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Factors associated with wearing a facemask in shops in England following removal of a legal requirement to do so during the COVID-19 pandemic

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Abstract

Objectives: We aimed to identify psychological factors associated with the use of facemasks in shops in England following removal of legal requirements to do so, and to compare associations with and without legal restrictions.

Design: Repeated cross-sectional online surveys ($n \approx 2000$ adults) between August 2020 and April 2022 (68,716 responses from 45,682 participants) using quota sampling.

Methods: The outcome measure was whether those who had visited a shop for essentials in the previous seven days reported always having worn a facemask versus sometimes or not at all. Psychological predictor variables included worry, perceived risk and severity of COVID-19 and the perceived effectiveness of facemasks. Socio-demographic variables and measures of clinical vulnerability were also measured. For the period following removal of legal restrictions, multivariable regression was used to assess associations between the primary outcome variable and predictors adjusting for socio-demographic and clinical vulnerability measures. The analysis was repeated including interactions between psychological predictors and presence versus absence of legal restrictions.

Results: Worry about COVID-19, beliefs about risks and severity of COVID-19 and effectiveness of facemasks were substantially and independently associated with the use of facemasks. Removal of legal obligations to wear facemasks

was associated with a 25% decrease in wearing facemasks and stronger associations between psychological predictors and wearing facemasks.

Conclusions: Legal obligations increase rates of wearing a facemask. Psychological factors associated with wearing a facemask could be targets for interventions aiming to alter rates of wearing a facemask. These interventions may be more effective when there are no legal obligations to wear a face covering in place.

Statement of contribution

What is already known on this topic

- Facemasks have been widely recommended and used to reduce the transmission of COVID-19.
- Adherence to the use of facemasks has been variable across times and places and between individuals.
- Psychological and demographic factors have been predictive of various behaviours related to COVID-19.

What this study adds

- Rates of wearing a facemask were higher when a legal obligation to do so was in place.
- Wearing facemasks was associated with psychological factors including perceived behavioural impact.
- Associations were stronger when there was no legal requirement to wear facemasks.

INTRODUCTION

Facemasks have been routinely used to protect people from spreading and acquiring infectious diseases in countries in South East Asia and in health care settings for decades. They were widely used globally during the COVID-19 pandemic when transmission rates were high. However, rates of adoption have varied by country (Badillo-Goicoechea et al., 2021). Evidence has been accumulating for their effectiveness from data collected using different methodologies, for example, observational data (Leffler et al., 2020), modelling based on large numbers of international datasets (Leech et al., 2022), a cluster-randomized trial of villages across Bangladesh (Abaluck et al., 2022) and evidence synthesis (Brainard et al., 2020; Talic et al., 2021). At the same time, a robust academic debate has taken place focusing on the limitations of the existing data and the potential costs of facemask wearing (Greenhalgh et al., 2022). This has left many policymakers and members of the public uncertain as to the value of facemasks. A recent Cochrane review found inconclusive evidence as to whether interventions to promote mask wearing slow the spread of respiratory infections, although there remain calls for more robust randomized controlled trials (Jefferson et al., 2023). Note that in this paper we use the term facemasks to mean both

masks (e.g., surgical facemasks) and face coverings (e.g., multi-layered cloth masks), recommended or mandated for use in public and community settings throughout the COVID-19 pandemic.

Legal obligations to wear facemasks differed between the four UK nations. In England, facemasks were mandated on public transport, in shops and restaurants in June (Department for Transport, Grant Shapps, n.d.), July, (Department of Health and Social Care, Matt Hancock, n.d.) and September 2020 (Cabinet Office, n.d.), respectively. Legal requirements were lifted in July 2021 (2021) and then re-imposed following high transmission of the Omicron variant in November 2021 for public transport and shops (2021) and most public indoor spaces in December (Prime Minister's Office 10 Downing Street, 2021). All facemask mandates were then lifted six weeks later at the end of January 2022 (2022).

Throughout the pandemic, there has been evidence that psychological factors were associated with engaging with protective behaviours (Smith et al., 2022a, 2022b, 2022c, 2022d). Theories of health behaviour suggest mechanisms through which psychological factors may contribute to behaviour. The Protection Motivation Theory would propose that threat appraisal (i.e., perceived susceptibility and severity of COVID-19) and coping appraisal (i.e., perceived effectiveness of wearing a facemask and perceived self-efficacy for wearing a facemask [capacity to wear a facemask]) affect intention to engage in facemask wearing, with intention ultimately affecting behaviour (Rogers, 1975). Wearing a facemask was associated with higher perceived severity of COVID-19, higher perceived susceptibility to COVID-19, higher perceived effectiveness of masks and higher self-efficacy (Chen & Lei, 2022; White et al., 2022). Qualitative data have also identified the influence of government recommendations, perceived effectiveness and perceived vulnerability to infection in the decision to wear a facemask (He et al., 2022).

Most research investigating factors associated with wearing a facemask was conducted at the start of the pandemic, as facemasks were being legally obligated. However, future infectious disease outbreaks may once again lead to recommendations to wear face coverings in the absence of legal compulsion. It is therefore important to study factors associated with wearing a facemask in times when wearing one is not a legal obligation. In the United Kingdom, one large cross-sectional study conducted in January to February 2022 investigated wearing a facemask and associations with socio-demographic and psychological variables, finding that greater capability, opportunity and motivation were associated with wearing a facemask (Armitage et al., 2023). People living in England, men, and those of White ethnicity were less likely to wear facemasks. However, this study asked people to report on their facemask wearing behaviour in the previous week, over a time that spanned changing of guidance.

In the United Kingdom, a national study of 64 cross-sectional surveys over 2 years (February 2020–January 2022; $n \approx 2000$ per wave) found that the greatest variations in facemask wearing, social mixing and hand cleaning reflected changes to government rules (Smith et al., 2022e). This finding for facemasks is consistent with global trends across 38 countries (Badillo-Goicoechea et al., 2021). Although survey data are self-report, there is evidence that self-reported rates of 'always' wearing a facemask are a reliable measure of observed behaviour, with observed rates of 65% (in supermarkets) and 62% (at bus stops) and self-reported rates of 63% (in shops for groceries/pharmacy) and 62% (on public transport respectively) having been recorded in the United Kingdom in one week during 2021 (Davies et al., 2023).

In this study, we sought to identify potential targets for communication campaigns that may be harnessed to increase facemask wearing when legal obligations are not actively in force. Beliefs and feelings about an infectious disease and about facemasks would be a potential target for such campaigns if they turned out to be important influences on facemask wearing.

The current study addresses two key questions:

1. Following the point at which all legal requirements for facemask wearing were lifted, what factors were associated with facemask wearing in shops?
2. Were there differences between factors associated with facemask wearing in shops, when legal requirements were or were not in force?

METHODS

Design

Data were from a repeated, cross-sectional online survey ($n \approx 2000$ UK adults) using quota sampling (age and sex combined, and region). There were a total of 73 waves of data collection, numbered from 1 to 72, with an additional survey numbered 63.5 (as it was hastily included in response to the emergence of the Omicron variant). Full background is available at: http://epr.hpru.nihr.ac.uk/our-research/research-themes/response/corsair-study. In this paper, we use data from wave 54 (26–27 July 2021) to wave 72 (11–13 April 2022). To be eligible, participants had to be aged 16 years or older and living in the United Kingdom. The dataset was restricted to people living in England only, as there were different legal obligations for wearing a face covering in the different nations. Questions about wearing a face covering were only asked to those who reported having attended that location at least once in the last week. Therefore, analyses are based on 31,490 responses from 24,100 participants who had visited a shop for groceries/pharmacy in the last seven days.

Measures

The outcome measure was: 'While you were doing each of these activities in the past seven days, did you wear a face covering? In shops, for groceries/pharmacy. *Yes – on all occasions / Yes – on some occasions / No, not at all*'. This question was only asked to those who reported that they had gone into grocery shops or pharmacies in the previous seven days. We restricted to groceries and pharmacies (further referred to as 'for essentials') as these were where shopping activity was often carried out and non-essential shops were shut during various lockdowns.

The psychological measures were:

1. Worry about COVID-19: 'Overall, how worried are you about coronavirus? *Extremely worried / very worried / somewhat worried / not very worried / not at all worried / don't know [coded as missing]*'
2. Perceived risk of COVID-19 to self: 'To what extent do you think coronavirus (COVID-19) poses a risk to you personally? *Major risk / significant risk / moderate risk / minor risk / no risk at all / don't know [coded as missing]*'
3. Perceived risk of COVID-19 to people in UK: 'To what extent do you think coronavirus (COVID-19) poses a risk to people in the UK? *Major risk / significant risk / moderate risk / minor risk / no risk at all / don't know [coded as missing]*'
4. Perceived severity of COVID-19: 'Coronavirus would be a serious illness for me. *Strongly agree / agree / neither agree nor disagree / disagree / strongly disagree / don't know [coded as missing]*'
5. Perceived exposure to COVID-19: 'It is likely that some of the people I come into contact with in the next seven days will have coronavirus. *Strongly agree / agree / neither agree nor disagree / disagree / strongly disagree / don't know [coded as missing]*'
6. Perceived effectiveness: 'An effective way to prevent the spread of coronavirus (COVID-19) is to… wear a facemask or another face covering (such as a scarf) when out and about. *Strongly agree / agree / neither agree nor disagree / disagree / strongly disagree / don't know [coded as missing]*'
7. Self-efficacy: 'How confident are you that, if you wanted to, you could… wear a face mask or another face covering (such as a scarf) when out and about. *Strongly agree / agree / neither agree nor disagree / disagree / strongly disagree / don't know [coded as missing]*'
8. Perceived behavioural impact: 'My personal behaviour has an impact on how COVID-19 spreads. *Strongly agree / agree / neither agree nor disagree / disagree / strongly disagree / don't know [coded as missing]*'

Demographic, social and health measures were gender, age, employment status, highest level of education, ethnicity and how many people lived in their household. We derived region (ONS groupings; Office for National Statistics, n.d.) and index of multiple deprivation (Ministry of Housing Communities & Local Government, 2019) from participants' postcode. Participants were also asked whether they had a dependent child, they had a chronic illness and whether a household member had a chronic illness. Participants were categorized as being at high risk of COVID-19 according to NHS guidance (NHS, 2021). Socio-economic grade was derived from an item asking participants the occupation of the highest earner in the household (Ipsos MediaCT, 2009). Financial hardship was computed by summing answers from three items (I am finding my current living situation difficult, I am struggling to make ends meet, I am skipping meals I would usually have; each scored on a five-point Likert scale from strongly disagree to strongly agree) to give a score ranging from 3 (least hardship) to 15 (most hardship). Items were categorized in line with previous analyses from the CORSAIR dataset (Smith et al., 2022a).

Ethics

This work was part of a service evaluation of the Department of Health and Social Care's public communications campaign, and following advice from King's College London Research Ethics Committee, was exempt from requiring ethical approval.

Consent was implied by participants' completion of the survey. This is in line with industry standards. Participants were members of online research panels, who had consented to being contacted to take part in online surveys.

Analysis

As a result of the reported alignment between self-reported and directly observed facemask wearing 'on all occasions' (Davies et al., 2023), wearing a facemask was recoded into a binary variable: wearing a face covering on all occasions versus sometimes or never wearing a facemask. To investigate the first research question, only waves where there was no legal obligation to wear a facemask were selected (waves 54–62 [26 July 2021–17 November 2021], and waves 68–72 [14 February 2022–13 April 2022]). Therefore $n = 21,453$ responses were investigated. We used generalized estimating equations (GEEs) with an unstructured correlation structure to investigate associations between psychological, demographic, social and health measures, and wearing a facemask, accounting for repeat participants. We adjusted for survey wave, region, gender, age (raw and quadratic), presence of a dependent child in the household, having a chronic illness oneself, having a household member who has chronic illness, employment status, socio-economic grade, index of multiple deprivation, highest educational or professional qualification, ethnicity, living alone, and financial hardship. Items asking about perceived effectiveness and self-efficacy were not included in all waves; therefore, number of respondents in these analyses are lower (perceived effectiveness included in waves 55, 57, 59, 61, 69; perceived self-efficacy included in waves 55, 57, 59, 61, 69, 71).

To investigate the second research question, whether legal obligations influenced factors associated with wearing a facemask, we used data from 26 July 2021 (wave 54) onwards. This covered a period of time when legal obligations were (waves 63.5–66 [6 December 2021–20 January 2022]) and were not (waves 54–62 [26 July 2021–17 November 2021], and waves 68–72 [14 February 2022–13 April 2022]) in place. Waves 63 (29 November–1 December 2021) and 67 (31 January–2 February 2022) were coded as missing as data collection spanned times when legal obligations were and were not in place.

We created interaction terms between face covering legal obligations in place and psychological factors. Multivariable analyses were used to investigate associations between outcomes, explanatory variables (as above), facemask legal obligations in place, and interaction terms, adjusting for region,

gender, age (raw and quadratic), presence of a dependent child in the household, having a chronic illness oneself, having a household member who has chronic illness, employment status, socio-economic grade, index of multiple deprivation, highest educational or professional qualification, ethnicity, living alone, financial hardship, and face covering legal obligations being in place. For these analyses, we did not investigate wave as it superseded presence of legal obligations.

All analyses used non-weighted data. We present raw p-values, but to account for multiple comparisons ($n = 25$), we applied a Bonferroni correction to our significance level ($p \leq .002$).

RESULTS

A total of 31,490 responses from 24,100 respondents were included in the analyses. There were 578 missing a unique participant identifier (1.8%). 19,414 participants completed the survey once, while 4696 completed the survey more than once. Demographic variables are presented per response in Table 1.

Rates of people wearing a face covering in grocery shops or pharmacies and details as to when different facemask policies were in place between 3 August 2020 and 13 April 2022 are shown in Figure 1.

Question 1: Following the point at which all legal requirements for facemask wearing were lifted, what factors were associated with mask wearing in shops?

When no legal obligations were in place, wearing a face covering on all occasions in shops was positively associated with all psychological predictors (adjusted odds ratios and 95% confidence intervals in brackets): worry about COVID-19 (1.87; 1.81–1.93), perceived risk of COVID-19 to self (1.51; 1.47–1.56), perceived risk of COVID-19 to people in the United Kingdom (1.62; 1.57–1.68), perceived severity of COVID-19 (1.53; 1.49–1.58); perceived exposure to COVID-19 (1.19; 1.15–1.22), perceived effectiveness (2.21; 2.08–2.35), self-efficacy (2.11; 1.98–2.23) and perceived behavioural impact (1.47; 1.43–1.52). For full details, see Table 2.

TABLE 1 Demographic variables per response.

Attribute	Level	N	%
Gender	Male	14,745	46.8
	Female	16,627	52.8
	Prefer to self-describe	90	.3
	Prefer not to say	28	.1
Age	Range from 16 to over 100 years	$M = 48.2$	$SD = 18.1$
Ethnicity	White British	25,972	82.5
	White other	1639	5.2
	Mixed	851	2.7
	Asian/Asian British	1746	5.5
	Black/Black British	922	2.9
	Arab/Other	181	.6
	Prefer not to say	179	.6

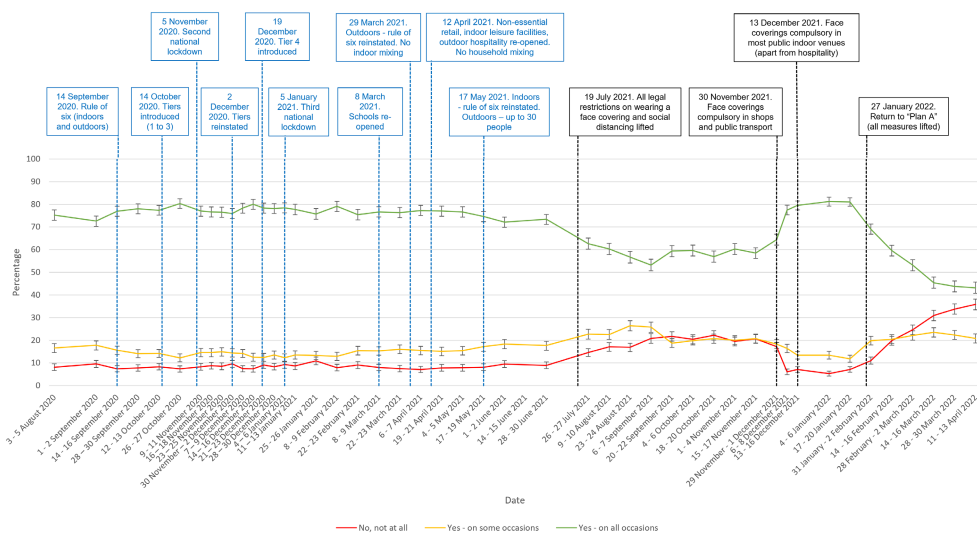Abbreviations: M, mean; N, number; SD, standard deviation.

FIGURE 1 Rates of people wearing a face covering in shops for groceries/pharmacy between 3 August 2020 and 13 April 2022. Error bars are 95% confidence intervals. Dashed vertical lines in blue depict changes in legal obligations about social mixing. Dashed vertical lines in black depict changes in legal obligations about wearing a face covering.

Question 2: Were there differences between factors associated with facemask wearing in shops, with and without legal requirements?

Removal of legal requirements to wear facemasks was associated with a 25% decrease from 79.9% to 55% in wearing facemasks on all occasions (Table 3). There were stronger associations between psychological factors and facemask wearing in shops when wearing facemasks was not a legal requirement, for all but two factors: self-efficacy and perceived exposure to COVID-19 (Table 3). Thus, people's likelihood of wearing a facemask was more likely to be influenced by worry (1.35; 1.26–1.44), perceived risk to self (1.25; 1.17–1.33), perceived risk to others (1.28; 1.19–1.37), perceived severity (1.28; 1.21–1.36), perceived effectiveness (1.24; 1.12–1.38) and perceived behavioural impact (.92; .86–.98) when legal requirements were not in place, compared to when they were.

DISCUSSION

This analysis of 31,490 responses from 24,100 adults in England between August 2020 and April 2022 showed that wearing facemasks in shops was strongly associated with the eight psychological predictors measured: worry about COVID-19, perceived risk of COVID-19 to self, perceived risk of COVID-19 to people in the United Kingdom, perceived severity of COVID-19, perceived exposure to COVID-19, perceived effectiveness, self-efficacy and perceived behavioural impact. This is in line with previous research (Armitage et al., 2023; Chen & Lei, 2022; He et al., 2022; White et al., 2022), and theories of health behaviour (Rogers, 1975). Similar to previous research, we found that rates of wearing a facemask were higher when it was legally obligated (Badillo-Goicoechea et al., 2021; He et al., 2022).

For all but two psychological factors associated with wearing a facemask, these associations were significantly stronger when legal requirements were not in place, compared to when they were. These findings suggest that without legal obligations, people may be more influenced by their emotions, perceptions and beliefs. The association between wearing a facemask and perceived exposure to COVID-19 was not changed by legal requirements, nor was self-efficacy. Whilst it is not possible to establish why this would be the case using our data, it may be linked to a number of factors such as messaging that accompanied the lifting of restrictions emphasizing that COVID-19 was still circulating. Given the

TABLE 2   Associations between always (vs. sometimes or never) wearing a face covering in shops following removal of legal requirement to do so.

Attribute	Level	Not or sometimes wearing a face covering n=9664, n (%)	Always wearing a face covering n=11,789, n (%)	aOR for always wearing a face covering (95% CI)[a]	p
Psychological predictors					
Worry about COVID-19	5-point scale (1=not at all worried to 5=extremely worried)	N=9632, M=2.7, SD=1.1	N=11,771, M=3.3, SD=1.0	1.87 (1.81–1.93)	<.001**
Perceived risk of COVID-19 to self	5-point scale (1=no risk at all to 5=major risk)	N=9558, M=2.8, SD=1.2	N=11,690, M=3.3, SD=1.1	1.51 (1.47–1.56)	<.001**
Perceived risk of COVID-19 to people in the United Kingdom	5-point scale (1=no risk at all to 5=major risk)	N=9527, M=3.2, SD=1.1	N=11,696, M=3.7, SD=.9	1.62 (1.57–1.68)	<.001**
Perceived severity of COVID-19	5-point scale (1=strongly disagree to 5=strongly agree)	N=9355, M=2.9, SD=1.2	N=11,440, M=3.5, SD=1.1	1.53 (1.49–1.58)	<.001**
Perceived exposure to COVID-19	5-point scale (1=strongly disagree to 5=strongly agree)	N=9185, M=3.2, SD=1.0	N=11,163, M=3.4, SD=1.0	1.19 (1.15–1.22)	<.001**
Perceived effectiveness[b]	5-point scale (1=strongly disagree to 5=strongly agree)	N=3213, M=3.6, SD=1.2	N=4321, M=4.4, SD=.8	2.21 (2.08–2.35)	<.001**
Self-efficacy[c]	5-point scale (1=strongly disagree to 5=strongly agree)	N=4143, M=3.9, SD=1.1	NN=5048, M=4.5, SD=.7	2.11 (1.98–2.23)	<.001**
Perceived behavioural impact	5-point scale (1=strongly disagree to 5=strongly agree)	N=9556, M=3.6, SD=1.1	N=11,730, M=4.0, SD=1.0	1.47 (1.43–1.52)	<.001**
Covariates					
Survey wave	26–27 July 2021 (wave 54)	37.4 (546)	62.6 (913)	Ref	–
	9–10 August 2021 (wave 55)	39.6 (578)	60.4 (880)	.89 (.76–1.05)	.16
	23–24 August 2021 (wave 56)	43.3 (640)	56.7 (838)	.80 (.68–.93)	.005*
	6–7 September 2021 (wave 57)	46.7 (682)	53.3 (777)	.68 (.58–.79)	<.001**
	20–22 September 2021 (wave 58)	40.6 (565)	59.4 (828)	.87 (.74–1.01)	.07
	4–6 October 2021 (wave 59)	41.0 (593)	59.0 (854)	.86 (.74–1.01)	.07
	18–20 October 2021 (wave 60)	43.0 (598)	57.0 (792)	.77 (.66–.90)	.001**
	1–4 November 2021 (wave 61)	39.7 (639)	60.3 (969)	.88 (.76–1.02)	.10
	15–17 November 2021 (wave 62)	42.0 (696)	58.0 (960)	.85 (.73–.98)	.03*
	14–16 February 2022 (wave 68)	40.4 (665)	59.6 (980)	.91 (.79–1.06)	.24

TABLE 2 (Continued)

Attribute	Level	Not or sometimes wearing a face covering $n = 9664$, n (%)	Always wearing a face covering $n = 11,789$, n (%)	aOR for always wearing a face covering (95% CI)[a]	p
	28 February–2 March 2022 (wave 69)	46.8 (756)	53.2 (859)	.66 (.57–.77)	<.001**
	14–16 March 2022 (wave 70)	54.6 (871)	45.4 (725)	.49 (.42–.57)	<.001**
	28–30 March 2022 (wave 71)	56.2 (932)	43.8 (726)	.45 (.39–.52)	<.001**
	11–13 April 2022 (wave 72)	56.8 (903)	43.2 (688)	.44 (.38–.51)	<.001**
	Overall	–	–	$\chi^2(13) = 359.4$	–
Region	East Midlands	47.5 (932)	52.5 (1030)	Ref	–
	East of England	42.5 (955)	57.5 (1294)	1.21 (1.06–1.39)	.006*
	London	40.4 (1188)	59.6 (1749)	1.42 (1.24–1.62)	<.001**
	North East	46.4 (536)	53.6 (618)	1.06 (.90–1.24)	.49
	North West	51.0 (1490)	49.0 (1431)	.87 (.76–.98)	.03*
	South East	44.5 (1554)	55.5 (1942)	1.11 (.98–1.26)	.09
	South West	39.1 (850)	60.9 (1325)	1.35 (1.18–1.56)	<.001**
	West Midlands	46.3 (1072)	53.7 (1241)	1.07 (.94–1.23)	.31
	Yorkshire and The Humber	48.4 (1087)	51.6 (1159)	.97 (.85–1.12)	.70
	Overall	–	–	$\chi^2(8) = 96.8$	<.001**
Gender	Male	43.4 (4337)	56.6 (5649)	Ref	–
	Female	46.5 (5291)	53.5 (6092)	.93 (.88–.99)	.02*
	Raw age	$N = 9664$, $M = 44.7$, $SD = 17.1$	$N = 11,789$, $M = 51.6$, $SD = 17.9$	1.26 (1.23–1.29)	<.001**
Age (per decade)					
Age: quadratic (age−mean)^2	–	–	–	1.0002 (1.0001–1.0003)	<.001**
Dependent child in household	None	41.2 (5901)	58.8 (8420)	Ref	–
	Child present	52.8 (3763)	47.2 (3369)	.86 (.79–.92)	<.001**
At high risk for COVID-19	No	46.7 (8027)	53.3 (9177)	Ref	–
	Yes	37.2 (1416)	62.8 (2386)	1.31 (1.21–1.43)	<.001**

TABLE 2 (Continued)

Attribute	Level	Not or sometimes wearing a face covering $n=9664$, n (%)	Always wearing a face covering $n=11{,}789$, n (%)	aOR for always wearing a face covering (95% CI)[a]	p
Household member has chronic illness	No	45.6 (8203)	54.4 (9791)	Ref	–
	Yes	41.2 (1240)	58.8 (1772)	1.17 (1.07–1.28)	.001**
Employment status	Not working	40.3 (3726)	59.7 (5526)	Ref	–
	Working	48.5 (5792)	51.5 (6156)	1.02 (.95–1.10)	.62
Socio-economic grade	ABC1	42.7 (5029)	57.3 (6736)	Ref	–
	C2DE	47.8 (4391)	52.2 (4787)	.86 (.81–.92)	<.001**
Index of multiple deprivation	1st (least) to 4th quartile (most deprived)	$N=9664$, $M=2.7$, $SD=1.1$	$N=11{,}789$, $M=2.7$, $SD=1.1$	.98 (.96–1.01)	.27
Highest educational or professional qualification	Less than degree	46.7 (6725)	53.3 (7690)	Ref	–
	Degree or higher	41.8 (2939)	58.2 (4099)	1.24 (1.15–1.32)	<.001**
Ethnicity	White British	44.6 (7937)	55.4 (9856)	Ref	–
	White other	50.7 (563)	49.3 (547)	.90 (.78–1.03)	.13
	Black and minority ethnicity	45.8 (1113)	54.2 (1319)	1.25 (1.13–1.39)	<.001**
	Overall	–	–	$\chi^2(2)=22.4$	<.001**
Living alone	Not living alone	45.7 (7726)	54.3 (9171)	Ref	–
	Living alone	42.5 (1938)	57.5 (2618)	.89 (.82–.97)	.008
Financial hardship	Range 3 (least) to 15 (most)	$N=9491$, $M=7.8$, $SD=3.2$	$N=11{,}631$, $M=7.4$, $SD=3.3$	1.02 (1.01–1.03)	.001

[a] Adjusting for survey wave, region, gender, age (raw and quadratic), presence of a dependent child in the household, having a chronic illness oneself, having a household member who has chronic illness, employment status, socio-economic grade, index of multiple deprivation, highest educational or professional qualification, ethnicity, living alone and financial hardship.

[b] Only included in waves 55, 57, 59, 61, 69; $n=7534$ responses investigated.

[c] Only included in waves 55, 57, 59, 61, 69, 71; $n=9191$ responses investigated.

*$p \le .05$, **$p \le .002$.

TABLE 3 Associations between always (vs. sometimes or never) wearing a face covering in shops including interaction with presence versus absence of legal requirement to do so.

Attribute	Level	Not or sometimes wearing a face covering n=10,927, n (%)	Always wearing a face covering n=16,813, n (%)	aOR for always wearing a face covering (95% CI)[a]	p
Psychological predictors					
Worry about COVID-19	5-point scale (1 = not at all worried to 5 = extremely worried)	N=10,893, M=2.7, SD=1.1	N=16,791, M=3.3, SD=1.0	1.41 (1.32–1.50)	<.001**
Interaction with legal obligations	—	—	—	1.35 (1.26–1.44)	<.001**
Perceived risk of COVID-19 to self	5-point scale (1 = no risk at all to 5 = major risk)	N=10,799, M=2.8, SD=1.2	N=16,683, M=3.3, SD=1.1	1.22 (1.15–1.29)	<.001**
Interaction with legal obligations	—	—	—	1.25 (1.17–1.33)	<.001**
Perceived risk of COVID-19 to people in the United Kingdom	5-point scale (1 = no risk at all to 5 = major risk)	N=10,769, M=3.2, SD=1.1	N=16,684, M=3.7, SD=1.0	1.30 (1.21–1.38)	<.001**
Interaction with legal obligations	—	—	—	1.28 (1.19–1.37)	<.001**
Perceived severity of COVID-19	5-point scale (1 = strongly disagree to 5 = strongly agree)	N=10,589, M=2.9, SD=1.2	N=16,288, M=3.5, SD=1.1	1.22 (1.16–1.29)	<.001**
Interaction with legal obligations	—	—	—	1.28 (1.21–1.36)	<.001**
Perceived exposure to COVID-19	5-point scale (1 = strongly disagree to 5 = strongly agree)	N=10,395, M=3.2, SD=1.0	N=15,931, M=3.4, SD=1.0	1.24 (1.17–1.32)	<.001**
Interaction with legal obligations	—	—	—	.92 (.86–.99)	.02*
Perceived effectiveness[b]	5-point scale (1 = strongly disagree to 5 = strongly agree)	N=3824, M=3.6, SD=1.2	N=6707, M=4.4, SD=.8	1.77 (1.62–1.94)	<.001**
Interaction with legal obligations	—	—	—	1.24 (1.12–1.38)	<.001**
Self-efficacy[c]	5-point scale (1 = strongly disagree to 5 = strongly agree)	N=4754, M=3.9, SD=1.1	N=7436, M=4.5, SD=.7	2.16 (1.95–2.38)	<.001**

(Continues)

TABLE 3 (Continued)

Attribute	Level	Not or sometimes wearing a face covering $n=10{,}927$, n (%)	Always wearing a face covering $n=16{,}813$, n (%)	aOR for always wearing a face covering (95% CI)[a]	p
Interaction with legal obligations	–	–	–	.96 (.86–1.08)	.51
Perceived behavioural impact	5-point scale (1 = strongly disagree to 5 = strongly agree)	$N=10{,}803$, $M=3.5$, $SD=1.1$	$N=16{,}733$, $M=4.0$, $SD=1.0$	1.60 (1.51–1.69)	<.001**
Interaction with legal obligations	–	–	–	.92 (.86–.98)	.006*
Covariates					
Region	East Midlands	41.2 (1032)	58.8 (1470)	Ref	–
	East of England	36.1 (1081)	63.9 (1910)	1.17 (1.03–1.32)	.01*
	London	35.6 (1369)	64.4 (2478)	1.38 (1.22–1.56)	<.001**
	North East	40.9 (600)	59.1 (867)	1.02 (.88–1.18)	.81
	North West	44.8 (1673)	55.2 (2062)	.86 (.76–.97)	.01*
	South East	38.6 (1761)	61.4 (2796)	1.07 (.96–1.20)	.22
	South West	34.6 (969)	65.4 (1831)	1.28 (1.13–1.46)	<.001**
	West Midlands	41.3 (1242)	58.7 (1763)	1.01 (.90–1.15)	.82
	Yorkshire and The Humber	42.3 (1200)	57.7 (1636)	.96 (.85–1.09)	.57
	Overall	–	–	$\chi^2(8)=100.1$	<.001**
Gender	Male	38.5 (5002)	61.5 (7975)	Ref	–
	Female	40.1 (5882)	59.9 (8776)	1.00 (.95–1.06)	.94
Age (per decade)	Raw age	$N=10{,}927$, $M=44.2$, $SD=17.2$	$N=16{,}813$, $M=50.9$, $SD=18.1$	1.26 (1.23–1.29)	<.001**
Age: quadratic $(\text{age}-\text{mean})^2$	–	–	–	1.0001 (1.0000–1.0002)	.05*
Dependent child in household	None	35.8 (6593)	64.2 (11,848)	Ref	–
	Child present	46.6 (4334)	53.4 (4965)	.84 (.78–.90)	<.001**

TABLE 3 (Continued)

Attribute	Level	Not or sometimes wearing a face covering n=10,927, n (%)	Always wearing a face covering n=16,813, n (%)	aOR for always wearing a face covering (95% CI)[a]	p
At high risk for COVID-19	No	40.6 (9030)	59.4 (13,208)	Ref	–
	Yes	33.2 (1643)	66.8 (3304)	1.25 (1.15–1.35)	<.001**
Household member has chronic illness	No	39.8 (9251)	60.2 (14,019)	Ref	–
	Yes	36.3 (1422)	63.7 (2493)	1.14 (1.05–1.24)	.001**
Employment status	Not working	35.3 (4209)	64.7 (7699)	Ref	–
	Working	42.2 (6552)	57.8 (8963)	1.02 (.96–1.10)	.48
Socio-economic grade	ABC1	37.0 (5659)	63.0 (9618)	Ref	–
	C2DE	42.3 (4998)	57.7 (6804)	.87 (.81–.92)	<.001**
Index of multiple deprivation	1st (least) to 4th quartile (most deprived)	N=10,927, M=2.7, SD=1.1	N=16,813, M=2.7, SD=1.1	1.00 (.97–1.02)	.75
Highest educational or professional qualification	Less than degree	41.0 (7621)	59.0 (10,980)	Ref	–
	Degree or higher	36.2 (3306)	63.8 (5833)	1.25 (1.17–1.33)	<.001**
Ethnicity	White British	38.9 (8897)	61.1 (13,981)	Ref	–
	White other	44.8 (651)	55.2 (802)	.88 (.77–1.00)	.04*
	Black and minority ethnicity	40.5 (1317)	59.5 (1935)	1.19 (1.08–1.31)	<.001**
	Overall	–	–	$\chi^2(2)=20.3$	<.001**
Living alone	Not living alone	40.1 (8770)	59.9 (13,122)	Ref	–
	Living alone	36.9 (2157)	63.1 (3691)	.91 (.84–.99)	.02*
Financial hardship	Range 3 (least) to 15 (most)	N=10,724, M=7.9, SD=3.2	N=16,571, M=7.5, SD=3.3	1.00 (.99–1.01)	.68
Face covering legal obligations in place	Present	20.1 (1263)	79.9 (5024)	Ref	–
	Absent	45.0 (9664)	55.0 (11,789)	.28 (.26–.30)	<.001**

[a] Adjusting for region, gender, age (raw and quadratic), presence of a dependent child in the household, having a chronic illness oneself, having a household member who has chronic illness, employment status, socio-economic grade, index of multiple deprivation, highest educational or professional qualification, ethnicity, living alone, financial hardship and face covering legal obligations.

[b] Only included in waves 55, 57, 59, 61, 63.5, 65, 69; n=10,531 responses investigated.

[c] Only included in waves 55, 57, 59, 61, 63.5, 65, 69, 71; n=12,190 responses investigated.

*p ≤ .05, **p ≤ .002.

relative ease of use and ubiquity of availability of facemasks, there may be a self-efficacy 'ceiling effect', or alternatively a floor effect for those who for various reasons may be unable to wear a facemask.

These data have two key implications. First, in the absence of regulation, psychological factors relating to perceived risk and efficacy are strongly associated with facemask wearing and therefore potentially important targets for social marketing campaigns. Interventions should be evidence-based and target potentially modifiable beliefs. Previous mask wearing was the greatest predictor of subsequent mask wearing (Conroy et al., 2022). Therefore, efforts to increase wearing a facemask in future outbreaks of infection should focus on those known to be less adherent during the COVID-19 pandemic. Recent review evidence has found mixed results for interventions aiming to increase the use of facemasks (Perski et al., 2022). Another study investigating whether a mental imagery intervention affected wearing a facemask found no intervention effects (Conroy et al., 2022). During future severe infectious disease outbreaks, ensuring that members of the public have a clear understanding of the risks involved and how these might be mitigated by the use of masks will be important in determining adherence. Where there is genuine debate as to either of these areas, this could be expected to reduce adherence. In the United Kingdom, there was much debate at the start of the pandemic about the effectiveness of wearing a facemask (BBC News, 2020). This is likely to have reduced the public's perceived effectiveness of wearing a face covering, a belief we and others have found to be associated with wearing a facemask (Chen & Lei, 2022; White et al., 2022). Ultimately, this is likely to have had the effect of reducing engagement with this protective behaviour. This should act as further motivation for researchers to evaluate the effectiveness of facemasks using large, methodologically robust randomized controlled trials (Jefferson et al., 2023): the public require clear information on this to inform their decisions.

Second, regulation is an effective way of increasing adherence to facemask wearing. Where restrictions must be put in place rapidly or require high levels of uptake to be effective, regulation should be considered.

One caveat of all survey-based data is that they involve self-report. Notably though, our binary outcome variable (wearing face coverings on all occasions vs. sometimes or never) was chosen because of evidence of alignment between self-reported and directly observed wearing of face coverings, which provides some additional confidence (Davies et al., 2023). While people generally over-report socially desirable behaviours, the current study was about predictors, and predictor variation over two different scenarios, so the findings are less likely to be skewed by social desirability bias. The use of cross-sectional survey data means that we could not investigate temporality of results and could not infer the direction of causality. Other limitations of cross-sectional surveys include sampling biases. In order to be able to collect data in a timely fashion, participants had previously signed up to receiving surveys, with quota sampling used to match the national profile by age, sex and region. This cannot guarantee national representativeness and respondents may systematically differ from the general public. However, other methods would be impractical for research of this nature.

Another caveat relates to the context during which data collection occurred. People's perceptions of COVID-19 may vary based on what they hear from the government and the media, but also based on their attitude towards the government and the media. For example, during the survey period, the 'Partygate' story, which related to politicians and staff in the UK government breaking COVID-19 regulations, was unfolding. The story was first reported on 30 November 2021 (Pippa Crerar, 2021), during data collection for wave 63, with further revelations over the course of the remainder of the survey waves.

While case rates fluctuated over the course of the data collection period, the perception among most people in the United Kingdom was that the pandemic was ongoing. Rhetoric and perceptions have subsequently changed – whether the associations we observed hold in the same way, while a government is encouraging people to return to 'business as usual' is unclear.

Psychological factors relating to the risks of COVID-19 were important predictors of facemask usage, with the strength of those relationships mostly higher after legal regulations were dropped. Maintaining appropriate awareness of the risks of a disease is important in achieving recommended behaviours during periods of legal enforcement, but even more so outside of periods of legal enforcement.

AUTHOR CONTRIBUTIONS

Louise E. Smith: Conceptualization; formal analysis; methodology; writing – original draft. **Robert West:** Conceptualization; methodology; writing – review and editing. **Henry W. W. Potts:** Conceptualization; funding acquisition; methodology; writing – review and editing. **Richard Amlôt:** Conceptualization; funding acquisition; methodology; writing – review and editing. **Nicola T. Fear:** Conceptualization; funding acquisition; methodology; writing – review and editing. **G. James Rubin:** Conceptualization; funding acquisition; methodology; writing – review and editing. **Susan Michie:** Conceptualization; funding acquisition; methodology; writing – original draft.

CONFLICT OF INTEREST STATEMENT

All authors had financial support from NIHR for the submitted work. RA is an employee of the UK Health Security Agency (UKHSA); HWWP has received additional salary support from Public Health England and NHS England; HWWP receives consultancy fees to his employer from Ipsos MORI and has a PhD student who works at and has fees paid by Astra Zeneca; NTF is a participant of an independent group advising NHS Digital on the release of patient data. All authors were participants of the UK's Scientific Advisory Group for Emergencies or its subgroups. There are no other financial relationships with any organizations that might have an interest in the submitted work in the previous three years and no other relationships or activities that could appear to have influenced the submitted work.

DATA AVAILABILITY STATEMENT

The data are owned by the UK's Department of Health and Social Care, so no additional data are available from the authors.

ETHICS STATEMENT

This work was conducted as a service evaluation of the Department of Health and Social Care's public communications campaign and was exempt from requiring ethical approval following advice from King's College London Research Ethics Committee.

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