7) | | | 6.29 | 1.075 | 1 | 7 |
| Friends Normative Pressure (1–7) | | | 5.52 | 1.699 | 1 | 7 |
| Neighbours Normative Pressure (1–7) | | | 4.69 | 1.825 | 1 | 7 |
| Social Factors | | | | | | |

| Explanatory Variables | n | % | Mean | S.D. | Min. | Max. |
|---|----------|----------|-------------|-------------|-------------|-------------|
| Financial Support | | | | | | |
| Getting Financial Support if Needed | 545 | 80 | | | | |
| Not Getting Financial Support If Needed | 136 | 20 | | | | |
| Community Support | | | | | | |
| Getting Community Support if Needed | 599 | 88 | | | | |
| Not Getting Community Support If Needed | 82 | 12 | | | | |
| Support from a Special Person (1–7) | | | 5.52 | 1.846 | 1 | 7 |
| Support from Family (1–7) | | | 5.35 | 1.665 | 1 | 7 |
| Support from Friends (1–7) | | | 5.41 | 1.44 | 1 | 7 |

Table 3
Non-adherence of social distancing rules

| | Adherence (n) | Adherence (%) | Non-Adherence (n) | Non-Adherence (%) |
|-------------------------------|----------------------|----------------------|--------------------------|--------------------------|
| All | 49 | 7.2% | 632 | 92.8% |
| Unintentional | 63 | 9.3% | 618 | 90.7% |
| Intentional | 350 | 51.4% | 331 | 48.6% |
| Unpermitted Leaving of House | 454 | 66.7% | 227 | 33.3% |
| Unpermitted Meeting of Others | 485 | 71.2% | 196 | 28.8% |

Table 4
Percentage of participants adhering and not adhering to all social distancing rules by categorical explanatory variable

| Explanatory Variables | Adherence (n) | Adherence (%) | Non-Adherence (n) | Non- Adherence (%) |
|---|----------------------|----------------------|--------------------------|---------------------------|
| Sample | 49 | 7% | 632 | 93% |
| Demographic Factors | | | | |
| Gender | | | | |
| Female | 42 | 7.4% | 522 | 92.6% |
| Male | 5 | 4.5% | 106 | 95.5% |
| Other | 2 | 33.3% | 4 | 66.7% |
| Ethnicity | | | | |
| White | 41 | 7% | 542 | 93% |
| BAME | 8 | 8.2% | 90 | 91.8% |
| Language | | | | |
| English as First Language | 43 | 7.4% | 539 | 92.6% |
| English Not as First Language | 6 | 6.1% | 93 | 93.9% |
| Religion | | | | |
| No Religion | 24 | 5.7% | 396 | 94.3% |
| Christian | 15 | 9.7% | 139 | 90.3% |
| Buddhist | 1 | 11.1% | 8 | 88.9% |
| Hindu | 1 | 33.3% | 2 | 66.7% |
| Jewish | 4 | 7.5% | 49 | 92.5% |
| Muslim | 1 | 7.1% | 13 | 92.9% |
| Sikh | 0 | 0% | 2 | 100% |
| Other | 3 | 11.5% | 23 | 88.5% |
| Highest Qualification Obtained | | | | |
| | | | | |
| Doctoral Degree | 1 | 2.6% | 38 | 97.4% |
| Masters Degree | 11 | 5.6% | 187 | 94.4% |
| Professional Qualification | 7 | 8.6% | 74 | 91.4% |
| Bachelors Degree | 22 | 9.3% | 214 | 90.7% |
| Vocational / Work-related Qualification | 6 | 15% | 34 | 85% |
| A Levels or equivalent | 0 | 0% | 44 | 100% |
| GCSEs or equivalent | 1 | 3.3% | 29 | 96.7% |
| No Qualifications | 1 | 7.7% | 12 | 92.3% |
| Employment Status* | | | | |
| Long-term sick or disabled | 5 | 17.9% | 23 | 82.1% |
| Retired | 13 | 23.2% | 43 | 76.8% |
| Working as an employee from home | 13 | 4.9% | 255 | 95.1% |
| Self-employed or freelance from home | 5 | 7.6% | 61 | 92.4% |
| Looking after home or family | 4 | 13.8% | 25 | 86.2% |
| Unemployed | 1 | 2.8% | 35 | 97.2% |
| A furloughed employee | 3 | 4.7% | 61 | 95.3% |

*Statistically significant association

| Explanatory Variables | Adherence (n) | Adherence (%) | Non-Adherence (n) | Non- Adherence (%) |
|--|----------------------|----------------------|--------------------------|---------------------------|
| A student | 1 | 5% | 19 | 95% |
| Working as an employee in my normal place of work (not home) | 1 | 1.5% | 66 | 98.5% |
| Self-employed or freelance in my normal place of work (not home) | 0 | 0% | 16 | 100% |
| Other | 3 | 9.7% | 28 | 90.3% |
| Key Worker Status | | | | |
| Not Key Worker | 43 | 8.1% | 485 | 91.9% |
| Key Worker | 6 | 3.9% | 147 | 96.1% |
| Housing Factors | | | | |
| Housing Situation* | | | | |
| Live in Own Home | 34 | 9.7% | 315 | 90.3% |
| Live in Rented Home | 13 | 5.2% | 237 | 94.8% |
| Live in Rented Room of Multiple Occupancy House | 2 | 2.4% | 80 | 97.6% |
| Living with a Vulnerable Person* | | | | |
| Living with Person of Vulnerable Health Status | 14 | 13.5% | 90 | 86.5% |
| Not Living with Person of Vulnerable Health Status | 35 | 6.1% | 542 | 93.9% |
| Health Factors | | | | |
| Vulnerable Health* | | | | |
| Vulnerable | 19 | 18.6% | 83 | 81.4% |
| Not Vulnerable | 30 | 5.2% | 549 | 94.8% |
| COVID-19 Symptoms | | | | |
| Not Had | 37 | 7.8% | 435 | 92.2% |
| Had | 12 | 5.7% | 197 | 94.3% |
| Political Factors | | | | |
| 2019 General Election | | | | |
| Voted for Government | 6 | 9.8% | 55 | 90.2% |
| Did Not Vote for Government | 43 | 6.9% | 577 | 93.1% |
| Lockdown Phase | | | | |
| Total Lockdown | 17 | 6.6% | 242 | 93.4% |
| Overlap of Total and First Relaxation | 14 | 5.5% | 241 | 94.5% |
| First Relaxation | 18 | 10.8% | 149 | 89.2% |
| Social Factors | | | | |
| Financial Support | | | | |
| Getting Financial Support if Needed | 38 | 7% | 507 | 93% |
| Not Getting Financial Support If Needed | 11 | 8.1% | 125 | 91.9% |
| Community Support | | | | |
| Getting Community Support if Needed | 43 | 7.2% | 556 | 92.8% |
| Not Getting Community Support If Needed | 6 | 7.3% | 76 | 92.7% |
| *Statistically significant association | | | | |

Table 5

Comparison of means of continuous explanatory variables between participants who did not adhere to all social distancing rules and those that did

| Explanatory Variables | Adherence (Mean) | Adherence (S.D.) | Non-Adherence (Mean) | Non-Adherence (S.D.) |
|--|------------------|------------------|----------------------|----------------------|
| Demographic Factors | | | | |
| Age* | 52.04 | 14.016 | 41.69 | 13.313 |
| Deprivation | 4.84 | 2.418 | 4.39 | 2.1 |
| Housing Factor | | | | |
| Number of People Living With | 2.43 | 1.242 | 2.59 | 1.378 |
| Health Factor | | | | |
| Perceived Susceptibility* | 4 | 1.568 | 4.79 | 1.543 |
| Political Factor | | | | |
| Trust in Government | 3.05 | 1.626 | 2.96 | 1.535 |
| Psychological Factors | | | | |
| COVID-19 and Social Distancing Knowledge | 6.98 | .946 | 7.03 | 1.064 |
| Social Responsibility | 6.37 | .859 | 6.18 | 1.022 |
| Self-Interest | 1.8 | 1.258 | 1.81 | 1.12 |
| Intention to Socially Distance* | 6.42 | .924 | 5.91 | 1.168 |
| Control over Leaving the House* | 6.08 | 1.187 | 5.28 | 1.923 |
| Control over Others' Distancing* | 3.41 | 1.813 | 2.45 | 1.516 |
| Control over Responsibilities* | 6.35 | 1.284 | 5.1 | 2.228 |
| Normative Pressure from Family | 6.53 | .793 | 6.27 | 1.092 |
| Normative Pressure from Friends* | 6.24 | 1.234 | 5.47 | 1.718 |
| Normative Pressure from Neighbours | 5.12 | 1.728 | 4.66 | 1.83 |
| Social Factors | | | | |
| Support from a Special Person | 5.63 | 1.811 | 5.51 | 1.85 |
| Support from Family | 5.44 | 1.691 | 5.34 | 1.664 |
| Support from Friends | 5.37 | 1.32 | 5.42 | 1.45 |
| *Statistically significant difference | | | | |

Table 6
Results of logistic regression, with binary outcome variable of adherence or non-adherence to all social distancing rules

| Explanatory Variables | Exp (B) | 95% Wald Confidence Interval for Exp (B) | | Sig. |
|---|------------|--|---------|------|
| | | Lower | Upper | |
| Constant | 24481821.0 | | | .996 |
| Demographic Factors | | | | |
| Gender | | | | .047 |
| Female | | | | |
| Male | 1.305 | .388 | 4.389 | .667 |
| Other** | .047 | .004 | .592 | .018 |
| Age | .977 | .933 | 1.023 | .322 |
| Ethnicity | | | | |
| White | | | | |
| BAME | 1.19 | .37 | 3.832 | .77 |
| Language | | | | |
| English as First Language | | | | |
| English Not as First Language | .613 | .182 | 2.068 | .43 |
| Religion | | | | .488 |
| No Religion | | | | |
| Christian | .504 | .203 | 1.252 | .14 |
| Buddhist | 6.469 | .208 | 201.301 | .287 |
| Hindu | .099 | .003 | 3.111 | .188 |
| Jewish | 1.641 | .298 | 9.043 | .569 |
| Muslim | 1.171 | .07 | 19.652 | .913 |
| Sikh | 5.882E + 9 | .000 | | .999 |
| Other | .414 | .071 | 2.407 | .326 |
| Highest Qualification Obtained | | | | .306 |
| Doctoral Degree | | | | |
| Masters Degree | .353 | .029 | 4.343 | .416 |
| Professional Qualification | .21 | .016 | 2.811 | .238 |
| Bachelors Degree | .166 | .014 | 2.028 | .16 |
| Vocational / Work-related Qualification | .133 | .008 | 2.121 | .153 |
| A Levels or equivalent | 28639096.0 | .000 | | .997 |
| GCSEs or equivalent | 1.272 | .042 | 38.118 | .89 |
| No Qualifications | 2.406 | .041 | 141.664 | .673 |
| Employment Status | | | | .586 |
| Long-term sick or disabled | | | | |
| Retired | .787 | .136 | 4.567 | .79 |
| Working as an employee from home | 3.579 | .682 | 18.774 | .132 |
| Self-employed or freelance from home | 2.24 | .36 | 13.947 | .387 |
| Looking after home or family | .721 | .075 | 6.904 | .777 |
| Unemployed | 3.303 | .23 | 47.51 | .38 |

*Significant predictors of non-adherence of all social distancing rules

**Significant association found, but below threshold of 10 units per variable (53)

| Explanatory Variables | Exp (B) | 95% Wald Confidence Interval for Exp (B) | | Sig. |
|--|----------------|---|--------|-------------|
| A furloughed employee | 3.573 | .451 | 28.315 | .228 |
| A student | 1.313 | .071 | 24.42 | .855 |
| Working as an employee in my normal place of work (not home) | 2.605 | .136 | 49.896 | .525 |
| Self-employed or freelance in my normal place of work (not home) | 121440088 | .000 | | .998 |
| Other | 3.414 | .363 | 32.075 | .283 |
| Key Worker Status | | | | |
| Not Key Worker | | | | |
| Key Worker | .511 | .154 | 1.694 | .272 |
| Deprivation | 1.016 | .841 | 1.227 | .873 |
| Housing Factors | | | | |
| Housing Situation | | | | |
| Live in Own Home | | | | |
| Live in Rented Home | 1.054 | .374 | 2.971 | .920 |
| | 1.553 | | | .664 |
| Live in Rented Room of Multiple Occupancy House | | .214 | 11.276 | |
| Number of People Living With | .849 | .619 | 1.166 | .312 |
| Living With a Vulnerable Person | | | | |
| Living with Person of Vulnerable Health Status | | | | |
| Not Living with Person of Vulnerable Health Status | .998 | .385 | 2.586 | .997 |
| Health Factors | | | | |
| Vulnerable Health* | | | | |
| Vulnerable | | | | |
| Not Vulnerable* | 4.506 | 1.799 | 11.285 | .001 |
| COVID-19 Symptoms | | | | |
| Not Had | | | | |
| Had | .87 | .341 | 2.215 | .77 |
| Perceived Susceptibility | 1.102 | .823 | 1.477 | .514 |
| Political Factors | | | | |
| 2019 General Election | | | | |
| Voted for Government | | | | |
| Did Not Vote for Government | 1.522 | .361 | 6.41 | .567 |
| Trust in Government | 1.005 | .76 | 1.328 | .974 |
| Lockdown Phase* | | | | |
| Total Lockdown | | | | |
| Overlap of Total and First Relaxation | 1.204 | .465 | 3.114 | .702 |
| First Relaxation* | .261 | .096 | .711 | .009 |
| Psychological Factors | | | | |
| COVID-19 and Social Distancing Knowledge | | | | |
| Social Responsibility | .966 | .63 | 1.482 | .875 |
| *Significant predictors of non-adherence of all social distancing rules | | | | |
| **Significant association found, but below threshold of 10 units per variable (53) | | | | |

| Explanatory Variables | Exp (B) | 95% Wald Confidence Interval for Exp (B) | | Sig. |
|--|----------------|---|-------|-------------|
| Self-Interest | .985 | .707 | 1.372 | .927 |
| Intention to Socially Distance | .688 | .433 | 1.094 | .114 |
| Control over Leaving the House | .821 | .634 | 1.063 | .135 |
| Control over Others' Distancing* | .724 | .573 | .916 | .007 |
| Control over Responsibilities* | .642 | .474 | .869 | .004 |
| Normative Pressure from Family | .931 | .577 | 1.5 | .768 |
| Normative Pressure from Friends | .739 | .526 | 1.037 | .08 |
| Normative Pressure from Neighbours | 1.062 | .824 | 1.369 | .643 |
| Social Factors | | | | |
| Financial Support | | | | |
| Getting Financial Support if Needed | | | | |
| Not Getting Financial Support If Needed | .731 | .241 | 2.22 | .58 |
| Community Support | | | | |
| Getting Community Support if Needed | | | | |
| Not Getting Community Support If Needed | 1.166 | .27 | 5.039 | .837 |
| Support from a Special Person | .912 | .674 | 1.234 | .551 |
| Support from Family | .903 | .596 | 1.366 | .628 |
| Support from Friends | 1.18 | .758 | 1.838 | .464 |
| *Significant predictors of non-adherence of all social distancing rules | | | | |
| **Significant association found, but below threshold of 10 units per variable (53) | | | | |

Table 7

Percentage of participants intentionally adhering and not adhering to social distancing rules by categorical explanatory variable

| Explanatory Variables | Intentional Adherence (n) | Intentional Adherence (%) | Intentional Non-Adherence (n) | Intentional Non-Adherence (%) |
|---|----------------------------------|----------------------------------|--------------------------------------|--------------------------------------|
| Sample | 350 | 51.4% | 331 | 48.6% |
| Demographic Factors | | | | |
| Gender | | | | |
| Female | 292 | 51.8% | 272 | 48.2% |
| Male | 55 | 49.5% | 56 | 50.5% |
| Other | 3 | 50% | 3 | 50% |
| Ethnicity | | | | |
| White | 302 | 51.8% | 281 | 48.2% |
| BAME | 48 | 49% | 50 | 51% |
| Language | | | | |
| English as First Language | 307 | 52.7% | 275 | 47.3% |
| English Not as First Language | 43 | 43.4% | 56 | 56.6% |
| Religion | | | | |
| No Religion | 210 | 50% | 210 | 50% |
| Christian | 79 | 51.3% | 75 | 48.7% |
| Buddhist | 5 | 55.6% | 4 | 44.4% |
| Hindu | 2 | 66.7% | 1 | 33.3% |
| Jewish | 27 | 50.9% | 26 | 49.1% |
| Muslim | 7 | 50% | 7 | 50% |
| Sikh | 2 | 100% | 0 | 0% |
| Other | 18 | 69.2% | 8 | 30.8% |
| Highest Qualification Obtained | | | | |
| Doctoral Degree | 14 | 35.9% | 25 | 64.1% |
| Masters Degree | 105 | 53% | 93 | 47% |
| Professional Qualification | 46 | 56.8% | 35 | 43.2% |
| Bachelors Degree | 117 | 49.6% | 119 | 50.4% |
| Vocational / Work-related Qualification | 26 | 65% | 14 | 35% |
| A Levels or equivalent | 23 | 52.3% | 21 | 47.7% |
| GCSEs or equivalent | 11 | 36.7% | 19 | 63.3% |
| No Qualifications | 8 | 61.5% | 5 | 38.5% |
| Employment Status* | | | | |
| Long-term sick or disabled | 19 | 67.9% | 9 | 32.1% |
| Retired | 30 | 53.6% | 26 | 46.4% |
| Working as an employee from home | 146 | 54.5% | 122 | 45.5% |
| Self-employed or freelance from home | 36 | 54.5% | 30 | 45.4% |
| Looking after home or family | 12 | 41.4% | 17 | 58.6% |
| Unemployed | 17 | 47.2% | 19 | 52.8% |
| A furloughed employee | 26 | 40.6% | 38 | 59.4% |
| A student | 6 | 30% | 14 | 70% |

*Statistically significant association

| Explanatory Variables | Intentional Adherence (n) | Intentional Adherence (%) | Intentional Non-Adherence (n) | Intentional Non- Adherence (%) |
|--|----------------------------------|----------------------------------|--------------------------------------|---------------------------------------|
| Working as an employee in my normal place of work (not home) | 37 | 55.2% | 30 | 44.8% |
| Self-employed or freelance in my normal place of work (not home) | 3 | 18.8% | 13 | 81.3% |
| Other | 18 | 58.1% | 13 | 41.9% |
| Key Worker Status | | | | |
| Not Key Worker | 276 | 52.3% | 252 | 47.7% |
| Key Worker | 74 | 48.4% | 79 | 51.6% |
| Housing Factors | | | | |
| Housing Situation* | | | | |
| Live in Own Home | 181 | 51.9% | 168 | 48.1% |
| Live in Rented Home | 138 | 55.2% | 112 | 44.8% |
| Live in Rented Room of Multiple Occupancy House | 31 | 37.8% | 51 | 62.2% |
| Living with Vulnerable Person | | | | |
| Living with Person of Vulnerable Health Status | 62 | 59.6% | 42 | 40.4% |
| Not Living with Person of Vulnerable Health Status | 288 | 49.9% | 289 | 50.1% |
| Health Factors | | | | |
| Health* | | | | |
| Vulnerable | 64 | 62.7% | 338 | 37.3% |
| Not Vulnerable | 286 | 49.4% | 293 | 50.6% |
| COVID-19 Symptoms | | | | |
| Not Had | 247 | 52.3% | 225 | 47.7% |
| Had | 103 | 49.3% | 106 | 50.7% |
| Political Factors | | | | |
| 2019 General Election | | | | |
| Voted for Government | 26 | 42.6% | 35 | 57.4% |
| Did Not Vote for Government | 324 | 52.3% | 296 | 47.7% |
| Lockdown Phase | | | | |
| Total Lockdown | 137 | 52.9% | 122 | 47.1% |
| Overlap of Total and First Relaxation | 133 | 52.2% | 122 | 47.8% |
| First Relaxation | 80 | 47.9% | 87 | 52.1% |
| Social Factors | | | | |
| Financial Support | | | | |
| Getting Financial Support if Needed | 287 | 52.7% | 258 | 47.3% |
| Not Getting Financial Support If Needed | 63 | 46.3% | 73 | 53.7% |
| Community Support | | | | |
| Getting Community Support if Needed | 308 | 51.4% | 291 | 48.6% |
| Not Getting Community Support If Needed | 42 | 51.2% | 40 | 48.8% |
| *Statistically significant association | | | | |

Table 8

Comparison of means of continuous explanatory variables between participants who intentionally did not adhere to social distancing rules and those that did

| Explanatory Variables | Adherence (Mean) | Adherence (S.D.) | Non-Adherence (Mean) | Non-Adherence (S.D.) |
|--|------------------|------------------|----------------------|----------------------|
| Demographic Factors | | | | |
| Age | 43.31 | 13.67 | 41.5 | 13.525 |
| Deprivation | 4.43 | 2.117 | 4.42 | 2.138 |
| Housing Factor | | | | |
| Number of People Living With | 2.51 | 1.317 | 2.64 | 1.418 |
| Health Factor | | | | |
| Perceived Susceptibility* | 4.61 | 1.562 | 4.87 | 1.543 |
| Political Factor | | | | |
| Trust in Government | 3.03 | 1.56 | 2.89 | 1.519 |
| Psychological Factors | | | | |
| COVID-19 and Social Distancing Knowledge | 7.1 | 1.002 | 6.95 | 1.105 |
| Social Responsibility* | 6.29 | 1.015 | 6.1 | 1.001 |
| Self-Interest* | 1.69 | 1.118 | 1.93 | 1.131 |
| Intention to Socially Distance* | 6.38 | .875 | 5.49 | 1.248 |
| Control over Leaving the House* | 5.51 | 1.815 | 5.16 | 1.955 |
| Control over Others' Distancing* | 2.68 | 1.632 | 2.34 | 1.457 |
| Control over Responsibilities* | 5.42 | 2.138 | 4.95 | 2.236 |
| Normative Pressure from Family* | 6.47 | .923 | 6.09 | 1.186 |
| Normative Pressure from Friends* | 5.84 | 1.568 | 5.19 | 1.772 |
| Normative Pressure from Neighbours | 4.62 | 1.902 | 4.76 | 1.741 |
| Social Factors | | | | |
| Support from a Special Person | 5.52 | 1.89 | 5.52 | 1.801 |
| Support from Family | 5.33 | 1.713 | 5.37 | 1.615 |
| Support from Friends | 5.32 | 1.505 | 5.53 | 1.36 |
| *Statistically significant difference | | | | |

Table 9

Results of logistic regression, with binary outcome variable of intentional non-adherence or adherence of social distancing rules

| Explanatory Variables | Exp (B) | 95% Wald Confidence Interval for Exp (B) | | Sig. |
|--|---------|--|--------|------|
| | | Lower | Upper | |
| Constant | 51.866 | | | .999 |
| Demographic Factors | | | | |
| Gender | | | | .649 |
| Female | | | | |
| Male | .795 | .475 | 1.328 | .38 |
| Other | .708 | .114 | 4.382 | .71 |
| Age | 1.001 | .98 | 1.022 | .942 |
| Ethnicity | | | | |
| White | | | | |
| BAME | 1.204 | .68 | 2.132 | .523 |
| Language | | | | |
| English as First Language | | | | |
| English Not as First Language | 1.484 | .851 | 2.587 | .164 |
| Religion | | | | .73 |
| No Religion | | | | |
| Christian | 1.164 | .725 | 1.868 | .529 |
| Buddhist | .831 | .159 | 4.33 | .826 |
| Hindu | 1.264 | .085 | 18.815 | .865 |
| Jewish | .872 | .414 | 1.838 | .719 |
| Muslim | .521 | .132 | 2.050 | .351 |
| Sikh | .000 | .000 | | .999 |
| Other | .423 | .156 | 1.141 | .089 |
| Highest Qualification Obtained* | | | | .02 |
| Doctoral Degree | | | | |
| Masters Degree* | .332 | .147 | .749 | .008 |
| Professional Qualification* | .307 | .123 | .765 | .011 |
| Bachelors Degree* | .361 | .161 | .807 | .013 |
| Vocational / Work-related Qualification* | .174 | .057 | .531 | .002 |
| A Levels or equivalent | .353 | .12 | 1.037 | .058 |
| GCSEs or equivalent | 1.125 | .325 | 3.891 | .853 |
| No Qualifications | .221 | .037 | 1.335 | .1 |
| Employment Status | | | | .052 |
| Long-term sick or disabled | | | | |
| Retired | 1.309 | .384 | 4.461 | .667 |
| Working as an employee from home | .638 | .219 | 1.854 | .409 |
| Self-employed or freelance from home | .693 | .215 | 2.233 | .539 |
| Looking after home or family | 1.548 | .401 | 5.975 | .526 |
| Unemployed | 1.007 | .286 | 3.541 | .992 |
| A furloughed employee | 1.321 | .41 | 4.253 | .641 |

*Significant predictors of intentional non-adherence of social distancing rules

| Explanatory Variables | Exp (B) | 95% Wald Confidence Interval for Exp (B) | | Sig. |
|---|----------------|---|--------|-------------|
| A student | 1.02 | .223 | 4.669 | .979 |
| Working as an employee in my normal place of work (not home) | .358 | .101 | 1.275 | .113 |
| Self-employed or freelance in my normal place of work (not home) | 3.184 | .551 | 18.401 | .196 |
| Other | .367 | .096 | 1.399 | .142 |
| Key Worker Status | | | | |
| Not Key Worker | 1.559 | .91 | 2.672 | .106 |
| Key Worker | | | | |
| Deprivation | 1.019 | .929 | 1.118 | .684 |
| Housing Factors | | | | |
| Housing Situation | | | | .155 |
| Live in Own Home | | | | |
| Live in Rented Home | .902 | .569 | 1.431 | .662 |
| Live in Rented Room of Multiple Occupancy House | 1.737 | .845 | 3.571 | .133 |
| Number of People Living With | 1.007 | .862 | 1.178 | .926 |
| Living With a Vulnerable Person | | | | |
| Living with Person of Vulnerable Health Status | | | | |
| Not Living with Person of Vulnerable Health Status | 1.26 | .723 | 2.195 | .415 |
| Health Factors | | | | |
| Health | | | | |
| Vulnerable | | | | |
| Not Vulnerable | 1.335 | .773 | 2.308 | .3 |
| COVID-19 Symptoms | | | | |
| Not Had | | | | |
| Had | 1.041 | .684 | 1.583 | .852 |
| Perceived Susceptibility | 1.077 | .939 | 1.235 | .289 |
| Political Factors | | | | |
| 2019 General Election | | | | |
| Voted for Government | | | | |
| Did Not Vote for Government* | .461 | .222 | .954 | .037 |
| Trust in Government | .907 | .794 | 1.036 | .149 |
| Lockdown Phase | | | | .444 |
| Total Lockdown | | | | |
| Overlap of Total and First Relaxation | .769 | .501 | 1.182 | .232 |
| First Relaxation | .792 | .487 | 1.289 | .348 |
| Psychological Factors | | | | |
| COVID-19 and Social Distancing Knowledge | .871 | .726 | 1.044 | .136 |
| Social Responsibility | .96 | .79 | 1.168 | .685 |
| Self-Interest | 1.07 | .891 | 1.284 | .472 |
| Intention to Socially Distance* | .468 | .381 | .575 | .000 |
| Control over Leaving the House | .992 | .895 | 1.1 | .877 |
| Control over Others' Distancing* | .829 | .73 | .942 | .004 |
| Control over Responsibilities | .91 | .819 | 1.011 | .079 |
| *Significant predictors of intentional non-adherence of social distancing rules | | | | |

| Explanatory Variables | Exp (B) | 95% Wald Confidence Interval for Exp (B) | Sig. |
|---|---------|--|------|
| Normative Pressure from Family | .872 | .716 1.061 | .171 |
| Normative Pressure from Friends | .942 | .834 1.063 | .331 |
| Normative Pressure from Neighbours* | 1.121 | 1.004 1.253 | .042 |
| Social Factors | | | |
| Financial Support | | | |
| Getting Financial Support if Needed | | | |
| Not Getting Financial Support If Needed | 1.596 | .938 2.714 | .085 |
| Community Support | | | |
| Getting Community Support if Needed | | | |
| Not Getting Community Support If Needed | .764 | .396 1.473 | .422 |
| Support from a Special Person | .991 | .861 1.141 | .904 |
| Support from Family | .853 | .694 1.05 | .133 |
| Support from Friends* | 1.465 | 1.152 1.864 | .002 |
| *Significant predictors of intentional non-adherence of social distancing rules | | | |

Table 10
Associations between univariate and multivariate predictors and comparison of models

| Non-Adherence All Rules | | Intentional Non-Adherence | |
|--|--|--|---|
| Univariate Predictor | Multivariate Predictor | Univariate Predictor | Multivariate Predictor |
| <ul style="list-style-type: none"> • <i>Lower Age</i> • Employment Status of Not Retired or Long-term Sick or Disabled • <i>Not Living With a Person of Vulnerable Health Status vs. Living With a Person of Vulnerable Health Status</i> • Lower Intention to Socially Distance | Not Vulnerable vs. Vulnerable Health | <ul style="list-style-type: none"> • Not Vulnerable vs. Vulnerable Health • Lower Social Responsibility • Higher Self-Interest • Lower Control over Leaving the House • Lower Control over Responsibilities • Lower Normative Pressure from Family • Lower Normative Pressure from Friends | Lower Intention to Socially Distance |
| <ul style="list-style-type: none"> • Living in a Rented Room in a Multiple Occupancy House vs. Owning Own Home • Higher Perceived Susceptibility | Lower Control over Others' Distancing | <ul style="list-style-type: none"> • Living in a Rented Room in a Multiple Occupancy House vs. Owning Own Home • Higher Perceived Susceptibility | Lower Control over Others' Distancing |
| <ul style="list-style-type: none"> • Lower Control over Leaving the House • Higher Normative Pressure from Friends | Lower Control over Responsibilities | <ul style="list-style-type: none"> • Employment Status of Self-employed or Freelance in Normal Place of Work or Student | Having a Doctoral Degree vs. a Masters, Professional Qualification, Bachelors Degree or Work-related Qualification |
| | <i>First Relaxation Phase vs. Total Lockdown</i> | | Voted for the Government |
| | | | Higher Normative Pressure from Neighbours |
| | | | Greater Support from Friends |
| <i>Predictors in italics are unique to the all social distancing rules model.</i> | | | |
| Predictors in bold are unique to the intentional non-adherence model. | | | |