The psychosocial impact of the COVID–19 pandemic on changes in smoking behavior: Evidence from a nationwide survey in the UK

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ABSTRACT

INTRODUCTION The stress and anxiety during this unprecedented public health crisis may lead current smokers to increase tobacco use or former smokers to relapse. Thus, this study aims to provide epidemiological evidence of the changes in smoking behavior among British smokers in response to the COVID-19 pandemic and assess the impact of psychosocial factors on these behaviors.

METHODS A nationwide survey of a representative sample of 4075 UK respondents aged >16 years was conducted between 27 April and 24 May 2020 during the COVID-19 pandemic. Psychosocial and demographic variables between different smoking behavior groups were compared using Pearson’s $\chi^2$ test and Cramer’s V.

RESULTS Among current smokers ($n=329$), one-quarter (25.2%, $n=86$) reported smoking more than usual, 50.9% ($n=174$) reported smoking the same amount, and 20.2% ($n=69$) reported smoking less. Significant associations were observed between different smoking behavior groups and psychosocial factors. Pearson’s $\chi^2$ test revealed significant differences between different smoking behavior groups in their concerns about mental health ($p<0.001$), anxiety ($p<0.001$) and stress ($p<0.001$), state of low mood ($p=0.012$), in the Patient Health Questionnaire (PHQ) score ($p=0.018$) and ranking on the Cantril Ladder scale ($p<0.001$). Many respondents expressed that the pandemic had a more negative impact on their mental health and the impact was more pronounced among those who smoked more.

CONCLUSIONS Deterioration of mental health and psychosocial well-being were linked to increased smoking. Public health authorities should take proactive measures to provide mental healthcare and smoking cessation support as preventive measures to tackle the pandemic.
COVID-19 infection\textsuperscript{5,6}. This is particularly relevant for nicotine addiction, as smokers may rely on tobacco and nicotine as their main method to manage stress and anxiety\textsuperscript{7}.

In this context, this study aims to provide epidemiological evidence of the changes in smoking behavior among British smokers in response to the COVID-19 pandemic and, more importantly, understand how demographic and psychosocial factors impact these behaviors.

**METHODS**

An analysis was conducted via a web-based survey using the UK arm of the international COVID-19 DATA TRACKER\textsuperscript{8}, a joint study of Imperial College London and YouGov. The study is an ongoing online weekly survey during the COVID-19 pandemic. A pooled sample of 4075 respondents aged >16 years was surveyed between 27 April and 24 May 2020 after the first month of stringent lockdown measures when outdoor activities were continuously restricted. The sample was weighted and designed to be representative of the general UK population in terms of age, gender, and region.

Individuals responded to questions regarding demographics, current smoking status, changes in smoking behaviors and psychosocial characteristics in response to the COVID-19 pandemic. Smoking in this survey refers to the use of all combustible tobacco products (excluding e-cigarettes). Psychosocial variables included occupational social class (A, B, C1, C2, D, E), concern about mental health (worried or not worried), experiences of mental health problems (anxiety, stress, low mood and sleeping problems), the Patient Health Questionnaire\textsuperscript{9} severity index (normal, mild, moderate, and severe) and the 10-point Cantril Ladder scale ranking\textsuperscript{10} (suffering: 0–3, struggling: 4–6 and thriving: 7–10). In this study, we used the Patient Health Questionnaire (PHQ) as an index of the severity of mental disorders and the Cantril Ladder scale as a measurement of psychosocial well-being and life satisfaction.

The weighted sample characteristics and prevalence of the three smoking behavior groups (increased, unchanged or decreased smoking) were calculated. To analyze the relationship between smoking behavior change and the respondents’ psychosocial characteristics, Pearson’s $\chi^2$ (or Fisher’s exact test when appropriate) and Cramer’s $V$ statistics were used. Adjusted residuals larger than $|1.96|$ ($\alpha=0.05$) were used to identify cells contributing to differences between groups in $\chi^2$ tests\textsuperscript{11}. Furthermore, the Cochran-Armitage test for trend was used to determine whether there was a linear trend in the prevalence between different levels of psychosocial variables. An alpha level of 5% was used to indicate a statistically significant difference for all hypothesis tests.

**RESULTS**

The prevalence of current smoking was 16.0% (17.4% for males and 14.7% for females) in this UK survey. Of the 486 current smokers surveyed, 329 current smokers who reported data on smoking behavior change were included in the analysis. One-quarter (25.2%, n=86) of current smokers reported smoking more than usual, with the majority being young female smokers aged 16–29 years; 50.9% (n=174) of smokers reported smoking the same amount and 20.2% (n=69) mostly young males aged 16–29 years, reported smoking less.

Table 1 presents the weighted prevalence of smoking behavior change stratified by demographic and psychosocial characteristics. The percentages of smoking behavior change did not differ by age, sex or social grade. However, there were significant differences in concerns about mental health ($p<0.001$), feelings of anxiety ($p<0.001$), stress ($p<0.001$) and low mood ($p=0.012$) during the pandemic. The differences were driven largely by respondents who reported an increase in smoking during the pandemic. More specifically, among smokers who reported worrying about their mental health, 42.3% smoked more during the pandemic, while 21.7% smoked less. The patterns were generally similar for respondents who experienced more anxiety, stress and low mood.

The percentages of smoking behavior change also differed according to PHQ score ($p=0.018$) and the Cantril Ladder ranking ($p<0.001$). A larger percentage of respondents who smoked more had moderate to severe PHQ index and a lower ranking on the Cantril Ladder scale, while a greater percentage of participants who smoked less reported normal to mild PHQ index and a higher ranking on
Table 1. Demographic and psychosocial characteristics between respondents in different smoking behavior groups, weighted (N=329)

| Characteristics          | Changes in smoking behavior |  |  |  |  |  |
|--------------------------|-----------------------------|---|---|---|---|---|
|                          | Increased smoking | Unchanged | Decreased smoking |  | Cramer’s V |
|                          | % (n)               | % (n)     | % (n)             |  |  |
| Total                    | 25.2 (86)           | 50.9 (174)| 20.2 (69)         |  |  |
| Gender                   |  |  |  |  |  |
| Male                     | 20.6 (37)           | 53.5 (96) | 21.2 (38)         | 0.154 | 0.151 |
| Female                   | 30.2 (49)           | 48.0 (78) | 19.0 (31)         |  |  |
| Age (years)              |  |  |  |  |  |
| 16–29                    | 33.4 (27)           | 33.9 (28) | 26.2 (21)         | 0.104 | 0.219 |
| 30–39                    | 26.9 (17)           | 51.0 (32) | 17.8 (11)         |  |  |
| 40–49                    | 23.0 (18)           | 51.2 (40) | 20.1 (16)         |  |  |
| 50–59                    | 25.5 (13)           | 56.9 (29) | 17.5 (9)          |  |  |
| 60–69                    | 12.6 (5)            | 69.4 (29) | 15.6 (6)          |  |  |
| ≥70                      | 21.6 (6)            | 61.0 (17) | 17.4 (5)          |  |  |
| Social grade*            |  |  |  |  |  |
| A                        | 19.9 (6)            | 46.7 (13) | 33.4 (9)          | 0.175 | 0.206 |
| B                        | 28.2 (6)            | 46.8 (9)  | 25.0 (5)          |  |  |
| C1                       | 25.9 (26)           | 42.8 (43) | 27.9 (28)         |  |  |
| C2                       | 31.5 (18)           | 55.9 (32) | 10.9 (6)          |  |  |
| D                        | 24.3 (15)           | 59.6 (38) | 16.1 (10)         |  |  |
| E                        | 21.3 (16)           | 53.4 (39) | 13.9 (10)         |  |  |
| Mental health            |  |  |  |  |  |
| Worried                  | 42.3 (39)*          | 35.1 (33) | 21.7 (20)         | <0.001 | 0.406 |
| Not worried              | 17.3 (25)           | 59.5 (86) | 20.7 (30)         |  |  |
| Anxiety                  |  |  |  |  |  |
| Less                     | 31.5 (5)            | 28.8 (5)  | 30.3 (5)          | <0.001 | 0.348 |
| Same                     | 12.1 (15)*          | 63.3 (77)* | 17.6 (21)         |  |  |
| More                     | 40.2 (43)*          | 36.7 (39)* | 22.4 (24)         |  |  |
| Stress                   |  |  |  |  |  |
| Less                     | 32.6 (10)           | 41.1 (12) | 14.1 (4)          | <0.001 | 0.314 |
| Same                     | 13.1 (14)*          | 64.8 (68)* | 17.4 (18)         |  |  |
| More                     | 36.9 (41)           | 37.4 (41) | 24.9 (28)         |  |  |
| Low mood                 |  |  |  |  |  |
| Less                     | 23.7 (4)            | 39.5 (7)  | 36.7 (7)          | 0.012 | 0.234 |
| Same                     | 18.9 (20)           | 60.3 (65) | 16.0 (17)         |  |  |
| More                     | 32.2 (38)           | 41.9 (49) | 22.3 (26)         |  |  |
| Sleep problems           |  |  |  |  |  |
| Less                     | 29.5 (5)            | 42.2 (7)  | 28.3 (5)          | 0.051 | 0.199 |
| Same                     | 19.2 (24)           | 58.5 (73) | 20.2 (25)         |  |  |
| More                     | 33.8 (36)           | 40.6 (43) | 19.3 (20)         |  |  |
| PHQ                      |  |  |  |  |  |
| Normal                   | 21.1 (29)           | 56.2 (78) | 21.6 (30)         | 0.018 | 0.217 |
| Mild                     | 16.9 (14)           | 54.0 (26) | 22.8 (20)         |  |  |
| Moderate                 | 36.8 (22)           | 45.5 (27) | 14.1 (8)          |  |  |
| Severe                   | 38.3 (20)           | 38.3 (20) | 20.0 (10)         |  |  |
| Cantril Ladder           |  |  |  |  |  |
| Thriving                 | 18.1 (21)           | 55.2 (64) | 26.7 (31)         | <0.001 | 0.257 |
| Struggle                 | 21.8 (43)*          | 39.1 (77) | 39.1 (77)*        |  |  |
| Suffer                   | 36.1 (22)*          | 54.1 (33) | 9.8 (6)*          |  |  |

*Adjusted residuals greater than |1.96|, contribute to differences between groups in χ² or Fisher’s exact tests when p<0.05. PHQ: patient health questionnaire. A Occupational social grade: AB – higher or intermediate managerial, administrative or professional occupation; C1 – supervisory or clerical and junior managerial, administrative or professional; C2 – skilled manual workers; D – semi-skilled and unskilled manual workers; E – state pensioners, casual and lowest grade workers, unemployed with social benefits only.
DISCUSSION
The study findings suggest that a quarter of current UK smokers have increased their smoking during this unprecedented time, and that mental health status and psychosocial well-being were strongly associated with tobacco consumption. This phenomenon was more pronounced among those reporting deteriorated mental health and well-being. The results were in line with previous evidence reporting the relationship between smoking and depression/anxiety12.

In the present study, smokers also expressed that the pandemic had a more negative impact on their mental health. A significant linear trend between proportions of increased smoking and both the PHQ score and the ranking on the Cantril Ladder scale indicates that a worsening mental health condition and worse psychosocial well-being were linked to increased smoking. Given the worsening conditions of mental well-being, smokers are likely to increase their consumption as a coping mechanism during the pandemic7.

From the outset of the COVID-19 pandemic, paramount evidence has indicated that smoking was a risk factor for COVID-195. Studies suggest that smoking and exposure to nicotine are linked to increased risk of COVID-19 infection13 and smokers are at higher risk of having adverse outcomes after becoming infected14. However, the psychosocial impact of the pandemic with associated stress and anxiety evoked by confinement and fear of the disease could lead current smokers to increase tobacco use and former smokers to relapse15. Thus, it is essential that controlling the disease during the global pandemic requires comprehensive management and support for mental health, especially among vulnerable populations such as quarantined people and individuals with pre-existing mental conditions who are at higher risk for smoking and other addictive behaviors.

Preventing the infection is currently the best treatment available at the individual and national levels. Thus, smokers should adopt healthy coping strategies such as physical activities, meditation or yoga as a means to deal with stress and anxiety16-18. Current smokers are urged to take advantage of this opportunity to quit permanently while former smokers should maintain their quit status. Most importantly, public health authorities should take proactive measures to support the psychological well-being of the people to mitigate the impact of the pandemic19. Moreover, smoking cessation campaigns should be conducted while advising preventive measures to tackle the pandemic. Behavioral support for quitting smoking such as digital platforms, quitlines and internet programs should also be strengthened to support smokers quitting successfully during this critical time.

LIMITATIONS
Limitations of this study include that the data collection was based on online self-reported surveys, which inevitably may be at risk of misclassification and response bias. Furthermore, as this report is a preliminary investigation of smoking behavior change among current smokers during the pandemic, limited data on the frequency of smoking and other potentially related characteristics of the respondents were not taken into account. Future studies should also follow-up smoking status change among former or never smokers to investigate whether recent quitters or never smokers have relapsed or initiated smoking and to better understand the long-term effects of this pandemic on smoking behaviors.

CONCLUSIONS
Deterioration of mental health and psychosocial well-being were linked to increased smoking. The study findings emphasize the need for public health authorities to provide mental healthcare and smoking cessation support as a preventive measure to tackle the pandemic with a particular focus on vulnerable individuals who are at high risk for addictive behaviors.

REFERENCES
1. Rawlinson K. UK coronavirus: Boris Johnson announces strict lockdown across country - as it happened. The Guardian. https://www.theguardian.com/politics/
live/2020/mar/23/uk-coronavirus-live-news-latest-boris-johnson-minister-condemns-people-ignoring-two-metre-distance-rule-in-parks-as-very-selfish. Published March 24, 2020. Accessed June 26, 2020.

2. Ozamiz-Etxebarria N, Idoiga MN, Dosił SM, Picaza GM. Psychological Symptoms During the Two Stages of Lockdown in Response to the COVID-19 Outbreak: An Investigation in a Sample of Citizens in Northern Spain. Front Psychol. 2020;11(1491). doi:10.3389/fpsyg.2020.01491

3. Yach D. Tobacco Use Patterns in Five Countries During the COVID-19 Lockdown. Nicotine Tob Res. 2020;22(9):1671-1672. doi:10.1093/ntr/ntaa097

4. Sun Y, Bao Y, Kosten T, et al. Editorial: Challenges to Opioid Use Disorders During COVID-19. Am J Addict. 2020;29(3):174-175. doi:10.1111/ajad.13031

5. World Health Organization. Smoking and COVID-19: Scientific brief. https://www.who.int/publications/i/item/smoking-and-covid-19. Published June 30, 2020. Accessed June 30, 2020.

6. World Health Organization. Alcohol and COVID-19: What you need to know. https://www.euro.who.int/__data/assets/pdf_file/0010/437608/Alcohol-and-COVID-19-what-you-need-to-know.pdf?ua=1. Accessed June 30, 2020.

7. Lawless MH, Harrison KA, Grandits GA, Eberly LE, Allen SS. Perceived stress and smoking-related behaviors and symptomatology in male and female smokers. Addict Behav. 2015;51:80-83. doi:10.1016/j.addbeh.2015.07.011

8. Jones SP. Imperial College London YouGov Covid 19 Behaviour Tracker Data Hub. London, UK: Imperial College London Big Data Analytical Unit, YouGov Plc. https://github.com/YouGov-Data/covid-19-tracker. Published April 2020. Accessed May 30, 2020.

9. Kroenke K, Spitzer RL. The PHQ-9: A new depression diagnostic and severity measure. Psychiatric Annals. 2002;32(9):509-515. doi:10.3928/0048-5713-20020901-06

10. Glatzer W, Gulyas J. Cantril Self-Anchoring Striving Scale. In: Michalos AC, ed. Encyclopedia of Quality of Life and Well-Being Research. Dordrecht, Netherlands: Springer Netherlands; 2014. doi:10.1007/978-94-007-0753-5_259

11. Sharpe DE. Your Chi-Square Test Is Statistically Significant: Now What? Practical Assessment, Research and Evaluation. 2015;20:1-10. doi:10.7275/tba-s148

12. Fleming CB, Mason WA, Mazza JJ, Abbott RD, Catalano RF. Latent growth modeling of the relationship between depressive symptoms and substance use during adolescence. Psychol Addict Behav. 2008;22(2):186-197. doi:10.1037/0893-164x.22.2.186

13. Russo P, Bonassi S, Giaconia R, et al. COVID-19 and smoking: is nicotine the hidden link?. Eur Respir J. 2020;55(6):2001116. doi:10.1183/13993003.01116-2020

14. Vardavas CI, Nikitara K. COVID-19 and smoking: A systematic review of the evidence. Tob Induc Dis. 2020;18(March):1-4. doi:10.18332/tid/119324

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