Cross-Sectional Survey of Smoking Patterns During the COVID-19 Pandemic in a Tobacco Cessation and Lung Cancer Screening Program

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Background: Coronavirus disease 2019 (COVID-19) produces a wide array of deleterious consequences, some of which are unintended. Data are sparse on whether, and if so, how, current cigarette smoking habits are affected by COVID-19. We describe changes to smoking habits and their correlates during the COVID-19 pandemic among participants in a tobacco cessation and lung cancer screening program.

Methods: Between June and October 2020, we conducted a cross-sectional survey of a convenience sample of 150 participants in a lung cancer screening and tobacco cessation program. The survey consisted of 3 parts: (1) changes in tobacco use, (2) impact and coping strategies toward COVID-19, and (3) COVID-19 exposure and use of protective measures. Demographic variables included age, sex, race/ethnicity, and marital status.

Results: All 150 participants who were contacted agreed to participate in this cross-sectional survey. The statistically significant correlates of increased tobacco use were high uncertainty about the future (P < 0.001), loneliness because of social distancing or self-isolating (P < 0.001), anger or frustration with how the pandemic has disrupted daily life (P < 0.001), boredom resulting from inability to work or engage in regular daily activities/routines (P < 0.001), desire to cope using alcohol or drugs (P = 0.002), sadness or feelings of hopelessness (P = 0.003), and worry or fear about challenges to securing basic needs such as groceries or medication (P < 0.001). In contrast, those who smoked less were more likely to practice social distancing (P = 0.002) and use protective measures (P = 0.005).

Conclusion: Among those who decreased or stopped smoking, correlates included greater use of protective measures for COVID-19, including social distancing and testing. These data may aid healthcare providers to identify and provide counsel to cigarette smokers at greater risk for increasing tobacco consumption during stresses such as COVID-19.

Keywords: COVID-19, smoking, smoking cessation, tobacco cessation, tobacco smoking

INTRODUCTION

Since 1965, the prevalence of cigarette smoking has markedly decreased in the United States.1 Despite the remarkable decline, cigarette smoking causes hundreds of thousands of potentially avoidable premature deaths in the United States each year, principally from lung cancer, cardiovascular disease, and chronic respiratory disease.1 While coronavirus disease 2019 (COVID-19) has caused more than 944,000 premature deaths since January 2020, the US Centers for Disease Control and Prevention estimates that tobacco-related causes account for more than 480,000 deaths per year in the United States.1,2 Tobacco consumption among US smokers has increased by more than 30% during the COVID-19 pandemic.3 COVID-19 has also adversely impacted screening,4 diagnosis,5 and survival from lung cancer.6 Moreover, concerns have been raised about adverse effects of the COVID-19 pandemic on smokers trying to quit in the United States.7

To the best of our knowledge, however, data are sparse about the possible interrelationships and characteristics of cigarette smokers who have increased and decreased their habits during the COVID-19 pandemic. In this report, we describe changes to smoking habits and correlates of increases and decreases during the COVID-19 pandemic, including key indicators of psychological distress among...
participants enrolled in a tobacco cessation and lung cancer screening program.

**METHODS**

**Design**

Between June and October 2020, we conducted a cross-sectional survey of a convenience sample of 150 participants in a lung cancer screening and tobacco cessation program. Participants were eligible for the program if they were 55 to 80 years of age, had a tobacco history of at least 30 pack-years, and were currently smoking or had quit smoking within the prior 15 years. The program involved 6 to 8 visits, including an initial face-to-face contact lasting 45 to 60 minutes and follow-up in person or by phone. As the US COVID-19 epidemic increased markedly, all visits transitioned to phone contacts, and educational materials were mailed to participants along with nicotine replacement therapies if indicated. Each participant was asked about participating in the survey during regular phone follow-up until 150 participants were enrolled. Data were collected by 3 trained interviewers whose backgrounds included fact-checking and verification.

Our sample size of 150 provided sufficient statistical power to detect small to moderate differences in smoking habits. Findings are reported in accordance with the Strenthening of the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The study was approved by the Institutional Review Board of the Baylor College of Medicine.

**Measures**

The survey consisted of 3 parts: (1) changes in tobacco use, (2) impact and coping strategies toward COVID-19, and (3) COVID-19 exposure and use of protective measures. Demographic variables included age, sex, race/ethnicity, and marital status. The survey (Appendix) included 28 questions adapted from the CoRonaviruS Health Impact Survey (CHIS) and the US Centers for Disease and Control Prevention guidance for COVID-19. Tobacco use change during the COVID-19 pandemic was classified as increased, unchanged, decreased, varied day to day with no clear pattern, and not applicable/former smoker. Coping strategies and mental health questions were answered on a 5-point Likert scale from least (1) to greatest (5). We included 4 questions about the clinical symptoms of COVID-19 and 3 questions about protective strategies. Five questions referred to mitigation practices, also scored on a 5-point Likert scale.

**Data Analysis**

We first explored whether significant differences were found among those who increased, decreased, or continued their same smoking patterns. Categorical variables are summarized by frequencies and percentages. Continuous variables are summarized by medians with interquartile ranges. We stratified the data by changes in smoking use overall and by race/ethnicity and tested for statistical significance using Kruskal-Wallis or chi-squared tests. To explore inter-relationships of changes in smoking with categorical baseline characteristics, we used paired chi-squared tests with Holm P value adjustments to explore which smoking use change and race/ethnicity group were significantly different from other categories. To explore continuous variables, we used pairwise Wilcoxon rank sum tests with Holm P value adjustments. We considered 2-sided P values at <0.05 as significant.

**RESULTS**

Among the 150 participants, 50 (33%) reported changes in tobacco use, 60 (40%) reported no changes, and 40 (27%) were former smokers. No former smokers reported relapsing. The mean age was 60.7 ± 4.5 years, and 97 participants (65%) were male (Table 1). Participants who reported increases in smoking had high levels of uncertainty about the future (P<0.001) (Figure 1A), loneliness as a result of social distancing or self-isolating (P<0.001) (Figure 1B), anger or frustration with how the pandemic has disrupted daily life (P<0.001) (Figure 2A), boredom because of being unable to work or engage in regular daily activities (P=0.001) (Figure 2B), a desire to cope using alcohol or drugs (P=0.002) (Figure 3A), sadness or feelings of hopelessness (P=0.003) (Figure 3B), and worry or fear about challenges to securing basic needs such as groceries or medication (P<0.001) (Figure 4A). In contrast, those who smoked less were more likely to practice social distancing (P=0.002) (Figure 4B) and practice other protective measures (P=0.005) (Figure 5A).

Table 2 shows survey responses stratified by tobacco usage. The numbers of participants tested for COVID-19 were significantly different between the groups (P=0.022). We found no statistically significant difference between tobacco use status and current housing, whether the participant had perceived control over contracting COVID-19, or source of information about COVID-19.

Table 3 shows survey responses stratified by race/ethnicity. Among the 150 participants, 48.7% were Black, 20.7% were non-Hispanic White, 22% were Hispanic, and 8.7% were Asian/Pacific Islander. We found significant
Table 2. Survey Questions Stratified by Tobacco Usage, n=110

| Survey Question                                                                 | Change in Tobacco Usage | P Value |
|---------------------------------------------------------------------------------|-------------------------|---------|
|                                                                                | Increased, n=31 | Stayed the Same, n=60 | Decreased, n=19 |       |
| Tobacco usage has changed during the COVID-19 pandemic, n (%)                   | 31 (100.0) | 0 (0.0) | 19 (100.0) | <0.001 |
| COVID-19 pandemic has affected your desire to participate in our LDCT lung cancer screening program, n (%) | 4 (12.9) | 3 (5.0) | 2 (10.5) | 0.393 |
| **Coping strategies and mental health, median [IQR]**                           |             |         |             |       |
| Uncertainty about the future                                                   | 4.00 [4.00, 5.00] | 3.00 [1.00, 4.00] | 2.00 [1.00, 3.00] | <0.001 |
| Loneliness as a result of social distancing/self-isolating                     | 4.00 [3.00, 4.50] | 2.00 [1.00, 3.00] | 1.00 [1.00, 2.00] | <0.001 |
| Anger or frustration with how the pandemic has disrupted your daily life       | 4.00 [3.50, 4.00] | 3.00 [2.00, 4.00] | 1.00 [1.00, 5.00] | <0.001 |
| Boredom due to being unable to work or engage in regular daily activities/routines | 4.00 [3.00, 5.00] | 3.00 [2.00, 4.00] | 3.00 [1.00, 3.00] | 0.001 |
| Desire to cope using alcohol or drugs                                           | 2.00 [1.00, 3.00] | 2.00 [1.00, 2.00] | 1.00 [1.00, 1.00] | 0.002 |
| Sadness or feelings of hopelessness                                            | 3.00 [2.50, 4.00] | 2.00 [1.00, 3.00] | 1.00 [1.00, 2.75] | 0.003 |
| Worry or fear about challenges to securing basic needs such as groceries or medication | 4.00 [3.00, 4.50] | 3.00 [1.00, 4.00] | 3.00 [1.00, 4.00] | <0.001 |
| **Health management, n (%)**                                                   |             |         |             |       |
| Have a serious or chronic health condition that requires medication and management at home | 12 (38.7) | 20 (33.3) | 12 (63.2) | 0.068 |
| **Effects on housing and employment, n (%)**                                   |             |         |             |       |
| I live alone                                                                    | 7 (22.6) | 18 (30.0) | 5 (26.3) | 0.749 |
| I live with spouse/significant other                                            | 11 (35.5) | 21 (35.0) | 9 (47.4) | 0.634 |
| I live with another family member                                               | 7 (22.6) | 16 (26.7) | 4 (21.1) | 0.846 |
| I live with a non-family member                                                 | 6 (19.4) | 5 (8.3) | 1 (5.3) | 0.191 |
| COVID-19 affected my housing situation                                         | 6 (19.4) | 5 (8.3) | 1 (5.3) | 0.191 |
| COVID-19 affected my employment status                                         | 9 (29.0) | 15 (25.0) | 5 (26.3) | 0.911 |
| **Exposure and preventive measures**                                            |             |         |             |       |
| COVID-19 symptoms in the past 2 weeks, n (%)                                    |             |         |             |       |
| Fever                                                                           | 0 (0.0) | 1 (1.7) | 0 (0.0) | 0.657 |
| Dry cough                                                                       | 0 (0.0) | 2 (3.3) | 0 (0.0) | 0.428 |
| Runny nose                                                                       | 0 (0.0) | 1 (1.7) | 0 (0.0) | 0.657 |
| Body aches                                                                       | 0 (0.0) | 1 (1.7) | 1 (5.3) | 0.398 |
| Upset stomach                                                                    | 0 (0.0) | 0 (0.0) | 0 (0.0) | NA    |
| Loss of smell/taste                                                             | 0 (0.0) | 0 (0.0) | 0 (0.0) | NA    |
| Fatigue, tiredness                                                              | 1 (3.2) | 1 (1.7) | 1 (5.3) | 0.689 |
| None of the above                                                                | 30 (96.8) | 56 (93.3) | 18 (94.7) | 0.790 |
| Had close contact with an individual with flu-like symptoms or a confirmed diagnosis of COVID-19 in the past 3 weeks, n (%) |             |         |             |       |
| Yes                                                                             | 2 (6.5) | 1 (1.7) | 0 (0.0) | 0.657 |
| No                                                                              | 27 (87.1) | 55 (91.7) | 16 (84.2) |       |
| Unsure                                                                          | 2 (6.5) | 4 (6.7) | 3 (15.8) |       |
| Have been tested for COVID-19, n (%)                                            | 4 (12.9) | 14 (23.3) | 9 (47.4) | 0.022 |
| Believed might have COVID-19 but did not get tested, n (%)                      | 1 (3.2) | 5 (8.3) | 0 (0.0) | 0.662 |
We found statistically significant and potentially clinically important differences between those who increased and decreased tobacco use. Among current smokers, 28.2% (31/110) reported increased tobacco use, 17.3% (19/110) decreased, and 54.5% (60/110) no change. In addition, there were no reports of relapse among former smokers.

DISCUSSION

Among 150 participants in a tobacco cessation and lung cancer screening program during the COVID-19 pandemic, we found statistically significant and potentially clinically important differences between those who increased and decreased tobacco use. Among current smokers, 28.2% (31/110) reported increased tobacco use, 17.3% (19/110) decreased, and 54.5% (60/110) no change. In addition, there were no reports of relapse among former smokers.

We found correlates of increased tobacco use related to coping strategies and mental health such as high uncertainty about the future, loneliness as a result of social distancing, anger or frustration with how the pandemic has disrupted daily life, boredom because of being unable to work or engage in regular daily activities/routines, desire to cope using alcohol or drugs, sadness or feelings of hopelessness, and worry or fear about challenges to securing basic needs such as groceries or medication. In contrast, those who smoked less were more likely to practice social distancing and other protective measures.

The current data are compatible with previous reports of a bidirectional effect of COVID-19 observed in smokers: a reduction in or cessation of smoking in some but an increase in others.13,14 In an online survey of 1,491 adults in Australia, all aspects of psychological distress—specifically depression, anxiety, and stress—were significantly correlated with health behavior.15 Among 172 smokers completing the
## Table 3. Survey Questions Stratified by Race/Ethnicity, n=150

| Survey Question                                                                 | Non-Hispanic White, n=31 | Hispanic, n=33 | Black, n=73 | Asian/Pacific Islander, n=13 | P Value |
|---------------------------------------------------------------------------------|---------------------------|----------------|-------------|-----------------------------|---------|
| Tobacco usage has changed during the pandemic, n (%)                           | 12 (38.7)                 | 9 (27.3)       | 25 (34.2)   | 4 (30.8)                    | 0.600   |
| Way your tobacco usage changed during the COVID-19 pandemic, n (%)              | n=23                      | n=20           | n=58        | n=9                         | 0.748   |
| Increased                                                                       | 8 (34.8)                  | 5 (25.0)       | 17 (29.3)   | 1 (11.1)                    |         |
| Decreased                                                                       | 4 (17.4)                  | 4 (20.0)       | 8 (13.8)    | 3 (33.3)                    |         |
| Stayed the same                                                                 | 11 (47.8)                 | 11 (55.0)      | 33 (56.9)   | 5 (55.6)                    |         |
| COVID-19 pandemic has affected your desire to participate in our LDCT lung cancer screening program, n (%) | 2 (6.5)                   | 2 (6.1)        | 8 (11.0)    | 0 (0.0)                     | 0.519   |
| **Coping strategies and mental health, median [IQR]**                           |                           |                |             |                             |         |
| Uncertainty about the future                                                    | 3.00 [3.00, 4.00]         | 4.00 [2.00, 5.00] | 3.00 [1.00, 4.00] | 4.00 [2.00, 4.00] | 0.467   |
| Loneliness as a result of social distancing/self-isolating                     | 3.00 [2.00, 4.00]         | 3.00 [2.00, 3.00] | 2.00 [1.00, 4.00] | 2.00 [1.00, 3.00] | 0.484   |
| Anger or frustration with how the pandemic has disrupted your daily life        | 3.00 [2.00, 4.00]         | 4.00 [2.00, 4.00] | 3.00 [2.00, 4.00] | 3.00 [2.00, 3.00] | 0.489   |
| Boredom due to being unable to work or engage in regular daily activities/routines | 3.00 [2.00, 4.00]         | 3.00 [2.00, 4.00] | 3.00 [2.00, 4.00] | 3.00 [2.00, 3.00] | 0.855   |
| Desire to cope using alcohol or drugs                                           | 1.00 [1.00, 2.00]         | 1.00 [1.00, 2.00] | 1.00 [1.00, 2.00] | 1.00 [1.00, 1.00] | 0.172   |
| Sadness or feelings of hopelessness                                             | 2.00 [2.00, 3.00]         | 2.00 [1.00, 3.00] | 2.00 [1.00, 3.00] | 2.00 [1.75, 4.25] | 0.839   |
| Worry or fear about challenges to securing basic needs such as groceries or medication | 3.00 [2.00, 4.00]         | 4.00 [1.00, 4.00] | 3.00 [2.00, 4.00] | 3.00 [3.00, 4.00] | 0.901   |
| **Health management, n (%)**                                                    |                           |                |             |                             |         |
| Have a serious or chronic health condition that requires medication and management at home | 13 (41.9)                 | 9 (27.3)       | 30 (41.1)   | 3 (23.1)                    |         |
| **Effects on housing and employment, n (%)**                                    |                           |                |             |                             |         |
| I live alone                                                                    | 10 (32.3)                 | 4 (12.1)       | 31 (42.5)   | 0 (0.0)                     | 0.001   |
| I live with spouse/significant other                                            | 11 (35.5)                 | 20 (60.6)      | 19 (26.0)   | 11 (84.6)                   | <0.001  |
| I live with another family member                                               | 6 (19.4)                  | 7 (21.2)       | 17 (23.3)   | 2 (15.4)                    | 0.916   |
| I live with a non-family member                                                 | 4 (12.9)                  | 2 (6.1)        | 6 (8.2)     | 0 (0.0)                     | 0.509   |
| COVID-19 affected my housing situation                                         | 4 (12.9)                  | 2 (6.1)        | 9 (12.5)    | 1 (7.7)                     | 0.738   |
| COVID-19 affected my employment status                                         | 5 (16.1)                  | 10 (30.3)      | 15 (20.5)   | 7 (53.8)                    | 0.042   |
| **Exposure and preventive measures**                                            |                           |                |             |                             |         |
| COVID-19 symptoms in the past 2 weeks, n (%)                                    |                           |                |             |                             |         |
| Fever                                                                           | 0 (0.0)                   | 0 (0.0)        | 1 (1.4)     | 0 (0.0)                     | 0.786   |
| Dry cough                                                                       | 0 (0.0)                   | 0 (0.0)        | 2 (2.7)     | 0 (0.0)                     | 0.544   |
| Runny nose                                                                       | 0 (0.0)                   | 0 (0.0)        | 1 (1.4)     | 0 (0.0)                     | 0.786   |
| Body aches                                                                      | 0 (0.0)                   | 0 (0.0)        | 2 (2.7)     | 0 (0.0)                     | 0.544   |
| Upset stomach                                                                   | 0 (0.0)                   | 0 (0.0)        | 1 (1.4)     | 0 (0.0)                     | 0.786   |
| Loss of smell/taste                                                             | 0 (0.0)                   | 0 (0.0)        | 0 (0.0)     | 0 (0.0)                     | N/A     |
| Fatigue, tiredness                                                              | 0 (0.0)                   | 0 (0.0)        | 3 (4.1)     | 0 (0.0)                     | 0.358   |
| None of the above                                                               | 31 (100.0)                | 33 (100.0)     | 66 (90.4)   | 13 (100.0)                  | 0.052   |
| Survey Question                                                                 | Non-Hispanic White, n=31 | Hispanic, n=33 | Black, n=73 | Asian/ Pacific Islander, n=13 | P Value |
|--------------------------------------------------------------------------------|--------------------------|----------------|------------|-------------------------------|---------|
| Had close contact with an individual with flu-like symptoms or a confirmed diagnosis of COVID-19 in the past 3 weeks, n (%) | 26 (83.9)                | 31 (93.9)      | 62 (84.9)  | 12 (92.3)                     | 0.816   |
| Yes                                                                            | 1 (3.2)                  | 1 (3.0)        | 3 (4.1)    | 0 (0.0)                       |         |
| No                                                                             | 25 (83.7)                | 30 (93.9)      | 60 (82.5)  | 12 (92.3)                     |         |
| Unsure                                                                         | 4 (12.9)                 | 1 (3.0)        | 8 (11.0)   | 1 (7.7)                       |         |
| Have been tested for COVID-19, n (%)                                           | 7 (22.6)                 | 4 (12.1)       | 23 (31.5)  | 2 (15.4)                      | 0.147   |
| Believed might have had COVID-19 but did not get tested, n (%)                 | 2 (6.5)                  | 2 (6.1)        | 3 (4.1)    | 0 (0.0)                       | 0.786   |
| Reside in an area under a "shelter-in-place" or "stay-at-home" order, n (%)    | 30 (96.8)                | 33 (100.0)     | 70 (95.9)  | 13 (100.0)                    |         |
| Avoided crowded places whenever possible, n (%)                                | 30 (96.8)                | 28 (84.8)      | 72 (98.6)  | 12 (92.3)                     | 0.029   |
| Wore a mask when leaving the house, n (%)                                      | 31 (100.0)               | 32 (97.0)      | 73 (100.0) | 13 (100.0)                    | 0.312   |
| Worried about you or individuals in your household getting COVID-19, median [IQR] | 3.00 [2.00, 4.00]         | 3.00 [2.00, 4.00] | 2.00 [2.00, 4.00] | 4.00 [3.00, 5.00] | 0.004   |
| Practice social distancing, median [IQR]                                       | 5.00 [4.00, 5.00]         | 4.00 [4.00, 5.00] | 5.00 [4.00, 5.00] | 4.00 [4.00, 5.00] | 0.602   |
| Practice protective measures such as hand washing, disinfecting household surfaces, using hand sanitizer, median [IQR] | 5.00 [4.00, 5.00]         | 4.00 [4.00, 5.00] | 5.00 [4.00, 5.00] | 4.00 [4.00, 5.00] | 0.677   |
| Control you feel you have over whether or not you or household might contract COVID-19, median [IQR] | 4.00 [3.00, 4.00]         | 3.00 [2.00, 4.00] | 4.00 [3.00, 4.00] | 3.00 [3.00, 4.00] | 0.394   |
| Feel equipped with enough knowledge to protect yourself and your household from COVID-19, median [IQR] | 4.00 [3.00, 4.00]         | 3.00 [3.00, 4.00] | 4.00 [3.00, 5.00] | 3.50 [3.00, 5.00] | 0.068   |

**Source of COVID-19 information and updates, n (%)**

| Source of COVID-19 information and updates | Non-Hispanic White, n=31 | Hispanic, n=33 | Black, n=73 | Asian/ Pacific Islander, n=13 | P Value |
|-------------------------------------------|--------------------------|----------------|------------|-------------------------------|---------|
| National news outlet (FOX, CNN, MSNBC, etc.) | 22 (71.0)                | 15 (45.5)      | 54 (74.0)  | 9 (69.2)                      | 0.033   |
| Local news on television                  | 30 (96.8)                | 31 (93.9)      | 62 (84.9)  | 11 (84.6)                     | 0.229   |
| Newspaper or local print media            | 3 (9.7)                  | 2 (6.1)        | 2 (2.7)    | 0 (0.0)                       | 0.371   |
| Directly from family or friends           | 5 (16.1)                 | 16 (48.5)      | 13 (17.8)  | 5 (38.5)                      | 0.003   |
| A healthcare provider                     | 2 (6.5)                  | 4 (12.1)       | 9 (12.3)   | 1 (7.7)                       | 0.805   |
| Social media (Facebook, Instagram, Twitter) | 7 (22.6)                 | 4 (12.1)       | 9 (12.3)   | 2 (15.4)                      | 0.563   |
| Messaging platform (WhatsApp, Facebook)   | 0 (0.0)                  | 2 (6.1)        | 2 (2.7)    | 0 (0.0)                       | 0.445   |
| Other                                     | 3 (9.7)                  | 1 (3.0)        | 6 (8.2)    | 3 (23.1)                      | 0.188   |

Note: Responses reported as median [interquartile range (IQR)] were scored according to a Likert scale ranging from 1 (least) to 5 (greatest).

COVID-19, coronavirus disease 2019; LDCT, low dose computed tomography.

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survey, 49.9% reported an increase in smoking behavior, while 16.3% reported a reduction. An online survey of 4,005 French adults during COVID-19 included 1,062 regular smokers; 231 (21.8%) reported that they increased their intake, while 177 (16.7%) reportedly decreased intake. The study authors suggested that the threat of contracting COVID-19 may have motivated some smokers to improve, while boredom and restrictions in movement may have had the opposite effect in others. In a survey from Italy, smokers reported increased tobacco use, increased food intake, and changes (positive and negative) in sleep quality during home confinement. High stress levels and the need to adapt to prolonged stays at home, particularly among fully employed individuals, have had significant correlations during COVID-19.

Smoking cessation programs struggle to achieve results. A report by Lang and Yakhkild showed that while the pandemic provides an opportunity to adapt and expand smoking cessation services, potential challenges involve the increased need for behaviorists because of widespread
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Figure 1. (A) Uncertainty about the future. Participants with increased tobacco use had more uncertainty about the future compared to those with unchanged (median 4 vs 3, \( P < 0.001 \)) or decreased tobacco use (median 4 vs 2, \( P = 0.002 \)). (B) Loneliness as a result of social distancing. Participants with increased tobacco use were more likely to report loneliness as a result of social distancing compared to those with unchanged (median 4 vs 2, \( P < 0.001 \)) or decreased tobacco use (median 4 vs 1, \( P < 0.001 \)). NA, not applicable.

stress brought on, in part, by isolation from friends and family.\(^{19}\) Some smokers may continue to smoke because of their erroneous belief that tobacco is a protective factor against COVID-19.\(^{19}\) Such erroneous beliefs may lead to decreases in enrollment in smoking cessation programs.\(^{14}\)

In a survey of smokers in Australia and the United Kingdom, 45% of respondents wanted more information about

Figure 2. (A) Anger or frustration with how the pandemic has disrupted your daily life. Participants with increased tobacco use reported more anger or frustration with how the pandemic has disrupted their daily life compared to those with unchanged tobacco use (median 4 vs 3, \( P < 0.001 \)). (B) Boredom due to being unable to work or engage in regular daily activities/routines. Participants with increased tobacco use reported more boredom compared to those with unchanged (median 4 vs 3, \( P = 0.001 \)) or decreased tobacco use (median 4 vs 3, \( P = 0.001 \)). NA, not applicable.

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Figure 3. (A) Desire to cope using alcohol or drugs. Participants with decreased tobacco use had less desire to cope using alcohol or drugs compared to those with unchanged (median 1 vs 2, *P*=0.008) or increased tobacco use (median 1 vs 2, *P*=0.002). (B) Sadness, or feelings of hopelessness. Participants with increased tobacco use had more sadness or feelings of hopelessness compared to those with unchanged (median 3 vs 2, *P*=0.006) or decreased tobacco use (median 3 vs 1, *P*=0.003). NA, not applicable.

Figure 4. (A) Worry/fear about challenges to securing basic needs such as groceries or medication. Participants with decreased tobacco use had more worry or fear about challenges to securing basic needs compared to those with unchanged tobacco use (median 4 vs 3, *P*<0.001). (B) How much social distancing do you practice? Participants with decreased tobacco use practiced more social distancing than those with unchanged (median 5 vs 4, *P*=0.012) or increased tobacco use (median 5 vs 4, *P*=0.002). NA, not applicable.

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Figure 5. (A) How often do you practice protective measures such as hand washing, disinfecting household surfaces, using hand sanitizer? Participants with decreased tobacco use practiced protective measures more often than those with unchanged (median 5 vs 4, $P=0.027$) or increased tobacco use (median 5 vs 4, $P=0.005$). (B) How worried are you about you or individuals in your household getting COVID-19? Participants who were Asian worried more about themselves or individuals in their household getting COVID-19 compared to patients who were non-Hispanic White (median 4 vs 3, $P=0.025$), Hispanic (median 4 vs 3, $P=0.037$), or Black (median 4 vs 2, $P=0.002$). NA, not applicable.

program who had volunteered to participate in a tobacco cessation program. In addition, all responses were self-reported and may be subject to recall bias. Also, as with any cross-sectional survey, the data are useful to formulate but not test hypotheses.\textsuperscript{21,22}

One unique strength of this cross-sectional survey is that all 150 volunteers approached agreed to participate. Another strength is that many hypotheses can be formulated from these descriptive data regarding possible behavioral and other factors that led some individuals to increase and others to decrease their smoking habits during COVID-19. Tests of such hypotheses will require analytic epidemiologic research designed a priori to do so.

CONCLUSION

These descriptive data show statistically significant differences between those who increased and decreased tobacco use during COVID-19 among volunteers who enrolled in a tobacco cessation and lung cancer screening program in Houston, Texas. Among those who decreased or stopped smoking, correlates included greater use of protective measures for COVID-19 such as social distancing and testing. These data may aid healthcare providers to identify and provide counsel to cigarette smokers at greater risk for increasing tobacco consumption during stresses such as the COVID-19 pandemic.

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## COVID-19 Survey

| Date |  
|------|---|
| Participant's ID |  
| Interviewer: |  

### Tobacco Usage

**Has your tobacco usage changed in any way (increased, decreased) during/after the COVID-19 pandemic?**
- [ ] Yes
- [ ] No

**In what way has your tobacco usage changed during/after the COVID-19 pandemic?**
- [ ] My tobacco usage has increased
- [ ] My tobacco usage has stayed the same
- [ ] My tobacco usage has decreased
- [ ] My tobacco usage has varied from day to day with no clear pattern
- [ ] Not applicable/former smoker

**Has the COVID-19 pandemic affected your desire to participate in our LDCT lung cancer screening program?**
- [ ] Yes
- [ ] No

**If so, please elaborate**

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**People react differently in stressful situations and may have different coping strategies to deal with the stress of an outbreak. Since the COVID-19 pandemic, have you experienced feelings of:**

| Feeling | 1 | 2 | 3 | 4 | 5 |
|---------|---|---|---|---|---|
| Uncertainty about the future | [ ] | [ ] | [ ] | [ ] | [ ] |
| Loneliness as a result of social distancing, or self-isolating | [ ] | [ ] | [ ] | [ ] | [ ] |
| Anger or frustration with how the pandemic has disrupted your daily life | [ ] | [ ] | [ ] | [ ] | [ ] |
| Boredom due to being unable to work or engage in regular daily activities/routines | [ ] | [ ] | [ ] | [ ] | [ ] |
| Desire to cope using alcohol or drugs | [ ] | [ ] | [ ] | [ ] | [ ] |
| Sadness, or feelings of hopelessness | [ ] | [ ] | [ ] | [ ] | [ ] |
| Worry or fear about challenges to securing basic needs such as groceries or medication | [ ] | [ ] | [ ] | [ ] | [ ] |

Scale: 1 (least) - 5 (greatest)
## General Health and Health Management

Do you have a serious or chronic health condition that requires medication and management at home?  
- Yes
- No

If so, please list

Has the COVID-19 pandemic affected your daily management of your health conditions? If so, please elaborate.

## Effects on Housing and Employment

How would you describe your current housing arrangement?  
- I live alone
- I live with spouse/significant other
- I live with another family member
- I live with a non-family member (friend, roommate, etc.)

Did COVID-19 affect your housing situation in any way? (Having someone else move in, having to move out to a new location, limiting the number of people per room...etc.)  
- Yes
- No

If so, please explain

Has COVID-19 affected your employment status?  
- Yes
- No

If yes, how so?

## COVID-19 Exposure and Preventative Measures

In the past 2 weeks, have you experienced any of these symptoms? Check all applicable.  
- Fever
- Dry Cough
- Runny nose
- Body aches
- Upset stomach
- Loss of smell/taste
- Fatigue, tiredness
- None of the above

In the past 3 weeks, have you had close contact with an individual with flu-like symptoms or a confirmed diagnosis of COVID-19?  
- Yes
- No
- Unsure

Have you been tested for COVID-19?  
- Yes
- No

Did you at any point, believe that you might have COVID-19 but DID NOT get tested for any reason?  
- Yes
- No

If yes, please explain
Confidential

Was the area you reside in under a "Shelter-in-Place" or "Stay-at-Home" order?  
☐ Yes  
☐ No  
☐ I don’t know

In recent days, have you avoided crowded places whenever possible?  
☐ Yes  
☐ No

In recent days, have you worn a mask when leaving the house?  
☐ Yes  
☐ No

What other precautions have you taken to keep yourself and other individuals in your household safe from COVID-19?

- How worried are you about you or individuals in your household getting COVID-19?  
☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

- How much social distancing do you practice?  
☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

- How often do you practice protective measures such as: hand washing, disinfecting household surfaces, using hand sanitizer?  
☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

- How much control do you feel like you have over whether or not you (or a member of your household) might contract COVID-19?  
☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

- Do you feel like you are equipped with enough knowledge to protect yourself and your household from COVID-19?  
☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5

Scale: 1 (least) - 5 (greatest)

How are you typically receiving the latest COVID-19 information and updates?  
☐ National news outlet (FOX, CNN, MSNBC, etc.)  
☐ Local news on TV  
☐ Newspaper or local print media  
☐ Directly from family or friends  
☐ A healthcare provider  
☐ Social media (Facebook, Instagram, Twitter, etc.)  
☐ Messaging platform (WhatsApp, Facebook Messenger, etc.)  
☐ Other

If other, please list

_____________________________