DIFFERENCES BETWEEN CURRENT AND FORMER CIGARETTE SMOKERS: COMPARISONS AMONG INDIVIDUALS WITH AND WITHOUT A CANCER DIAGNOSIS

Kinsey Pebley

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DIFFERENCES BETWEEN CURRENT AND FORMER CIGARETTE SMOKERS: COMPARISONS AMONG INDIVIDUALS WITH AND WITHOUT A CANCER DIAGNOSIS

by

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Abstract

Smoking is dangerous to health in general, but poses increased unique risks to the health of individuals diagnosed with cancer. Despite numerous trials aimed at increasing smoking cessation among individuals with cancer, few have been successful and cessation rates remain low. The current study aimed to assess differences between former and continued smokers with and without cancer to identify unique considerations to be addressed in future cessation interventions with individuals diagnosed with cancer. Participants ($N = 203$) completed an online survey about demographic characteristics, cigarette use, depression, anxiety, social support, barriers to quitting, and cessation resource use (e.g., nicotine patches). Results indicated that current smokers with cancer had higher depression, anxiety, perceived stress, and cancer-related stress scores, and were more likely to live with someone who smoked compared to former smokers with cancer. Additionally, former smokers with cancer were more likely to not have health insurance than former smokers without cancer. Lastly, current smokers with cancer were older, had higher anxiety scores, and reported more challenges to stopping smoking than current smokers without cancer. Thus, there may be specific considerations that need to be addressed when working with individuals with cancer trying to quit smoking. The current study may help to inform future cancer-specific cessation intervention development in order to improve cessation rates and health outcomes.
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Differences Between Current and Former Cigarette Smokers: Comparisons Among Individuals With and Without a Cancer Diagnosis

Cigarette smoking is the leading cause of preventable death in the United States (US; US Department of Health & Human Services [USDHHS], 2014), and results in an estimated $170 billion in healthcare spending annually (Adams, 2020; USDHHS, 2014). Approximately 16 million individuals in the US are living with a smoking-related disease (Adams, 2020; USDHHS, 2014). While cigarette smoking is dangerous to health in general, it also poses unique risks to individuals with a cancer diagnosis, regardless of whether the cancer is attributable to smoking. These risks include, but are not limited to, an increased likelihood of having metastatic disease at diagnosis (Kobrinsky et al., 2003), a secondary cancer diagnosis (Demark-Wahnefried et al., 2005; Toll et al., 2013), worsened side effects of treatment (Kawahara et al., 1998; Toll et al., 2013), worsened wound healing (Toll et al., 2013; i.e., for surgical patients who have had ports inserted, tumors removed, etc.), and increased risk of development of other life-threatening illnesses such as cardiovascular disease (Toll et al., 2013). Given the many possible negative health consequences, it is critical for cancer patients, regardless of cancer type, to successfully achieve smoking cessation.

Smoking Prevalence and Cessation

About 14.0% of the US population smokes cigarettes. Although this is a significant decrease from previous decades, this translates to approximately 34 million adults (not including adolescent smokers under the age of 18) who smoke cigarettes (USDHHS, 2014) and are at risk of the deleterious effects associated with smoking. In a recent nationally representative study, approximately 55.4% of individuals who smoked had made a past-year quit attempt and only 7.4% had recently quit (i.e., last smoked between six and 12 months ago; Babb et al., 2017).
While the percentage of individuals who have recently quit has increased in past years, it is still far below the 68.0% of smoking adults who reported that they wanted to quit smoking (Babb et al., 2017).

Although a cancer diagnosis is a “teachable moment” for many (Gritz et al., 2006), smoking among individuals with cancer remains alarmingly high. A recent review reported that between 9-33% of cancer survivors continued to smoke (Jassem, 2019). This may be an underestimate given the stigma associated with smoking after a cancer diagnosis, and not all studies used chemical verification techniques (e.g., cotinine levels) to accompany their self-report measures (Jassem, 2019). Indeed, one study using National Health and Nutrition Examination Survey (NHANES) data found that 63.9% of cancer patients in the sample who smoked prior to diagnosis continued smoking (Tseng et al., 2012), highlighting the broad range in estimates.

Specific smoking prevalence and cessation rates are more difficult to determine among individuals with cancer, as they vary significantly across cancer type and inclusion criteria of the sample (e.g., currently being treated versus cancer survivor). Notably, there are differences in cessation rates among those with a cancer attributable to smoking and those with a cancer not attributable to smoking. Individuals with a smoking-related cancer (e.g., lung, head and neck cancers) are more likely to quit smoking than those with a non-smoking-related cancer (Jassem, 2019). There is also significant variability by cancer type, with some prevalence rates exceeding rates of use by the general population (almost 14%; Creamer et al., 2019). For example, one study using National Health Interview Study (NHIS) data determined prevalence rates of smoking of respondents who reported various cancer diagnoses. Approximately 43.9% of cervical cancer survivors, 21.2% of melanoma survivors, 14.5% of lung, larynx, and windpipe
cancer survivors, 13.3% of breast cancer survivors, 11.2% of colon cancer survivors, and 7.2% of prostate cancer survivors reported smoking. Taken together, approximately 18.3% of all individuals reporting a history of cancer in this study continued to smoke after their cancer diagnosis (Tseng et al., 2010). Thus, it is clear that there is significant room to improve cessation outcomes among individuals with cancer.

**Cessation Resources**

There are many resources to aid with smoking cessation. Counselling, pharmacological aids (e.g., nicotine lozenges, nasal sprays, and gums; varenicline [Chantix]), self-help resources, quit lines, and less typical methods such as acupuncture, hypnosis, or laser therapy are available, each with varying degrees of evidence of effectiveness at reducing cigarette use. For example, a Cochrane review found that counselling was an effective resource for smoking cessation with (Risk Ratio [RR] = 1.24) and without the use of nicotine replacement therapy (NRT) simultaneously (RR = 1.57; Lancaster & Stead, 2017). However, a Cochrane review of acupuncture and laser therapy found little evidence to support these methods as effective resources for smoking cessation (White et al., 2014).

In a nationally representative study, 31.2% of smoking adults used cessation counselling and/or cessation medications, similar to rates of use of these cessation aids among adults with cancer (Schnoll et al., 2004). Despite the importance of individuals with cancer receiving information about and having access to cessation resources, there is a dearth of research examining which cessation tools are used among individuals with cancer, and if the utilization of resources differs between people with and without cancer. One study found that less than half of participants reported receiving information about the consequences of smoking with cancer from
a health care provider (Burke et al., 2009), with many cancer patients attempting cessation without assistance or information (Schnoll et al., 2004).

Few smoking cessation trials that employ behavioral strategies (as opposed to medication assistance) have been conducted among individuals with cancer (Gritz et al., 2006; Sheeran et al., 2019) and these trials investigated a variety of techniques (e.g., telephone-based counseling, nurse delivered interventions; Gritz et al., 2006; Sheeran et al., 2019). However, a recent meta-analysis (Sheeran et al., 2019) examining the effectiveness of smoking cessation interventions among individuals with cancer showed that these interventions have not been effective (Cohen’s $d = 0.03$), corroborating findings from previous reviews (Nayan et al., 2013; Nayan, Gupta, & Sommer, 2011). The authors were also able to test the effectiveness of individual intervention and delivery techniques used in studies in order to further determine which methods may or may not be helpful in future cessation programs. Out of 36 techniques and methodological considerations tested (e.g., who delivered the intervention, number of sessions, treatment modality), only having the intervention delivered by a nurse was significantly associated with reduced smoking ($B = 0.35, p = .045$). The disappointing findings from this meta-analysis further highlight the importance of developing effective cessation intervention strategies that are tailored to the unique needs and risk factors of individuals with cancer.

**Barriers to Smoking Cessation**

In a review of retrospective and cross-sectional studies of current and former smokers assessing reasons for cessation, wanting to quit for current and future health purposes was a top reason across studies (McCaul et al., 2006). Fear of becoming ill has also been reported as a motivator among young adults (Wellman et al., 2018). Social concerns (e.g., pressure from family to quit, setting an example for children) and the cost of cigarettes were also consistently
endorsed as reasons for wanting to quit smoking among the general population (McCaul et al., 2006), along with concerns related to weight gain (Fahey et al., 2020; Klesges et al., 1988) despite mixed evidence related to weight gain due to inconsistent measurement across studies (Germeroth & Levine, 2018). Other reasons for wanting to quit have varied across studies and are often quite vague, such as religious reasons, and being “sick” of smoking among samples without cancer (McCaul et al., 2006). Clarification of the specific factors motivating individuals with cancer to quit smoking could lead to more tailored and efficacious intervention approaches.

Prospective studies of cessation have found similar results, including wanting to quit for health-related reasons, social concerns, and cost. However, at follow-up, reasons for wanting to quit smoking were not significantly different between successful quitters and non-quitters across studies (McCaul et al., 2006). Another study found that individuals with concerns about their health were more likely to achieve cessation, while individuals receiving pressure from friends or family to quit or who were concerned with cost were actually less likely to achieve cessation (Halpern & Warner, 1993).

Further, in a review of vulnerable populations (i.e., individuals from low socioeconomic groups, with mental health concerns, from indigenous backgrounds, experiencing homelessness, and in prison) found that common barriers to cessation among groups included using cigarettes for coping with stress, the acceptability of smoking within their respective communities, and an absence of healthcare support to quit (Twyman et al., 2014). Additionally, cigarette smoking may function as a way to avoid withdrawal symptoms, particularly among regular daily smokers (Spinella et al., 2020). These are important considerations given that the more perceived barriers there are, the less likely an individual is to quit (Kaufman et al., 2018).
Similar findings have been reported among individuals with cancer. A qualitative study found that many former smokers with cancer were concerned about their health, which acted as a motivator for cessation. Additionally, there were social motivators, with many former smokers also reporting that their families were concerned with their health. Cost was also a consideration, with many expressing a desire to save money after their cancer diagnosis and acknowledging that smoking is expensive (Li, Chan, & Lam, 2014). These reasons for smoking cessation are similar to those reported by individuals without a reported cancer diagnosis in other literature, indicating that there may be salient similarities between these populations to be considered when delivering cessation interventions. However, to our knowledge, there are currently no studies that have directly compared individuals with and without cancer.

Qualitative efforts have also shown that individuals with cancer who continue to smoke report that perceived barriers outweigh the perceived benefits to quitting (Li et al., 2014). There were also social components that acted as barriers to cessation, with smoking reportedly acting as a way to connect with friends and that smoking was a “social norm.” Nicotine dependence was also identified as a barrier among individuals with a cancer diagnosis, with abstention being difficult to maintain when smoking urges occurred, or when the participants felt bored (Li et al., 2014).

Many smokers within the general population are concerned with developing a serious illness (McCaul et al., 2006). However, individuals with cancer who smoke are in a unique position where they already do have a serious illness which potentially impacts their views of their smoking behaviors. Fear of cancer recurrence has been associated with increased smoking, although the effect sizes were very small (Humphris & Rogers, 2004). Additionally, risk perception has been associated with decreased smoking among individuals with cancer (Hay et
This may indicate a need for a different approach to motivate this vulnerable population to quit, or use the diagnosis as a “teachable moment” in order to capitalize on that health-related motivation. It may be that individuals believe that it is “too late” for them to quit smoking given their diagnosis, particularly among individuals in later stages of their illness (Li et al., 2014), despite the many benefits of smoking cessation post-diagnosis. Understanding experiences and concerns that are unique to individuals with cancer may help to further tailor cessation interventions by addressing concerns that may be directly related to their cancer-related beliefs or experiences.

**Correlates of Smoking**

**Demographics**

Several demographic characteristics are associated with continued smoking or successful quitting, such as age. As age increases, smoking rates decrease among individuals with (Kim et al., 2016; Regan et al., 2015; Tseng et al., 2012) and without a cancer diagnosis (Tseng et al., 2010). In samples of patients with lung cancer, people who are younger are more likely to continue smoking or relapse compared to their older counterparts (Cooley et al., 2009; Lucchiari et al., 2016; Walker et al., 2004). However, other studies have found dissimilar results, with older age being associated with continued smoking among individuals with colorectal cancer (Park et al., 2012).

Gender and racial/ethnic differences have also been found in smoking behaviors. In the general population, men have been shown to smoke more than women (Creamer et al., 2019). However, despite the Surgeon General’s report stating that gender/sex differences are no longer significant (USDHHS, 2014), there is evidence to suggest that women tend to have a more difficult time with cessation (Smith et al., 2016). However, a recent study using a nationally
representative sample as part of the CDC’s National Health Interview Studies showed that a slightly higher percentage of women were successful in recent cessation attempts compared to men (7.6% versus 7.2%, respectively; Babb et al., 2017). Among samples of individuals with cancer, men were more likely to quit than women (Schnoll et al., 2006; Tseng et al., 2012), consistent with findings from the general population (Smith et al., 2016).

Among racial and ethnic groups, individuals who identify as Native Americans and Alaskan Natives have the highest rates of cigarette use, followed by individuals from multiracial, White, Black, Hispanic, and Asian backgrounds (Creamer et al., 2019). Individuals who identify as Asian reported the highest rate of recent smoking cessation (between six and 12 months ago), followed by Hispanic, non-Hispanic White, and Black individuals (Babb et al., 2017). Among a nationally representative sample of adult cancer survivors (with a wide variety of diagnoses) who took part in the CDC’s National Health and Nutrition Examination Survey (NHANES), those who identify as Hispanic and other individuals from racial minority backgrounds were less likely to quit smoking than their non-Hispanic White counterparts (Tseng et al., 2012). In contrast, another study with a large sample (\(N = 3063\)) of patients with colorectal cancer from a cohort of participants from different regions in the U.S. who were part of a cancer outcomes surveillance project found that patients who were White were more likely to continue smoking compared to non-White individuals (Park et al., 2012).

Income and insurance status may also play important roles in smoking and cessation behaviors. A recent epidemiological study has shown that individuals with incomes below the poverty level and no health insurance have lower rates of recent smoking cessation (Babb et al., 2017). Among a sample of cancer survivors, individuals with lower incomes without health insurance were also less likely to quit smoking (Burcu, Steinberger, & Sorkin, 2016; Park et al.,...
2012; Regan et al., 2015; Tseng et al., 2012). However, for many of these demographic associations with smoking behaviors, there are limited direct comparisons between individuals with and without a cancer diagnosis. It will be helpful to further characterize continued smokers and successful quitters among those with and without cancer, and assess for similarities and differences, and potential disparities, that should be taken into consideration in future tailored cessation interventions.

**Depression and Anxiety**

Mental health concerns may also impact smoking behaviors. Depression is associated with smoking and difficulty quitting among the general population (Heckman et al., 2015; Lawrence, Mitrou, & Zubrick, 2009; Lê Cook et al., 2014; Luger et al., 2014; McClave et al., 2009). Similarly, among individuals who have been diagnosed with cancer, those with more depressive symptoms are more likely to be continuing smokers after diagnosis as opposed to quitters (Berg et al., 2013; Park et al., 2012). This is particularly salient given that rates of depression are high among cancer patients (Duffy et al., 2012; Massie, 2004). However, to our knowledge, there is limited research comparing depressive symptoms between individuals with and without a cancer diagnosis.

Anxiety may also have implications for smoking. Individuals diagnosed with anxiety disorders are more likely to smoke and are more likely to experience severe withdrawal symptoms (Morissette et al., 2007). Anxiety is also more likely to be higher among smokers than non-smokers (McClave et al., 2009) and is higher among smokers who continue smoking compared to those who successfully achieve cessation (Becoña, Vázquez, & del Carmen Míguez, 2002; Gritz et al., 1999). However, it remains unclear if these patterns are similar among individuals with cancer, and if anxiety levels differ between individuals with and without cancer.
One study found that, among individuals with cancer, there were no differences in smoking cessation rates for individuals with and without anxiety disorders (Blalock et al., 2011). Further work is needed to understand the role of anxiety in smoking behaviors among individuals with cancer, and if there are differences between those with and without cancer.

**Stress**

Relatedly, stress is associated with smoking behaviors, with previous research demonstrating a positive association between stress/distress tolerance and smoking (Kraemer et al., 2013; McKee et al., 2011; Romano et al., 1991) and those reporting stress having increased cigarette cravings (Childs & de Wit, 2010). Stress may also have important implications for smoking cessation, with recent longitudinal studies finding that momentary stress is predictive of a smoking lapse among individuals attempting to quit (Cambron et al., 2019; Cambron et al., 2020). Additionally, stress has been strongly associated with more intense withdrawal symptoms (Lawless et al., 2015) and reduced ability to resist smoking (McKee et al., 2011). Indeed, in a study of adults, smokers reported using smoking as a stress reduction technique, and report less frequently using other coping techniques such as eating than non-smokers. In comparison, non-smokers more frequently used their other coping strategies, such as food intake, when experiencing stress (Meule, Reichenberger, & Blechert, 2018).

A cancer diagnosis poses a unique source of stress, which may impact smoking behaviors. For example, current smoking has been associated with increased distress related to diagnosis of confirmed or suspected lung cancer (Choi, Chan, & Lehto, 2019). Stress can also impact the biological functions of the body related to cancer. In a sample of individuals with breast cancer, individuals who had previously smoked cigarettes had prolonged inflammatory responses when exposed to stressors compared to never smokers despite not having a
significantly different amount of cortisol or interleukin-6 (indicators of inflammation; Bennett et al., 2013). Additionally, stress has been shown to impact cancer progression and metastases (Mravec et al., 2020). Thus, stress may be a critical component to address in cessation interventions among individuals with cancer.

Examination of stress and cancer-specific stressors is surprisingly understudied, but may have important implications for smoking cessation among this population. When using a measure of cancer-specific stressors, one study found that fear of disease progression was the most salient stressor across groups, and that certain cancer types (i.e., breast cancer and soft tissue cancers) had the highest levels of cancer-related stress (Herschbach et al., 2004). While it seems logical that individuals with cancer would experience higher levels of general life stress than the broader population, this is not something that, to our knowledge, has previously been tested. It remains unclear whether stress is different between groups of successful quitters and continued smokers with and without a cancer diagnosis, and this knowledge may influence how stress is addressed in future intervention programs for individuals with cancer. Additionally, further exploration about the cancer-specific stressors that may differentiate successful quitters and continued smokers may also help to identify important sources of stress to incorporate into future smoking cessation interventions for individuals with cancer.

**Social Support**

Previous studies have examined the relationship between social support and smoking behaviors. Individuals who are married have the lowest rates of cigarette use, while divorced/separated/widowed and single individuals have the highest rates (18.1% and 13.9%, respectively; Creamer et al., 2019). Past studies suggest that individuals who receive support while trying to quit smoking may be more likely to achieve cessation in the short-term (i.e., less
than a year; Carlson et al., 2002; Lichtenstein, Glasgow, & Abrams, 1986; Mermelstein et al., 1986). However, when support comes from a current smoker, the individual is significantly less likely to successfully quit (Mermelstein et al., 1986; Murray et al., 1995; Rice et al., 1996).

In studies of patients with cancer who smoke, being single (Kim et al., 2016) or divorced/widowed (Mayer & Carlson, 2011) and having lower levels of social support are associated with increased likelihood of smoking after diagnosis (ranging from five months to 11 years post-diagnosis; Park et al., 2012; Poghosyan et al., 2016; Yang et al., 2013). Individuals with cancer who smoke often live with smokers and have social networks populated by smokers, which makes it difficult to maintain abstention from smoking (Duffy, Louzon, & Gritz, 2012; McBride & Ostroff, 2003). Additionally, having fewer friends who smoke, no one smoking in the home, and having a spouse who does not smoke is associated with increased smoking cessation (Kashigar et al., 2013). Having smoking cues in the home may lead to an increase in the urge to smoke and subsequent continued smoking (Lucchiari et al., 2016). Again, this topic has been understudied among individuals with cancer, and there is a dearth of research examining differences in the perception of social support between individuals who successfully quit or continue smoking among individuals with and without cancer.

**Alcohol Use**

Alcohol use may also contribute to continued cigarette smoking. Higher alcohol consumption is associated with heavier smoking (Weitzman & Chen, 2005) and decreased odds of smoking cessation (Carmelli et al., 1993; Hymowitz et al., 1997; Osler et al., 1999; Sobell, Sobell, & Kozlowski, 1995; Sorlie & Kannel, 1990; Vander Ark et al., 1997; Zimmerman et al., 1990). Among samples of individuals with cancer, problematic drinking and alcohol use disorders were associated with continued smoking (Blalock et al., 2011; Duffy et al., 2008; Kim...
et al., 2016). However, one study found that heavy drinking (e.g., five or more drinks per?) in the past year was not associated with cessation among individuals with cancer (Tseng et al., 2012). It may be the case that cancer patients consume alcohol as a coping mechanism (Duffy et al., 2008), but without an impact on their smoking behavior. More work is needed to understand if alcohol use is a risk factor for continued smoking among individuals with cancer, or if alcohol consumption has a different relationship with smoking behaviors between individuals with and without cancer.

**Nicotine Dependence**

Nicotine dependence is also an important consideration when assessing correlates of smoking cessation. Nicotine dependence has been shown to be higher among those who continue smoking or relapse after a cancer diagnosis compared to those who successfully quit (Gritz et al., 1999), and it is inversely associated with motivation to quit (Schnoll et al., 2004). Nicotine dependence, however, is surprisingly understudied among individuals with cancer (Toll et al., 2013). The number of cigarettes smoked per day has been positively associated with continued smoking after a cancer diagnosis (Humphris & Rogers, 2004), which may act as a proxy for addiction or dependence. However, conducting direct assessments of nicotine dependence using standardized measures may help to solidly characterize the role of dependence in cessation or continued smoking among this vulnerable population.

**Theoretical Considerations**

The current study is informed by the biopsychosocial model, which suggests the presence and interaction of biological, social, and psychological factors that influence health outcomes. Thus, we are examining contextual factors that may influence a person’s ability to successfully quit smoking as evidenced by previous literature. This may serve to inform future studies that
can further assess how these different contextual factors interact to impact health behaviors in accordance with this model.

**The Current Study**

There are few studies that examine differences between successful quitters and continued smokers among individuals with cancer, despite numerous studies citing a need to better understand characteristics of individuals with cancer who smoke. Those studies that have been conducted also tend to focus on smoking-related cancers (Gritz et al., 2006). Additionally, there are few studies that compare smokers and successful quitters without a cancer diagnosis and smokers and quitters with cancer. This line of inquiry may assist in determining if there are unique considerations that may be helpful to include when tailoring cessation interventions for individuals with cancer. Specifically, it may inform future researchers and providers about who may be most at risk for continued smoking with cancer. More cessation research has been conducted among individuals without cancer, and more research related to similarities between individuals with and without cancer may provide additional information to reference as cessation programs are developed among individuals with cancer.

While many of the variables assessed are not modifiable (e.g., race/ethnicity, age, etc.), they may be indicators of potential risk or have notable disparities and may potentially inform who might require greater smoking cessation assistance. For modifiable variables (e.g., social support, depression, anxiety, stress), future cessation interventions may be able to directly target these concerns or provide referrals to other resources to potentially promote cessation success. More research will be needed to learn how to best incorporate all relevant considerations into tailored cessation intervention programs with individuals with cancer, but this study will serve as a starting point to identify what variable may actually be relevant for consideration.
The current study aims to determine which variables are associated with successful quitting versus continued smoking in cancer patients and compare successful quitters and continued smokers with cancer to successful quitters and continued smokers without cancer. Specifically, we aim to: 1) identify differences between individuals who continue smoking versus those who successfully quit among individuals with a cancer diagnosis; 2) identify differences between continued smokers with cancer and without cancer for the purpose of understanding what variables are similar, as well as what is unique to individuals with cancer and may require extra attention or referrals to resources during the course of intervention; and 3) identify differences between successful quitters with cancer and without cancer for the purpose of identifying what variables are similar, as well as what is unique to individuals with cancer and should be incorporated in interventions tailored to those with a cancer diagnosis.

We expected that individuals with a cancer diagnosis who continued to smoke, compared to individuals with and without cancer who successfully quit and those without cancer who continued to smoke, would report higher levels of depression and anxiety, lower levels of perceived social support, higher levels of general and cancer-related stress, higher alcohol consumption, and higher nicotine dependence, and would be more likely to live with someone who smokes. Additionally, we expected individuals with cancer who continued to smoke to be younger, female, White, single or divorced/separated/widowed, have a lower income, and have no health insurance. Analyses comparing cessation resource use were exploratory.

While this study is not exhaustive and there may be other contributors to continued smoking or successful quitting, this serves as a first step to directly compare important correlates of cigarette smoking between groups for the purpose of informing future cessation interventions,
given that past cessation interventions delivered to individuals with cancer have been largely unsuccessful.

**Methods**

All study procedures and materials were approved by the University of Tennessee Health Science Center (UTHSC) Institutional Review Board (IRB) and were subsequently acknowledged by the University of Memphis IRB. The University of Virginia IRB also acknowledged study procedures related to recruitment messages sent by their faculty and staff.

**Participants**

The only exclusion criteria for participation were never using a cigarette, or not having smoked 100 cigarettes in their lifetime as well as not having smoked a cigarette in the past 30 days (i.e., have not been a lifetime smoker or current smoker), and being under the age of 18 given that research suggests that smoking among adolescents is different from smoking among adults. The number of participants for each cell was calculated using Gpower (Faul et al., 2007), and used a Cohen’s $f$ effect size of 0.02 to detect a small effect. The original power analysis included six groups, as students were also going to be compared. However, the two student cells were not included in the final analysis because they were not needed to answer the current study questions. Participants were categorized into subsamples of cancer patient/survivor and non-cancer individuals. Within each subsample there were two cells: current smokers and quitters.

In order to be an eligible smoker, potential participants must have smoked cigarettes in the past 30 days and report smoking “every day” or “some days” (as opposed to “not at all”). In order to be an eligible quitter, participants must have reported smoking “not at all,” but must endorse that they have smoked a cigarette before, have smoked at least 100 cigarettes in their lifetime, or have smoked in the past 30 days to establish that they did, in fact, use cigarettes
previously. One important distinction in deciding eligibility of cancer patients who quit smoking was when their quit occurred. Individuals with cancer must have quit smoking after their initial cancer diagnosis. This would allow us to determine differences among individuals who continue smoking or quit after cancer diagnosis, as individuals who quit prior to diagnosis may have different motivators for their quit.

**Participant Recruitment**

Study recruitment occurred through a variety of modalities, including partnerships with medical environments where patients with cancer were seen in Charlottesville, VA, affiliated with the University of Virginia. Social media sites were also used to recruit participants with posts on Twitter, Instagram, and within relevant Facebook groups (with permission of individuals with administrative responsibility within those groups). Appendix A displays the images used when posting on these platforms.

Research Match, a site that allows researchers to contact potentially eligible participants who have signed up to use the match system and have consented to be contacted, was used. Using this system allowed us to contact individuals who reported having a cancer diagnosis and those with smoking in their profile information. Interested individuals were sent the survey link. Appendix A shows the language used in the Research Match posting.

Lastly, we used Prolific, a participant recruitment platform. Individuals signed up on the Prolific platform and were invited to participate if they met certain eligibility criteria set by researchers. They were compensated through the site using fair wage standards set by Prolific after the researchers review the data provided. Data did remain anonymous. Appendix A shows the language used in the Prolific posting.
Procedures

A total of 2823 potential participants answered screening questions. Eligible participants were permitted to take the main survey until their cell was filled. Surveys were completed remotely using Qualtrics using anonymous data collection settings from June 2020 to January 2021. Captcha features, open-ended questions, and attention check questions were used in order to identify potential bots and participants who may have been randomly responding. The participants were given an altered consent form that stated the details of the study but allowed them to continue with the survey questions if they agreed with the terms of the consent form rather than requiring them to sign a physical copy per recommendations from the UTHSC IRB. After survey questions were completed, participants were given a link to a new survey in order to enter their e-mail address so that they could be entered for a chance to win one of two $50 Amazon gift cards. By collecting this information in a separate survey, we eliminated the possibility of connecting e-mail addresses to survey responses.

Measures

The complete survey administered can be found in Appendix B. This displays the questions asked, along with answer responses, in the order by which they appeared.

Screening Questions. Screening questions inquired about age and smoking behaviors (e.g., if they had ever smoked a cigarette in their life, if they smoked in the past 30 days, if they had smoked at least 100 cigarettes in their lifetime, and if they smoke cigarettes now). Additionally, we asked if they had ever been diagnosed with cancer. For participants who endorsed that they had been diagnosed with cancer and that they were not currently smoking, a question about when they quit (i.e., before or after their cancer diagnosis) was asked. All screening questions were multiple choice with the exception of age, which required text entry.
These questions were used to determine eligibility as well as to categorize participants, and quotas were set within the survey software so that individuals categorized into cells that were already full were not allowed to complete.

**Demographics.** Demographic characteristics such as age, race, ethnicity, income, marital status, sexual orientation, sex assigned at birth, employment, and healthcare coverage were asked in the beginning of the survey. All demographic questions were multiple choice with the exception of age, which required text entry.

**Patient Health Questionnaire, Eight-Item (PHQ-8).** The PHQ-8 is a measure of depression among the general population that has been used extensively in previous research, with a score of ten or higher indicating the presence of depression (Kroenke et al., 2009). The PHQ-8 is almost identical to the PHQ-9, which has been found to be reliable and valid among individuals with cancer as well as among the general population (Hinz et al., 2016; Kroenke et al., 2001). The item removed from the PHQ-9 in order to create the PHQ-8 is a question inquiring about suicidality. Given the nature of the current study (i.e., anonymous survey completed remotely), researchers would not have an adequate way to intervene if suicidality was endorsed. A list of resources was provided at the end of the survey for participants who may benefit from accessing mental healthcare (see Appendix C). However, studies have shown that the PHQ-9 and PHQ-8 have similar predictive validity related to identifying depression (Shin et al., 2019; Wu et al., 2020). A total score was calculated, with higher scores indicating more depressive symptoms.

**Beck Anxiety Index (BAI).** The BAI is a measure of anxiety (Beck and Steer, 1990). A meta-analysis that reviewed psychometric data from 1993 to 2013 found that the BAI is a robust measure of anxiety. Internal consistency was high (Cronbach’s α = 0.91) and a test-retest
coefficient across scores from the collected studies was 0.66. The measure also demonstrated good external validity and was highly correlated with measures of similar constructs (Bardoshi, Duncan, & Erford, 2016). Participants were presented with a list of sensations and feelings (e.g., “terrified or afraid,” “difficulty breathing”) and asked to select an answer option that best represented how often they experience that item on a Likert scale from 0 (not at all) to 3 (severely – it bothered me a lot). A total score was calculated, with higher scores indicating more anxiety symptoms.

**Perceived Stress Scale (PSS).** The PSS (Cohen et al., 1988) is a widely used measure of stress and consists of ten items (e.g., “In the last month, how often have you felt that you were unable to control the important things in your life” and “In the last month, how often have you been able to control irritations in your life”). Answer responses included a five-point Likert scale from zero (never) to four (very often). A total summed score was used. Men and women have been found to score differently on the PSS, with women having higher scores. However, no differential item functioning was found between men and women for each question, and the PSS appears to be a valid measure of stress (Taylor, 2015).

**Interpersonal Support Evaluation List 12-Item Short Form (ISEL-12).** The ISEL-12 is a measure of perceived social support (Cohen et al., 1985) and evaluates the amount of social support that an individual perceives to be available to them. Participants answered questions using a Likert scale ranging from 1 (definitely false) to 4 (definitely true), with items such as “If I wanted to go on a trip for a day (for example, to the country or mountains), I would have a hard time finding someone to go with me” and “If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house or apartment (the plants, pets, garden, etc.).” There are three subscales within the measure: appraisal (receiving advice),
belonging (concern, empathy), and tangible (receiving help). However, a total score is recommended as internal consistency scores are not adequate within subscales (Merz et al., 2013). Thus, a summed total score ranging from 12 to 48 was used to represent perceived social support, with higher scores indicating greater perceived social support. The ISEL-12, although less work has been done to evaluate its psychometric properties compared to its long-form counterpart, has demonstrated adequate internal consistency when the total score is used among the general U.S. population and among Latino/a/x individuals from different backgrounds (Cronbach’s $\alpha = 0.70 – 0.90$; Cohen, 2008; Merz et al., 2013).

**Daily Drinking Questionnaire (DDQ).** The DDQ (Collins, Park, & Marlatt, 1985) is a commonly used measure of alcohol consumption that asks the individual to report the number of drinks that they typically consume each day of the week, and the number of hours in which they consume those drinks (which can help to determine binge or high intensity drinking behaviors). The number of drinks per week consumed can be summed for a total score to be modeled continuously.

**Smoking behaviors.** Participants also answered questions about their cigarette use behaviors, including if they lived with someone who smoked (measured dichotomously). Participants were also asked if they have smoked 100 cigarettes in their lifetime and if they have smoked in the past 30 days (both measured dichotomously) to establish if they are or were previously a regular smoker. Questions were modeled after those used by the CDC’s 2019 Behavioral Risk factor Surveillance System (BRFSS), Global Adult Tobacco Surveys (GATS), and National Adult Tobacco Surveys.

**Fagerstrom Test of Nicotine Dependence.** Nicotine dependence was measured using the Fagerstrom Test of Nicotine Dependence (FTND). This is a standardized six-item measure,
with higher scores indicating higher nicotine dependence (Heatherton et al., 1991). Items included “Do you find it difficult to refrain from smoking in places where it is forbidden, e.g., in a church, at the library, cinema, etc.?” and “Which cigarettes would you hate most to give up?” Answer options vary by question. A total score was used. A meta-analysis examining psychometric studies related to the FTND in a multitude of countries found that the measure has adequate test-retest reliability and moderate internal consistency (Cronbach’s $\alpha = 0.55 – 0.70$) that may be attributable to the number of constructs being assessed within the measure (Meneses-Gaya et al., 2009).

**Challenges to Quitting Smoking.** Participants who reported smoking within the past 30 days were also given the 21-item *Challenges to Stopping Smoking* (CSS-21) questionnaire (Thomas et al., 2016). Participants were asked to rate how much of a challenge a series of situations are on a scale of 1 (*not a challenge*) to 4 (*major challenge*). Situations include “feeling lost without cigarettes,” “something stressful happened when I was trying to stop smoking,” and “the cost of stop-smoking medicines such as nicotine replacement therapy.” There are two subscales within this measure, with one relating to intrinsic factors and the other relating to extrinsic factors. A total score for each subscale will be used. Internal validity has been found to be adequate for each subscale (Cronbach’s $\alpha = 0.86$ and $0.82$, respectively; Thomas et al., 2016).

**Cessation Resources.** Participants were given a list of 14 different smoking cessation tools and asked if they had ever used the items to help them quit or cut down their cigarette use. Resources included in-person counseling, varenicline (Chantix), nicotine gum, etc. Participants selected with *yes, I have used* or *no, I have NOT used*.

**Cancer Diagnosis.** Participants were asked if a health professional had ever told them that they have cancer, at what age they were first diagnosed, how many types of cancer they had
been diagnosed with (only one, two, three or more), and if they were receiving treatment (yes; no, I’ve completed treatment; no, I’ve refused treatment; no, I haven’t started treatment).

Participants were also given an extensive list of cancer diagnoses and asked to select which ones they had received and were permitted to select more than one. Questions were derived from the CDC’s 2019 BRFSS survey.

**Questionnaire on Stress in Cancer Patients.** This measure was designed to assess the unique experience of cancer patients and determine how much stress these different experiences cause (Herschbach et al., 2004). Participants who reported being diagnosed with cancer and smoking within the past 30 days were given 24 situations that may cause them stress (e.g., “I am afraid of a progression of my disease;” “I am afraid of having to go to the hospital again”), and asked to rank how much of a problem the situation was for them on a scale from only a slight problem to a very severe problem, with an option to select does not apply to me. While this is, of course, not an exhaustive list of potentially stressful situations that could be encountered by a person with cancer, it does act as a stepping-stone to characterize cancer-specific stress using quantitative methods. While the psychometric properties of this measure have not been established, it remains the only cancer-specific stress questionnaires published to date.

**Captcha/Attention Checks.** A captcha was included at the beginning of the survey to minimize risks of bots from taking the survey in an attempt to obtain the incentive for participation. Additionally, three attention check questions that began as simple arithmetic word problems, but had instructions about which answer option to select embedded within, were included throughout the survey to provide additional protection against bots and random responding by participants. Lastly, there were two open-ended questions at the end of the survey.
Abnormal responses to attention checks and/or the open-ended questions were flagged as suspicious and investigated as described in the data analysis section.

**Data Analyses**

Data was excluded from the analysis if participants discontinued the survey part of the way through (and thus, had incomplete survey data; \( n = 13 \)), if they failed two or more attention checks (\( n = 15 \)), or provided inconsistent responses on the screening questions and the identical questions housed in the main survey (\( n = 5 \)). The final sample was 203 participants.

In the final sample, the missing data rate within questionnaires was low (0.5%-7.9%, with the DDQ having the highest rate of missingness). No limit was set as to how much missingness was permissible within a single measure. However, missingness within a measure was one question for all imputed measures apart from the DDQ, where participants sometimes had multiple days left blank. Multiple imputation with 100 imputed data sets was used to address missing data within standardized scales that yield a total score. Using multiple imputation allowed for having total scores for all participants rather than having some missing total scores because a participant missed a question. Multiple imputation was found to be appropriate given its effectiveness with small sample sizes (Graham, 2009) and its ability to produce relatively unbiased estimates (Graham, 2009). We used 100 imputed data sets because modern recommendations state at least 40 imputed data sets are needed (Graham, 2009) but up to 100 can be helpful (Graham, Olchowski, & Gilreath, 2007). With additional imputed data sets comes increased power. Thus, we opted for the higher number of imputed sets. Data was imputed at the item level rather than the scale level for measures that all participants were asked to complete given recent research showing that item-level imputation for scales introduces less bias than scale-level imputations (Gottschall, West, & Enders, 2012; Mazza, Enders, & Ruehlman, 2015).
However, item-level imputation was not possible for the measures completed by a subset of the sample (i.e., assessments only given to individuals with cancer [Questionnaire on Stress in Cancer Patients] or current smokers [FTND, Challenges to Stopping Smoking]; Gottschall et al., 2021). For these measures, scale-level imputation was used to impute a total score.

Logistic regressions were used to assess for differences between groups with categorical variables of interest, and linear regressions were used to assess for differences between groups with continuous variables. Models controlled for age, sex, and income. These models were selected over others (e.g., ANOVA) because they are possible to conduct with a dataset that has undergone multiple imputation, given that multiple imputation precludes many other statistical tests. Due to lack of variance, differences between individuals from different racial and ethnic backgrounds were not assessed as the sample sizes were too small to adequately power statistical tests.

Chi square tests were also used to determine if smoking status was associated with cancer type to determine if controlling for this variable in models comparing individuals with cancer was appropriate. Smoking status among individuals with cancer was significantly associated with thyroid ($\chi^2 = 4.00, p = .05$) and Hodgkin’s lymphoma ($\chi^2 = 5.18, p = .02$). It was not significantly correlated with the 18 other types of cancer that a participant endorsed. It is important to note that many of these types of cancer only had one person endorse having that diagnosis. Given the lack of association between smoking status and most cancer types, and the small sample sizes within most cancer types, we did not control for cancer type in models assessing differences between current and former with cancer in order to not overfit the model.
Results

Participant Characteristics

Participant characteristics are displayed in Table 1. Most participants were female (73.4%), White (85.2%), and non-Hispanic or Latino/a/x (92.6%). More than half of participants reported income of less than $50,000 per year in each group except former smokers without cancer, where most participants reported income greater than $50,000 per year. Age was significantly different between groups, with current smokers without cancer having the lowest mean age and former smokers with cancer having the highest mean age. Other demographic characteristics presented in Table 1 (i.e., marital status, income, employment, and sex) were not significantly different across groups. Given the lack of variance across race and ethnicity, differences were not tested between groups for these variables.

Table 2 displays mean scores for surveys with total scores for different groups. Average scores for depression using the BDI were slightly below the threshold for depression (score of 10) in both individuals with and without cancer ($M = 8.33$ and 8.18, respectively). Average scores for individuals with cancer indicated mild anxiety on the BAI ($M = 17.01$), while average scores for individuals without cancer indicated mild anxiety ($M = 14.42$). Average scores for both groups on the PSS indicate moderate stress ($M = 17.74$ and 14.48, respectively). Additionally, averages of alcoholic drinks per week in both groups did not meet criteria for heavy drinking ($M = 5.36$ and 9.74 drinks, respectively), although the group without cancer did report a higher number of drinks per week than those with cancer.

For current and former smokers, average scores for depression using the BDI were also slightly below the threshold for depression ($M = 9.46$ and 7.04, respectively). Average scores for current smokers indicated moderate anxiety on the BAI ($M = 18.88$) and mild anxiety for former
smokers ($M = 12.22$). Average scores for both groups on the PSS indicate moderate stress ($M = 20.25$ and 14.95, respectively). Additionally, averages of alcoholic drinks per week in both groups did not meet criteria for heavy drinking ($M = 9.27$ and 6.47 drinks, respectively), although the current smokers reported a higher number of drinks per week than former smokers.

**Current Smokers with Cancer versus Former Smokers with Cancer**

Table 3 displays linear regression results. Former smokers with cancer were coded as zero, and current smokers with cancer were coded as one. Among people with a cancer diagnosis, current smokers with cancer had higher depression ($B = 2.66$, standard error [$SE$] = 1.29, $p = .04$), anxiety ($B = 7.02$, $SE = 2.83$, $p = .01$), perceived stress ($B = 4.34$, $SE = 1.77$, $p = .01$), and cancer-related stress ($B = 12.25$, $SE = 4.71$, $p = .01$) scores. Current smokers with cancer also had lower perceived social support scores ($B = -3.93$, $SE = 1.81$, $p = .03$). Smoking status was not significantly associated with age or income ($p > .05$).

Smokers with cancer also used more smoking cessation resources ($B = 1.90$, $SE = 0.59$, $p = .002$). Table 1 shows how many participants in each group endorsed using individual resources. Nicotine patches and gum were the most frequently endorsed cessation resources among both groups, but the percentage of participants within the smoking group that endorsed use were much higher than those who had quit.

Table 4 displays logistic regression results. Former smokers with cancer were less likely to live with someone who smokes (not living with someone who smokes = 0; living with someone who smokes = 1; $OR = 0.19$, 95% CI: [0.60, 0.58], $p = .004$) and were more likely to have health insurance (health insurance = 0, no health insurance = 1; $OR = 0.18$, 95% CI: [0.35, 0.93], $p = .04$). Additionally, there was no significant difference in smoking status for sex or marital status ($p > .05$).
Former Smokers with Cancer versus Former Smokers without Cancer

Table 3 displays linear regression results. Former smokers without cancer were coded as zero, and former smokers with cancer were coded as one. Among individuals who had quit smoking, depression scores, anxiety scores, PSS scores, perceived social support, daily drinking questionnaire total scores, age, and income were not significantly different between individuals with cancer and those without cancer ($p > .05$).

Former smokers with cancer also used more smoking cessation resources ($B = 1.25, SE = 0.40, p = .002$). Table 1 shows how many participants in each group endorsed using individual resources. Nicotine patches and gum and self-help guides were the most frequently endorsed cessation resources among both groups, but the percentage of participants within the former smokers with cancer who endorsed use were much higher than those without cancer.

Table 4 displays logistic regression results. Sex, marital status, and living with a smoker were not associated with smoking status ($p > .05$). However, former smokers with cancer were more likely to not have health insurance than former smokers without cancer ($health\; insurance = 0, no\; health\; insurance = 1; OR = 12.45, 95\% CI: [1.89, 89.82], p = .01$).

Current Smokers with Cancer versus Current Smokers without Cancer

Table 3 displays linear regression results. Current smokers without cancer were coded as zero, and current smokers with cancer were coded as one. Current smokers with cancer were older ($B = 7.52, SE = 2.83, p = .008$), had higher anxiety scores ($B = 6.28, SE = 2.70, p = .02$), and reported more intrinsic ($B = 3.14, SE = 1.51, p = .04$) and extrinsic ($B = 2.11, SE = 1.87, p = .008$) challenges to stopping smoking.

Current smokers with cancer also used more smoking cessation resources ($B = 1.26, SE = 0.58, p = .03$). Table 1 shows how many participants in each group endorsed using individual
resources. Nicotine patches and gum and self-help guides were the most frequently endorsed cessation resources among both groups, but the percentage of participants within the current smokers with cancer who endorsed use were much higher than those without cancer.

Table 4 displays logistic regression results. Individuals who were separated/divorced/widowed (OR = 0.16, 95% CI: [0.06, 0.91], p = .01) or never married (OR = 0.23, 95% CI: [0.04, 0.68], p = .04) were more likely to be current smokers without cancer than current smokers with cancer compared to those who were married/cohabitating/part of an unmarried couple. Sex, health insurance status, and living with a smoker were not associated with being a current smoker with cancer or a current smoker without cancer (p > .05).

Discussion

The current study found significant differences between current and former smokers with and without cancer that may be pertinent to consider in future intervention development among smokers with cancer. Specifically, this study found that current smokers with cancer had higher depression, anxiety, perceived stress, and cancer-related stress scores, and were more likely to live with someone who smoked compared to former smokers with cancer. Current smokers with cancer also had lower perceived social support scores and were less likely to have health insurance than former smokers with cancer.

The current study also found that former smokers with cancer were less likely to have health insurance than former smokers without cancer, but otherwise were not significantly different on other measures or demographic characteristics. Thus, it appears that former smokers may be more similar than different. However, current smokers with cancer were older, had higher anxiety scores, and reported more challenges to stopping smoking than current smokers.
without cancer. Thus, there may be more perceived barriers to quitting smoking among individuals with cancer than among individuals without cancer.

**Demographics**

Current smokers with cancer were older. Age could be a function of how long an individual has smoked, as older individuals may have simply had the opportunity to smoke for a longer amount of time than their younger counterparts. Indeed, post-hoc analyses that assessed the association between smoking status and time since the person first smoked (reported age of first smoking subtracted from the person’s age) were statistically significant. However, in a regression that controlled for age, the effect was no longer statistically significant. This suggests that age is an important consideration related to quitting above and beyond amount of time smoking. However, it is important to note that the variable representing time since first smoked here is imperfect because it does not account for quit time. This finding may also be related to past findings that it is “too late” to quit smoking (Li et al., 2014), but more research is needed to determine if this is true. It may be the case that individuals with cancer have had more time to develop cancer since they are older.

Current smokers with cancer were less likely to have health insurance than former smokers with cancer, and former smokers with cancer were less likely to have health insurance than former smokers without cancer. It was not different among current smokers with and without cancer. This may be due to low sample sizes in some cells, and thus more research is needed to corroborate these findings. It may also be the case that having health insurance is an important factor when quitting smoking among individuals with cancer given that current smokers with cancer were less likely to have health insurance than former smokers with cancer. This would be consistent with a nationally representative study in the U.S. among the general
population that found increased recent smoking cessation among individuals with private health insurance compared to those who were uninsured or enrolled in Medicaid (Babb et al., 2017). Additionally, Medicaid expansion in several states and subsequent coverage of cessation services has also recently been found to be associated with increased smoking cessation (Yip et al., 2020). Thus, helping cancer patients who smoke access insurance resources offered at the state or federal level may be helpful to promote smoking cessation. Having insurance may promote the use of nicotine replacement therapies or other resources because these tools are covered, making the cost less prohibitive. It may also result in greater access to care and the ability to have more regular visits with a physician, which would allow for greater screening and potential intervention.

Surprisingly, income was not statistically significant in any of the models. This is unexpected because past studies have shown an association between difficulty quitting smoking and lower income (Babb et al., 2017). This may have been attributable to the low sample size, or perhaps the distribution of income across groups. While there was a wide range of incomes reported across participants (see Table 1), the model may have been overfitted or there may simply not have been an association above and beyond other variables such as health insurance status. Although the income variable was treated as continuous to preserve statistical power, more research with larger, more diverse samples is needed to determine if income is not as much of a concern to address among individuals with cancer trying to quit smoking.

**Negative Affect**

Depression, anxiety, perceived stress, and cancer-related stress were significantly higher among current smokers with cancer than former smokers with cancer, and anxiety scores were also significantly higher among current smokers with cancer than current smokers without
cancer. Thus, negative affect and stress may be important points of intervention within smoking cessation programs among individuals with cancer in order to increase chances of success. This is consistent with past research showing that individuals with cancer experience higher levels of depression than those without cancer (Duffy et al., 2012; Massie, 2004), that depression makes cessation more difficult (Heckman et al., 2015; Lawrence, Mitrou, & Zubrick, 2009; Lê Cook et al., 2014; Luger et al., 2014; McClave et al., 2009), and that more depressive symptoms are associated with continued smoking compared to cessation among individuals with cancer (Berg et al., 2013; Park et al., 2012). Additionally, these results are consistent with past findings that continued smokers report more anxiety than successful quitters (Becoña, Vázquez, & del Carmen Míguez, 2002; Gritz et al., 1999). The current study is an extension of the literature because it provides evidence for a similar pattern among individuals with cancer. These considerations are included as part of many cessation resources, including government-sponsored programs such as smokefree.gov (n.d.) and the American Lung Association (2020). However, most recommendations for smoking cessation treatment programs are vague, including seeking behavioral health treatment to identify triggers for smoking. Assessment for negative affect and stress may be particularly important to ensure these experiences are identified and treated concurrently.

Stress was also higher among current smokers with cancer than former smokers with cancer. This is consistent with previous studies showing that stress is predictive of cravings, reduced ability to resist smoking, and smoking lapses (Cambron et al., 2019; Cambron et al., 2020; Childs & de Wit, 2010; McKee et al., 2011). The current study provides an extension to the literature by demonstrating the higher levels of stress among those with cancer who continue to smoke than those with cancer who successfully quit. Additionally, current smokers with
cancer reported more cancer-related stress than former smokers with cancer. This may indicate that cancer-specific stressors are important to address in order to facilitate successful smoking cessation. Post-hoc analyses indicate that cancer treatment engagement (i.e., refused treatment, currently in treatment, completed treatment) were not associated with smoking status ($p > .05$). Thus, there appears to be other reasons aside from where a person is at with regards to treatment that make the cancer experience stressful and potentially contribute to continued smoking.

There are a number of considerations for future research regarding negative affect and smoking cessation among individuals with cancer. Depressive symptoms often include fatigue, which may be made worse by cancer treatments and by other cardiovascular effects of smoking. Cigarettes may be used as a stimulant to feel more awake or alert, and does increase cognitive function (Bruijnzeel, 2017). Additionally, nicotine increases reward function from non-drug stimuli. That is, smoking cigarettes serves to increase the reward or valuation of other non-smoking activities and when smoking is discontinued, those activities become less rewarding and anhedonia increases. This increase in anhedonia subsequently increases risk for relapse (Bruijnzeel, 2017). Thus, more research is needed to determine why negative affect may play a role in continued smoking among those with cancer (e.g., if anhedonia contributes to continued smoking, if using to stay alert or to think clearly, etc.).

Social Environment

Social factors may also be important to address in smoking cessation interventions among individuals with cancer. Smokers with cancer had lower perceived social support scores and were more likely to live with someone who smoked compared to former smokers with cancer. This is consistent with past studies showing that social support was associated with quitting (Carlson et al., 2002; Lichtenstein, Glasgow, & Abrams, 1986; Mermelstein et al., 1986) unless
the support came from a current smoker (Mermelstein et al., 1986; Murray et al., 1995; Rice et al., 1996). Thus, addressing the home environment and bolstering support among friends and family for quitting may be useful strategies to improve cessation outcomes. These findings also extend the current literature by providing additional evidence that social support may play an important role in successful smoking cessation for those with cancer. Research related to cessation among those with cancer and social support has been limited but has suggested that smokers with cancer often live with someone who smoke and subsequently have a difficult time with cessation (Duffy, Louzon, & Gritz, 2012; McBride & Ostroff, 2003). The current study supports this finding.

Additionally, individuals who were separated, divorced, or widowed were more likely to be current smokers without cancer than current smokers with cancer compared to those who were married/cohabitating or part of an unmarried couple. This may mean that individuals with cancer who are smoking may have a partner at home, but given the previously discussed results related to perceived social support it may be important to involve significant others when addressing smoking cessation with people with cancer in order to garner support for the quit. More research that further examines the nature of these relationships and the support for quitting those with cancer get from their partners may be helpful to better address these concerns.

**Substance Use and Nicotine Dependence**

Alcohol use was not significantly different between the tested groups. There have been few studies examining alcohol use among individuals with cancer. In the general population, higher alcohol consumption has been associated with difficulty with quitting smoking (Carmelli et al., 1993; Hymowitz et al., 1997; Osler et al., 1999; Sobell, Sobell, & Kozlowski, 1995; Sorlie & Kannel, 1990; Vander Ark et al., 1997; Zimmerman et al., 1990). However, this was not the
case among individuals with cancer who did engage in binge drinking behaviors (Tseng et al., 2012). Previously, alcohol has been posited to be a coping mechanism that may preclude smoking cessation among those with cancer (Duffy et al., 2008). The current study did not corroborate this finding, but there may be other considerations that influence alcohol use behaviors among individuals with cancer that are worth exploring in more depth. For example, some individuals may have severe symptoms due to their illness or due to side effects of treatment that preclude alcohol consumption. It may be that disease stage plays a role in consumption (e.g., those with advanced illness may drink less than those in early stages, or vice versa), which in turn has a differential impact on smoking cessation. More research is needed to untangle this potentially complicated relationship between cancer, alcohol, and smoking cessation.

Additionally, nicotine dependence was not significantly different between current smokers with and without cancer, which may be a positive thing as one group is not experiencing greater dependence. There is a dearth of research examining the impact of nicotine dependence on smoking cessation among those with cancer, and if dependence levels are different compared to individuals without cancer. Future studies are needed to determine the role this plays, if any, in successful smoking cessation among individuals with cancer.

**Barriers to Smoking Cessation**

Smokers with cancer also reported more barriers to quitting smoking than smokers without cancer. While this is important to address with all groups, it appears to be particularly salient for those with cancer given that there appears to be more that they feel they need to overcome in order to be successful. It remains unclear if these boundaries are perceived because the person is already under increased stress because they have received a diagnosis, or if their
diagnosis creates actual additional barriers that preclude cessation. Further research is needed to clarify why there are more reported barriers for those with cancer.

The current study used a measure that provided a total score to quantify barriers to smoking. Future research may benefit from examining if there are themes or patterns to the types of barriers encountered by those with cancer that consistently preclude successful cessation. Past qualitative studies have shown that barriers outweigh perceived benefits of cessation (Li et al., 2014). Surprisingly, fear of cancer recurrence (Humphris & Rogers, 2004) has been associated with smoking, and it may be that a barrier is a lack of alternative coping methods. There is also reportedly the idea that it is “too late” to quit (Li et al., 2014), and further studies are needed to determine if that is a pervasive belief that precludes smoking cessation. It may also be the case that health insurance status plays a role in the number of cessation resources used, and which ones. Future studies may benefit from assessing the relationship between health insurance status and cessation resource use among those with cancer.

Cessation Resource Use

Smokers with cancer used more cessation resources than former smokers with cancer and current smokers without cancer. Former smokers with cancer also reported using more cessation resources than former smokers without cancer. It may be the case that continued smokers are seeking more resources because they have not been successful with a particular resource, while those who quit were successful and did not need to seek alternatives. Future research may benefit from assessing the types of resources used (e.g., behavioral, pharmacological) among larger samples to determine cessation resource preferences and efficacy.
Limitations

Despite the strengths of the study, including the novelty of the research questions, there are some limitations worth noting. First, the cell sizes were small and uneven (e.g., significantly more women than men), which may leave some analyses underpowered. Secondly, the sample was not racially diverse (85% of participants reported being White), and tests of associations between some demographic characteristics (i.e., race, ethnicity) were precluded due to lack of variance. Further research is needed to replicate these results in a larger, more diverse sample. Analyses included people who smoked every day and some days together to preserve power and bolster the sample size of these cells. However, these groups may be different from each other, and future research would benefit from separating these groups.

Another limitation is the absence of a variable measuring education level of each participant. While participants were originally planned to be asked about their education, the variable did not function correctly in the online survey. Thus, this information is missing, and future studies will significantly benefit from examining the influence of educational opportunities on cessation among those with cancer given the association between education and smoking status in the general population (Creamer et al., 2019).

Additionally, future studies should account for the amount of time smoked and amount of time since former smokers had quit. It may be the case that someone has smoked longer and has more time to develop patterns of smoking behaviors, or the number of years since quitting is different which could introduce recall bias given that the length of time that has passed is different.

Lastly, when comparing current and former smokers with a cancer diagnosis, we did not control for the stage of cancer as this information was not available, and we included individuals
undergoing active treatment and those who had completed treatment. Future studies may need to determine if illness severity and treatment status impact the smoking status of the person.

**Conclusions**

The current study found that current smokers with cancer had higher depression, anxiety, perceived stress, and cancer-related stress scores, and were more likely to live with someone who smoked compared to former smokers with cancer. Current smokers with cancer also had lower perceived social support scores and were less likely to have health insurance than former smokers with cancer. Former smokers with cancer were less likely to have health insurance than former smokers without cancer. Lastly, current smokers with cancer were older, had higher anxiety scores, and reported more challenges to stopping smoking than current smokers without cancer. The current study extends previous literature by assessing the impact of variables that are associated with smoking cessation in the general population among individuals with cancer. Additionally, we extended the current body of literature by assessing cancer-specific variables (i.e., cancer-specific stress) to determine if experiences unique to individuals with cancer were associated with smoking behaviors.

The current work can contribute to the development of tailored smoking cessation intervention programs that are feasible for individuals with cancer to facilitate improvement of successful cessation rates. Negative affect, social support, and barriers to cessation may be particularly salient points of intervention when addressing smoking cessation among individuals with cancer. While more work is needed in order to confirm the results and explore these differences in more depth, the current study serves as a first step to expand what we know about smoking cessation among the general population to those experiencing cancer. Smoking with cancer has significant implications for secondary cancers (Demark-Wahnefried et al., 2005; Toll
et al., 2013) and cancer treatment (Kawahara et al., 1998; Toll et al., 2013), but so far studies have been largely unsuccessful in testing ways to increase cessation rates among those with cancer (Sheeran et al., 2019). Thus, it is important that we better understand unique considerations within this population in order to significantly improve cessation success and health outcomes.
References


Yip, D., Gubner, N., Le, T., Williams, D., Delucchi, K., & Guydish, J. (2020). Association of medicaid expansion and health insurance with receipt of smoking cessation services and smoking behaviors in substance use disorder treatment. *Journal of Behavioral Health Services & Research, 47*(2), 264-274.

<table>
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<th>Characteristic</th>
<th>Current Smokers with Cancer</th>
<th>Former Smokers with Cancer</th>
<th>Current Smokers without Cancer</th>
<th>Former Smokers without Cancer</th>
<th>Overall Sample</th>
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<td>current</td>
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<td>current</td>
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<td>12 (5.9%)</td>
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<td>Non-Hispanic</td>
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<td>50 (87.7%)</td>
<td>52 (91.2%)</td>
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<td>149 (73.4%)</td>
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<td>Male</td>
<td>12 (27.3%)</td>
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<td>18 (31.6%)</td>
<td>54 (26.6%)</td>
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<td><strong>Marital Status</strong></td>
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<td>18 (31.6%)</td>
<td>15 (26.3%)</td>
<td>49 (24.1%)</td>
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<td>Member of an unmarried couple/ Married/Cohabitating</td>
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<td>23 (51.1%)</td>
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<td>30 (52.6%)</td>
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<tr>
<td>Separated/Widowed/Divorced</td>
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<td>Employed for wages</td>
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<td>17 (37.8%)</td>
<td>25 (43.9%)</td>
<td>24 (42.1%)</td>
<td>81 (39.9%)</td>
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<td>Self-employed</td>
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<td>7 (12.3%)</td>
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<td>24 (11.8%)</td>
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<td>Out of work for 1+ years</td>
<td>6 (13.6%)</td>
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<td>6 (10.5%)</td>
<td>9 (15.8%)</td>
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<td>Out of work &lt;1 year</td>
<td>6 (13.6%)</td>
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<td>11 (19.3%)</td>
<td>5 (8.8%)</td>
<td>26 (12.8%)</td>
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<td>Homemaker</td>
<td>11 (25.0%)</td>
<td>10 (22.2%)</td>
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<td>44 (21.7%)</td>
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<tr>
<td><strong>Income</strong></td>
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<td></td>
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<td>Less than $10,000</td>
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<td>6 (10.5%)</td>
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<td>3 (6.8%)</td>
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<td>3 (5.3%)</td>
<td>14 (6.9%)</td>
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<tr>
<td>$15,000 – less than $20,000</td>
<td>5 (11.4%)</td>
<td>4 (8.9%)</td>
<td>5 (8.8%)</td>
<td>3 (5.3%)</td>
<td>17 (8.4%)</td>
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<td>$20,000 – less than $25,000</td>
<td>5 (11.4%)</td>
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<td>42 (95.5%)</td>
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<td>47 (82.5%)</td>
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<td>10 (22.2%)</td>
<td>10 (17.5%)</td>
<td>5 (8.8%)</td>
<td>27 (13.3%)</td>
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Table 1 (Continued)

**Cessation Resources Used**

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<th>Resource</th>
<th>Sample 1</th>
<th>Sample 2</th>
<th>Sample 3</th>
<th>Sample 4</th>
<th>Sample 5</th>
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<tr>
<td>Self-help guides</td>
<td>21 (47.7%)</td>
<td>16 (35.6%)</td>
<td>15 (26.3%)</td>
<td>6 (10.5%)</td>
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<td>Online Programs</td>
<td>10 (22.7%)</td>
<td>5 (11.1%)</td>
<td>7 (12.3%)</td>
<td>2 (3.5%)</td>
<td>24 (11.8%)</td>
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<td>In-Person Counseling</td>
<td>15 (34.1%)</td>
<td>9 (20.0%)</td>
<td>8 (14.0%)</td>
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<td>37 (18.2%)</td>
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<td>Telephone Counseling</td>
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<td>5 (8.8%)</td>
<td>1 (1.8%)</td>
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<tr>
<td>Nicotine Patches</td>
<td>27 (61.4%)</td>
<td>17 (37.8%)</td>
<td>28 (49.1%)</td>
<td>9 (15.8%)</td>
<td>81 (39.9%)</td>
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<tr>
<td>Nicotine Gum</td>
<td>22 (50.0%)</td>
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<td>28 (49.1%)</td>
<td>9 (15.8%)</td>
<td>72 (35.5%)</td>
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<td>Nicotine Lozenges</td>
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<td>Nicotine Inhaler</td>
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<tr>
<td>Varenicline (Chantix)</td>
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<td>Bupropion</td>
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<td>Acupuncture</td>
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**Age – Mean (SD)**

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<th>Sample 4</th>
<th>Sample 5</th>
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</thead>
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<tr>
<td>51.5 (12.2)</td>
<td>52.3 (15.54)</td>
<td>43.5 (15.0)</td>
<td>50.7 (17.88)</td>
<td>49.2 (15.8)</td>
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*Note.* SD = standard deviation; a = percentages do not add up to 100% because participants could endorse the use of multiple cessation resources, and thus percentages represent how much of the sample endorsed using each resource.
<table>
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<tr>
<th></th>
<th>Individuals with Cancer</th>
<th>Individuals Without Cancer</th>
<th>Current Smokers</th>
<th>Former Smokers</th>
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<tr>
<td></td>
<td><em>M (SE)</em></td>
<td><em>M (SE)</em></td>
<td><em>M (SE)</em></td>
<td><em>M (SE)</em></td>
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<tr>
<td>PHQ-8</td>
<td>8.33 (0.67)</td>
<td>8.18 (0.56)</td>
<td>9.46 (0.58)</td>
<td>7.04 (0.61)</td>
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<td>Beck Anxiety Index</td>
<td>17.01 (1.52)</td>
<td>14.42 (1.13)</td>
<td>18.88 (1.35)</td>
<td>12.22 (1.17)</td>
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<td>Perceived Stress Scale</td>
<td>17.74 (0.95)</td>
<td>14.48 (0.90)</td>
<td>20.25 (0.85)</td>
<td>14.95 (0.92)</td>
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<td>Interpersonal Support</td>
<td>23.52 (0.91)</td>
<td>22.50 (0.86)</td>
<td>21.79 (0.87)</td>
<td>24.07 (0.89)</td>
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<tr>
<td>Drinks per week (DDQ)</td>
<td>5.36 (1.12)</td>
<td>9.74 (1.36)</td>
<td>9.27 (1.46)</td>
<td>6.47 (1.11)</td>
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<tr>
<td>Fagertsrom Test of</td>
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<td>4.07 (0.33)</td>
<td>4.52 (0.28)</td>
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<td>Nicotine Dependencea</td>
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<tr>
<td>Challenges to Stopping</td>
<td>25.76 (0.92)</td>
<td>22.57 (0.99)</td>
<td>23.92 (0.71)</td>
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</tr>
<tr>
<td>Challenges to Stopping</td>
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<td>21.67 (0.98)</td>
<td>22.68 (0.75)</td>
<td>N/A</td>
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<tr>
<td>Smoking (Extrinsic)b</td>
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<td>Questionnaire on Stress</td>
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<td>33.41 (3.03)</td>
<td>20.19 (2.97)</td>
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<tr>
<td>in Cancer Patientsc</td>
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</tbody>
</table>

*Note. SE = standard error; DDQ = Daily Drinking Questionnaire. Standard errors are provided rather than standard deviations given that the means presented here were calculated using the pooled data after multiple imputations were performed; a = Only completed by current, everyday smokers; b = Only completed by current smokers; c = Only completed by individuals with a cancer diagnosis.*
Table 3. Linear Regression Results

<table>
<thead>
<tr>
<th>Current and Former Smokers with Cancer</th>
<th>B</th>
<th>SE</th>
<th>p</th>
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<tr>
<td>Age</td>
<td>-1.17</td>
<td>3.10</td>
<td>.71</td>
</tr>
<tr>
<td>Income</td>
<td>-.001</td>
<td>0.02</td>
<td>.96</td>
</tr>
<tr>
<td>PHQ-8 Total Score</td>
<td>2.66</td>
<td>1.29</td>
<td>.04</td>
</tr>
<tr>
<td>BAI Total Score</td>
<td>7.02</td>
<td>2.83</td>
<td>.01</td>
</tr>
<tr>
<td>Perceived Stress Total Score</td>
<td>4.34</td>
<td>1.77</td>
<td>.01</td>
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<tr>
<td>ISEL-12 Total Score</td>
<td>-3.93</td>
<td>1.81</td>
<td>.03</td>
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<td>Daily Drinking Questionnaire Total Score</td>
<td>3.58</td>
<td>2.52</td>
<td>.16</td>
</tr>
<tr>
<td>Cancer-Related Stress(^a)</td>
<td>12.25</td>
<td>4.71</td>
<td>.009</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Former Smokers with and without Cancer</th>
<th>B</th>
<th>SE</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.95</td>
<td>3.46</td>
<td>0.78</td>
</tr>
<tr>
<td>Income</td>
<td>-0.64</td>
<td>0.48</td>
<td>0.19</td>
</tr>
<tr>
<td>PHQ-8 Total Score</td>
<td>0.28</td>
<td>1.18</td>
<td>0.81</td>
</tr>
<tr>
<td>BAI Total Score</td>
<td>2.24</td>
<td>2.34</td>
<td>0.35</td>
</tr>
<tr>
<td>Perceived Stress Total Score</td>
<td>1.90</td>
<td>1.80</td>
<td>0.29</td>
</tr>
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<td>1.83</td>
<td>0.58</td>
</tr>
<tr>
<td>Daily Drinking Questionnaire Total Score</td>
<td>-3.26</td>
<td>2.32</td>
<td>0.16</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Smokers with and without Cancer</th>
<th>B</th>
<th>SE</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>7.52</td>
<td>2.83</td>
<td>0.008</td>
</tr>
<tr>
<td>Income</td>
<td>0.12</td>
<td>0.44</td>
<td>0.79</td>
</tr>
<tr>
<td>PHQ-8 Total Score</td>
<td>1.88</td>
<td>1.21</td>
<td>0.09</td>
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<td>Perceived Stress Total Score</td>
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<td>1.73</td>
<td>0.37</td>
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<td>ISEL-12 Total Score</td>
<td>-1.24</td>
<td>1.83</td>
<td>0.50</td>
</tr>
<tr>
<td>Daily Drinking Questionnaire Total Score</td>
<td>-1.35</td>
<td>2.94</td>
<td>0.65</td>
</tr>
<tr>
<td>Fagerstrom(^b)</td>
<td>0.78</td>
<td>0.61</td>
<td>0.20</td>
</tr>
<tr>
<td>Challenges to Stop Smoking (Intrinsic)(^c)</td>
<td>3.14</td>
<td>1.51</td>
<td>0.04</td>
</tr>
<tr>
<td>Challenges to Stop Smoking (Extrinsic)(^c)</td>
<td>2.11</td>
<td>1.87</td>
<td>0.008</td>
</tr>
</tbody>
</table>

Note. SE = standard error; \(^a\) = questionnaire only given to participants with a cancer diagnosis; \(^b\) = questionnaire only given to participants who endorsed smoking in the past 30 days; \(^c\) = questionnaire only given to current smokers.
Table 4. **Logistic Regression Results**

<table>
<thead>
<tr>
<th>Current and Former Smokers with Cancer</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>1.15</td>
<td>0.42, 3.18</td>
<td>0.78</td>
</tr>
<tr>
<td>Marital status(^b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>1.13</td>
<td>0.32, 4.08</td>
<td>0.85</td>
</tr>
<tr>
<td>Separated/Divorced/Widowed</td>
<td>1.23</td>
<td>0.40, 3.77</td>
<td>0.72</td>
</tr>
<tr>
<td>Married/cohabitating or member of unmarried couple</td>
<td>Reference category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No health insurance vs. insurance</td>
<td>0.18</td>
<td>0.35, .93</td>
<td>0.04</td>
</tr>
<tr>
<td>Live with smoker vs does not live with smoker</td>
<td>0.19</td>
<td>0.60, 0.58</td>
<td>0.004</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Former Smokers with and without Cancer</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>0.71</td>
<td>0.28, 31.80</td>
<td>0.47</td>
</tr>
<tr>
<td>Marital status(^b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>0.82</td>
<td>0.25, 2.71</td>
<td>0.74</td>
</tr>
<tr>
<td>Separated/Divorced/Widowed</td>
<td>1.34</td>
<td>0.48, 3.78</td>
<td>0.58</td>
</tr>
<tr>
<td>Married/cohabitating or member of unmarried couple</td>
<td>Reference category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No health insurance vs. insurance</td>
<td>12.45</td>
<td>1.89, 81.82</td>
<td>0.01</td>
</tr>
<tr>
<td>Live with smoker vs does not live with smoker</td>
<td>1.46</td>
<td>0.35, 6.12</td>
<td>0.61</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Smokers with and without Cancer</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>1.60</td>
<td>0.49, 5.24</td>
<td>0.44</td>
</tr>
<tr>
<td>Marital status(^b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married</td>
<td>0.23</td>
<td>0.06, 0.91</td>
<td>0.04</td>
</tr>
<tr>
<td>Separated/Divorced/Widowed</td>
<td>0.16</td>
<td>0.04, 0.68</td>
<td>0.01</td>
</tr>
<tr>
<td>Married/cohabitating or member of unmarried couple</td>
<td>Reference category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No health insurance vs. insurance</td>
<td>0.19</td>
<td>0.03, 1.12</td>
<td>0.07</td>
</tr>
<tr>
<td>Live with smoker vs does not live with smoker</td>
<td>1.46</td>
<td>0.59, 3.61</td>
<td>0.42</td>
</tr>
</tbody>
</table>

*Note. OR = odds ratio; CI = confidence interval.*
Appendix A: Recruitment Materials
Are you a current or former cigarette smoker? We are looking for college student who have used cigarettes!

HELP US LEARN MORE ABOUT CURRENT AND PAST SMOKERS’ HEALTH, INCLUDING ABOUT CORONAVIRUS!
CLICK BELOW TO SEE IF YOU’RE ELIGIBLE FOR OUR ONLINE SURVEY AND A CHANCE IN A DRAWING FOR A $50 AMAZON GIFT CARD!

HTTPS://MEMPHIS.CO1.QUALTRICS.COM/JFE/FORM/SV_CJBGVUPJ8G00F4N

THE UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER AND UNIVERSITY OF MEMPHIS

Are you a current or former cigarette smoker? We are looking for cigarette users who have been diagnosed with cancer!

HELP US LEARN MORE ABOUT CURRENT AND PAST SMOKERS’ HEALTH, INCLUDING ABOUT CORONAVIRUS!
CLICK BELOW TO SEE IF YOU’RE ELIGIBLE FOR OUR ONLINE SURVEY AND A CHANCE IN A DRAWING FOR A $50 AMAZON GIFT CARD!

HTTPS://MEMPHIS.CO1.QUALTRICS.COM/JFE/FORM/SV_CJBGVUPJ8G00F4N

THE UNIVERSITY OF TENNESSEE HEALTH SCIENCE CENTER AND UNIVERSITY OF MEMPHIS
Research Match Posting

You are being invited to take part in a research study about health behaviors, including questions about your emotions, alcohol use, tobacco use, stress, relationships, COVID-10, and other important behaviors. You will be entered for a chance to win a $50 Amazon gift card after completing the survey. Our goal is to learn more about why different people smoke or quit smoking, and other perceptions related to aspects important to health. If you complete the survey, you will be one of about 300 people to do so.
Prolific Study Description

You are being invited to take part in a research study about health behaviors, including questions about your emotions, alcohol use, tobacco use, stress, relationships, COVID-19, and other important behaviors. The survey takes about 30 minutes, and you will be given $4.75 in exchange for your time. You will also be entered for a chance to win a $50 Amazon gift card. Our goal is to learn more about why different people smoke or quit smoking, and other perceptions related to aspects important to health. If you complete the survey, you will be one of at least 300 people to do so.
Appendix B: Survey
Screening Survey
S1. What is your age?
   ____ (Discontinue survey if below 18 years)

S2. Have you ever smoked a cigarette in your life?
   □ Yes
   □ No (ineligible)

S3. Have you smoked at least 100 cigarettes in your entire life? (100 cigarettes = 5 packs)
   □ Yes
   □ No

S4. Have you smoked in the last 30 days?
   □ Yes
   □ No

S5. Do you now smoke cigarettes:
   □ Every day
   □ Some days
   □ Not at all

S6. Has a doctor, nurse, or other health professional ever told you that you had cancer?
   □ Yes
   □ No

S7. Did you quit smoking before or after a cancer diagnosis? (asked only if answered “yes” to S6)
   □ Before cancer diagnosis
   □ After cancer diagnosis

*If a participant responds “no” to S2, participant is ineligible. If responses to both S3 and S4 are “no,” participant is ineligible. If responses to either S3 or S4, or both, are “yes” and the participant is above age 18, then they are eligible. If a participant reports “not at all” to S5, “yes” to S6, and “before cancer diagnosis” to S7, then participant is ineligible.

Primary Survey
The following is a survey about things that may affect your health, such as tobacco use, your emotions, alcohol use, relationships, and more. Some of the questions might look like the questions you just answered, but we would appreciate if you answer them again here. Remember, you can stop the survey at any time. Thank you for taking our survey!

Demographics

D1. What is your age?
   ____ (Discontinue survey if below 18 years)

D2. Which one of these groups would you say best represents your race?
D3. Are you of Hispanic/Latino origin?
☐ Yes (Proceed to question D3a)
☐ No (Skip to question D4)

D3a. Are you:
☐ Mexican, Mexican American, Chicano/a
☐ Puerto Rican
☐ Cuban
☐ Central American
☐ South American
☐ Dominican
☐ Other/More than one

D4. Are you:
☐ Married/Cohabitating
☐ Divorced
☐ Widowed
☐ Separated
☐ Never married
☐ A member of an unmarried couple

D5. Which of the following best represents how you think of yourself?
☐ Lesbian or gay
☐ Straight
☐ Bisexual
☐ Other

D6. What was your sex were you assigned at birth? (on your birth certificate)
☐ Male
☐ Female

D7. Are you currently:
☐ Employed for wages (go to question D9)
☐ Self-employed (go to question D9)
☐ Out of work for 1 year or more (go to question D9)
☐ Out of work less than 1 year (go to question D9)
☐ A homemaker, not looking for paid work (go to question D9)
☐ A homemaker (go to question D9)
A student (go to question D8)

D8. What is the outcome of your current educational program?
   - High school graduate (or GED)
   - Technical qualifications (e.g., training certificate)
   - Associate’s degree (community college degree)
   - Bachelor’s degree (e.g., BA, BS, BSc)

D9. Is your annual household income from all sources:
   - Less than $10,000
   - $10,000 to less than $15,000
   - $15,000 to less than $20,000
   - $20,000 to less than $25,000
   - $25,000 to less than $35,000
   - $35,000 to less than $50,000
   - $50,000 to less than $75,000
   - $75,000 or more

D10. Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?
   - Yes
   - No

PHQ-8 (Depression)
Over the last two weeks, how often have you been bothered by any of the following problems?

<table>
<thead>
<tr>
<th>PHQ1. Little interest or pleasure doing things.</th>
<th>Not at all</th>
<th>Several Days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHQ2. Feeling down, depressed, or hopeless.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ3. Trouble falling asleep or staying asleep, or sleeping too much.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ4. Feeling tired or having little energy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ5. Poor appetite or overeating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ7. Trouble concentrating on things, such as reading the</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
newspaper or watching television.

**PHQ8.** Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual.

Beck Anxiety Inventory (BAI)
Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today.

<table>
<thead>
<tr>
<th>BAI1.</th>
<th>Numbness or tingling</th>
<th>Not at all</th>
<th>Mildly – but it didn’t bother me much</th>
<th>Moderately – it wasn’t pleasant at times</th>
<th>Severely – it bothered me a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAI2.</td>
<td>Feeling hot</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI3.</td>
<td>Wobbliness in legs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI4.</td>
<td>Unable to relax</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI5.</td>
<td>Fear of worst happening</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI6.</td>
<td>Dizzy or lightheaded</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI7.</td>
<td>Heart pounding/racing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI8.</td>
<td>Unsteady</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI9.</td>
<td>Terrified or afraid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI10.</td>
<td>Nervous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI11.</td>
<td>Feeling of choking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI12.</td>
<td>Hands trembling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI13.</td>
<td>Shaky/unsteady</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI14.</td>
<td>Fear of losing control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI15.</td>
<td>Difficulty in breathing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI16.</td>
<td>Fear of dying</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI17.</td>
<td>Scared</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI18.</td>
<td>Indigestion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI19.</td>
<td>Faint/lightheaded</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI20.</td>
<td>Face flushed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAI21.</td>
<td>Hot/cold sweats</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Perceived Stress Scale (PSS)
The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by checking a box how often you felt or thought a certain way.

<table>
<thead>
<tr>
<th>Question</th>
<th>Frequency Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS1. In the last month, how often have you been upset because of something that happened unexpectedly?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS2. In the last month, how often have you felt that you were unable to control the important things in your life?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS3. In the last month, how often have you felt nervous and “stressed”?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS4. In the last month, how often have you felt confident about your ability to handle your personal problems?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS5. In the last month, how often have you felt that things were going your way?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS6. In the last month, how often have you found that you could not cope with all the things you had to do?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS7. In the last month, how often have you been able to control irritations in your life?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS8. In the last month, how often have you felt that you were on top of things?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS9. In the last month, how often have you been angered because of the things that were outside of your control?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
<tr>
<td>PSS10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?</td>
<td>Never  Almost Never  Sometimes  Fairly Often  Very Often</td>
</tr>
</tbody>
</table>

Interpersonal Support Evaluation List – 12 Item (ISEL-12)
This scale is made up of a list of statements, each of which may or may not be true about you. For each statement check the box by “definitely true” if you are sure it is true about you and “probably true” if you think it is true but are not absolutely certain. Similarly, you should circle “definitely false” if you are sure the statement is false and “probably false” if you think it is false but are not absolutely certain.
ISEL1. If I wanted to go on a trip for a day (for example, to the country or mountains), I would have a hard time finding someone to go with me.

- Definitely false
- Probably false
- Probably true
- Definitely true

ISEL2. I feel that there is no one I can share my most private worries and fears with.

- Definitely false
- Probably false
- Probably true
- Definitely true

ISEL3. If I were sick, I could easily find someone to help me with my daily chores.

- Definitely false
- Probably false
- Probably true
- Definitely true

ISEL4. There is someone I can turn to for advice about handling problems with my family.

- Definitely false
- Probably false
- Probably true
- Definitely true

ISEL5. If I decide one afternoon that I would like to go to a movie that evening, I could easily find someone to go with me.

- Definitely false
- Probably false
- Probably true
- Definitely true

ISEL6. When I need suggestions on how to deal with a personal problem, I know someone I can turn to.

- Definitely false
- Probably false
- Probably true
- Definitely true

ISEL7. I don't often get invited to do things with others.

- Definitely false
- Probably false
- Probably true
- Definitely true

ISEL8. If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house or apartment (the plants, pets, garden, etc.).
ISEL9. If I wanted to have lunch with someone, I could easily find someone to join me.

ISEL10. If I was stranded 10 miles from home, there is someone I could call who could come and get me.

ISEL11. If a family crisis arose, it would be difficult to find someone who could give me good advice about how to handle it.

ISEL12. If I needed some help in moving to a new house or apartment, I would have a hard time finding someone to help me.

Daily Drinking Questionnaire
These questions are asking about the past month. Fill in each calendar day the number of standard drinks you usually drank on that day during a typical week during that month, and the number of hours over which you consumed this amount (i.e., the time from 1st sip to last sip).

When we say one drink, we mean 12 oz. of beer, 5 oz. of wine, or 1.5 oz of hard liquor (see picture below). Malt liquor is stronger than regular beer, so one 40 oz. Malt Liquor beverage such as Colt 45 counts as 5 standard drinks.
Fill in an amount for each of the 7 days. If you did not typically drink on a given day, fill in a 0 for that day.

DDQ1. Typical number of drinks on a Sunday: 

_______ drinks

DDQ1a. Number of hours: 

_______ hours

DDQ2. Typical number of drinks on a Monday: 

_______ drinks

DDQ2a. Number of hours: 

_______ hours

DDQ3. Typical number of drinks on a Tuesday: 

_______ drinks

DDQ3a. Number of hours: 

_______ hours

DDQ4. Typical number of drinks on a Wednesday: 

_______ drinks

DDQ4a. Number of hours: 

_______ hours
DIFFERENCES BETWEEN SMOKERS AND SUCCESSFUL QUITTERS

DDQ5. Typical number of drinks on a Thursday: 
_______ drinks

DDQ5a. Number of hours: 
_______ hours

DDQ6. Typical number of drinks on a Friday: 
_______ drinks

DDQ6a. Number of hours: 
_______ hours

DDQ7. Typical number of drinks on a Saturday: 
_______ drinks

DDQ7a. Number of hours: 
_______ hours

Tobacco Use

TOB1. Have you ever smoked a cigarette in your life? 
☐ Yes (go to question TOB2) 
☐ No (go to next section)

TOB2. At what age did you first smoke a cigarette? 
_____ years

TOB3. Have you smoked at least 100 cigarettes in your entire life? (100 cigarettes = 5 packs) 
☐ Yes 
☐ No

TOB4. Have you smoked in the last 30 days? 
☐ Yes 
☐ No

TOB5. Do you now smoke cigarettes every day, some days, or not at all? 
☐ Every day 
☐ Some days 
☐ Not at all

TOB6. When you were smoking at your heaviest, how many cigarettes did you smoke per day? (ask only if reported “yes” to TOB3 AND/OR “yes” to TOB4) 
_____ cigarettes per day

TOB7. Are you thinking about quitting the use of cigarettes for good? (asked only if answered “every day” or “some days” for TOB5)
DIFFERENCES BETWEEN SMOKERS AND SUCCESSFUL QUITTERS

☐ Yes
☐ No

TOB8. How soon are you likely to quit using cigarettes? Would you say: (only asked if said “yes” to TOB7)
☐ Within the next 30 days
☐ Within the next 6 months
☐ Within the year
☐ Longer than a year

TOB9. During the past 12 months, have you tried to stop smoking?
☐ Yes
☐ No

TOB10. Do you now smoke cigarettes:
☐ Every day
☐ Some days
☐ Not at all

TOB11. How long has it been since you last smoked a cigarette, even one or two puffs?
☐ Within the past month (less than 1 month ago)
☐ Within the past 3 months (1 month but less than 3 months ago)
☐ Within the past 6 months (3 months but less than 6 months ago)
☐ Within the past year (6 months but less than 1 year ago)
☐ Within the past 5 years (1 year but less than 5 years ago)
☐ Within the past 10 years (5 years but less than 10 years ago)
☐ 10 years or more
☐ Never smoked regularly

TOB12. During any visit to a doctor or health care provider in the past 12 months, were you advised to quit smoking?
☐ Yes
☐ No

TOB13. Do you live with someone who smokes?
☐ Yes
☐ No

Why Do You Smoke Questionnaire (asked only if report “yes” to TOB4; skipped if current non-smoker)

Never Seldom Occasionally Frequently Always

WDS1. I smoke cigarettes in order to keep myself from slowing down.
☐ ☐ ☐ ☐ ☐

WDS2. Handling a cigarette is part of the enjoyment of smoking it.
☐ ☐ ☐ ☐ ☐
| WDS3. | Smoking cigarettes is pleasant and relaxing. |  |  |  |  |  |
| WDS4 | I light up a cigarette when I feel angry about something. |  |  |  |  |  |
| WDS5 | When I have run out of cigarettes I find it almost unbearable until I get them. |  |  |  |  |  |
| WDS6 | I smoke cigarettes automatically without even being aware of it. |  |  |  |  |  |
| WDS7 | I smoke cigarettes to stimulate me, to perk myself up. |  |  |  |  |  |
| WDS8 | Parts of the enjoyment of smoking a cigarette comes from the steps I take to light up. |  |  |  |  |  |
| WDS9 | I find cigarettes pleasurable. |  |  |  |  |  |
| WDS10 | When I feel uncomfortable or upset about something, I light up a cigarette. |  |  |  |  |  |
| WDS11 | I am very much aware of the fact when I am not smoking a cigarette. |  |  |  |  |  |
| WDS12 | I light up a cigarette without realizing I still have one burning in the ashtray. |  |  |  |  |  |
| WDS13 | I smoke cigarettes to give me a lift. |  |  |  |  |  |
| WDS14 | When I smoke a cigarette, part of the enjoyment is watching the smoke as I exhale it. |  |  |  |  |  |
| WDS15 | I want a cigarette most when I am comfortable and relaxed. |  |  |  |  |  |
| WDS16 | When I feel blue or want to take my mind off cares and worries, I smoke cigarettes. |  |  |  |  |  |
| WDS17 | I get a real gnawing hunger for a cigarette when I haven’t smoked for a while. |  |  |  |  |  |
| WDS18 | I’ve found a cigarette in my mouth and didn’t remember putting it there. |  |  |  |  |  |
Fagerstrom Test for Nicotine Dependence (administered only if reported “every day” for question TOB5)

FTND1. How soon after you wake up do you smoke your first cigarette?
   [ ] After 60 minutes
   [ ] 31-60 minutes
   [ ] 6-30 minutes
   [ ] Within 5 minutes

FTND2. Do you find it difficult to refrain smoking in places where it is forbidden, e.g., in a church, at the library, cinema, etc.?
   [ ] Yes
   [ ] No

FTND3. Do you find it difficult to refrain smoking in places where it is forbidden, e.g., in a church, at the library, cinema, etc.?
   [ ] Yes
   [ ] No

FTND4. Which cigarette would you hate most to give up?
   [ ] The first one in the morning
   [ ] All others

FTND5. How many cigarettes per day do you smoke?
   [ ] 10 or less
   [ ] 11-20
   [ ] 21-30
   [ ] 31 or more

FTND6. Do you smoke more frequently during the first hours of waking than during the rest of the day?
   [ ] No
   [ ] Yes

FTND7. Do you smoke if you are so ill that you are in bed most of the day?
   [ ] No
   [ ] Yes

Challenges to Stop Smoking Questionnaire if (asked only if said “yes” to TOB4; skipped if current non-smoker)
The following statements refer to different challenges or problems associated with stopping smoking. Please rate how much of a challenge each one of them was in your most recent attempt to stop smoking. Please indicate your responses on a scale of 1 (not a challenge); 2 (minor challenge); 3 (moderate challenge) or 4 (major challenge) by selecting the appropriate number for each statement.
### Differences Between Smokers and Successful Quitters

**CSS1.** Withdrawal symptoms (e.g., depression, anxiety, restlessness, irritability, sleeplessness, craving, etc.) when I tried to stop smoking

**CSS2.** Feeling lost without cigarettes

**CSS3.** Being addicted to cigarettes

**CSS4.** Having strong emotions or feelings such as anger, or feeling upset when I try to stop smoking

**CSS5.** Something stressful happened when I was trying to stop smoking

**CSS6.** Thinking about never being able to smoke again after I stop smoking

**CSS7.** Getting bored when I was trying to stop smoking

**CSS8.** Seeing things or people which reminded me of smoking

**CSS9.** Easy availability of cigarettes

**CSS10.** Difficulty in finding someone to help me stop smoking

**CSS11.** Lack of support or encouragement from health professionals to stop smoking

**CSS12.** The cost of stop-smoking medicines such as nicotine replacement therapy

**CSS13.** Fear of side effects from stop-smoking medicines

**CSS14.** Lack of encouragement or help from family or friends to stop smoking

**CSS15.** Fear of weight gain if I stopped smoking

**CSS16.** Family members or friends encouraging me to smoke

**CSS17.** Fear of failing to stop smoking

**CSS18.** Belief that medicines to stop smoking do not work

**CSS19.** Fear that stopping smoking may interrupt social relationships

**CSS20.** Belief that I can stop smoking in the future, if I need to

**CSS21.** Use of other substances such as cannabis, alcohol, etc.

### Smoking Cessation Aids

Have you ever tried any of the following to help you quit or cut down your cigarette smoking?
### Differences Between Smokers and Successful Quitters

<table>
<thead>
<tr>
<th>NRT1.</th>
<th>Self-help guides</th>
<th>Yes, I have used</th>
<th>No, I have NOT used</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRT2.</td>
<td>Online programs</td>
<td></td>
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<tr>
<td>NRT3.</td>
<td>In-person counseling</td>
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<tr>
<td>NRT4.</td>
<td>Telephone counseling</td>
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<tr>
<td>NRT5.</td>
<td>Nicotine patch (e.g., Nicoderm)</td>
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<tr>
<td>NRT6.</td>
<td>Nicotine gum (e.g., Nicorette)</td>
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<tr>
<td>NRT7.</td>
<td>Nicotine lozenge</td>
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<td>NRT8.</td>
<td>Nicotine inhaler</td>
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<tr>
<td>NRT9.</td>
<td>Nicotine nasal spray</td>
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<tr>
<td>NRT10.</td>
<td>Varenicline (Chantix)</td>
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<tr>
<td>NRT11.</td>
<td>Bupropion (Wellbutrin, Zyban)</td>
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<tr>
<td>NRT12.</td>
<td>Hypnosis</td>
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<td>NRT13.</td>
<td>Laser therapy</td>
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<tr>
<td>NRT14.</td>
<td>Acupuncture</td>
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</table>

### E-Cigarette Use

**ECG1.** Have you ever used an e-cigarette or vape, even just one time in your entire life?
- ☐ Yes (go to question ECG2)
- ☐ No (go to next section)

**ECG2.** How many times in total do you think you have used a vape during your lifetime?
- ☐ 1-10
- ☐ 11-20
- ☐ 21-50
- ☐ Over 50 times

**ECG3.** Do you now use vapes everyday, some days, rarely, or not at all?
- ☐ Every day
- ☐ Some days
- ☐ Rarely
- ☐ Not at all

**ECG4.** Do you think you will use a vape in the next year? Would you say:
- ☐ Definitely yes
- ☐ Probably yes
- ☐ Probably not
- ☐ Definitely not

**ECG5.** How old were you when you first used a vape – even if only one or two puffs?
- ☐ _____ years

### Cancer Diagnosis

**CAN1.** Has a doctor, nurse, or other health professional ever told you that you had cancer?
- ☐ Yes (go to question CAN2)
DIFFERENCES BETWEEN SMOKERS AND SUCCESSFUL QUITTERS

☐ No (go to COVID-19 section)
☐ Not sure (go to COVID-19 section)

CAN2. How many different types of cancer have you had?
☐ Only one
☐ Two
☐ Three or more

CAN3. At what age were you told that you had cancer?
     ___ years

CAN4. What type of cancer was it?
☐ Breast cancer
☐ Cervical cancer (cancer of the cervix)
☐ Endometrial cancer (cancer of the uterus)
☐ Ovarian cancer (cancer of the ovary)
☐ Head and neck cancer
☐ Pharyngeal (throat) cancer
☐ Thyroid
☐ Larynx
☐ Colon (intestine) cancer
☐ Esophageal (esophagus) cancer
☐ Liver cancer
☐ Pancreatic (pancreas) cancer
☐ Rectal (rectum) cancer
☐ Stomach cancer
☐ Hodgkin’s Lymphoma (Hodgkin’s disease)
☐ Leukemia (blood) cancer
☐ Non-Hodgkin’s Lymphoma
☐ Prostate cancer
☐ Testicular cancer
☐ Melanoma
☐ Other skin cancer
☐ Heart cancer
☐ Lung cancer
☐ Bladder cancer
☐ Renal (kidney) cancer
☐ Bone cancer
☐ Brain cancer
☐ Neuroblastoma
☐ Other

CAN5. Are you currently receiving treatment for cancer?
☐ Yes
☐ No, I’ve completed treatment
☐ No, I’ve refused treatment
□ No, I haven’t started treatment

Questionnaire on Stress in Cancer Patients *(asked only if said “yes” to CAN1)*

Here is a list of situations that you might encounter and that might cause you stress. For each situation, please first decide whether the situation currently applies to you. If so, then please indicate how much of a problem the situation is for you by selecting the answer options on the five point scale “only a slight problem” to “a very big problem.” If not, then select “does not apply to me.”

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</table>

CSTR1. I often feel tired and weak.
CSTR2. I am suffering pain due to surgery.
CSTR3. I feel unconfident in relationships with other people.
CST4. I am suffering pain due to unknown causes (headaches, lower back pain, belly aches)
CST5. I am afraid of a progression of my disease.
CST6. Other people often react inconsiderately/unsympathetically
CST7. Body care has become difficult since I developed cancer.
CST8. I am afraid of developing pain.
CST9. I have the feeling to be of less value for other people.
CST10. I am afraid of having to go to the hospital again.
CST11. I feel physically imperfect.
CST12. I cannot follow my hobbies (e.g., sports) as much as before I developed cancer.
CST13. I often have trouble sleeping.
CST14. I am afraid of not being able to work anymore.
CST15. I do not feel well informed about my illness/treatment.
CST16. I am often tense and nervous.
CST17. I have had sex less frequently since developing cancer.
CST18. I do not feel adequately informed about possibilities for social/financial support.

CST19. It is difficult to talk with my family about my situation.

CST20. Since I developed cancer, I have been going out less (to the movies, out to eat, visiting friends, etc.).

CST21. Different doctors gave me different information about my illness.

CST22. I have too few opportunities to talk about emotional problems with a specialist.

CST23. It is difficult for my spouse/partner to empathize with my situation.

COVID-19 Questions

COV1. I am afraid of being infected by COVID-19.

- Strongly disagree
- Disagree
- Neither agree or disagree
- Agree
- Strongly agree

COV2. During the past week, did you ever avoid eating take-out meals or ordering meals for delivery because of the novel coronavirus outbreak?

- Yes
- No

COV3. During the past week, did you ever avoid taking public transportation because of the novel coronavirus outbreak?

- Yes
- No

COV4. During the past week, did you ever reduce visits to public places because of the novel coronavirus outbreak?

- Yes
- No

COV5. During the past week, how often have you worn a face mask when going out?

- Rare
- Sometimes
- Usually
Always
☐ Did not go out

COV6. During the past week, how often did you wash your hands immediately when returning home?
☐ Rare
☐ Sometimes
☐ Usually
☐ Always
☐ Did not go out

COV7. How likely do you think it is that you will contract COVID-19 over the next month?
☐ Very unlikely
☐ Unlikely
☐ Neither unlikely or likely
☐ Likely
☐ Very likely

COV8. How serious do you think COVID-19 would be if you contracted it?
☐ Very mild
☐ Mild
☐ Moderate
☐ Serious
☐ Very serious

COV9. Have you received and read information (brochures, pamphlets) about COVID-19 from the government?
☐ Yes
☐ No

COV10. Have you received and read information (brochures, pamphlets) about COVID-19 from a medical expert (for example, a doctor or nurse)?
☐ Yes
☐ No

COV11. The information I have received about COVID-19 is sufficient.
☐ Strongly disagree
☐ Disagree
☐ Neither agree or disagree
☐ Agree
☐ Strongly agree

COV12. I believe that I can take measures to protect myself against COVID-19.
☐ Strongly disagree
☐ Disagree
Neither agree or disagree
Agree
Strongly agree

How effective are the following actions for preventing you from becoming infected with COVID-19?

<table>
<thead>
<tr>
<th>Action</th>
<th>Ineffective</th>
<th>Neither ineffective or effective</th>
<th>Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>COV13. Frequent handwashing</td>
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<tr>
<td>COV14. Drinking hot liquids to wash viral germs out of the mouth.</td>
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<tr>
<td>COV15. Washing mouth with salty water.</td>
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<td>COV16. Taking vitamin C.</td>
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<td>COV17. Taking other vitamins or supplements.</td>
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<td>COV18. Disinfecting commonly touched objects in your home.</td>
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<tr>
<td>COV19. Wearing a face mask.</td>
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<tr>
<td>COV20. Avoiding going out.</td>
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<td>COV22. Leaving delivered goods in the sun to kill the virus.</td>
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<td>COV23. Showering immediately after returning home.</td>
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<td>COV24. Not smoking.</td>
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<td>COV25. Social distancing.</td>
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<td>COV26. Get a flu vaccine.</td>
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<td>COV27. Coughing or sneezing onto your elbow.</td>
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<td>COV28. Using hand sanitizer with at least 60% alcohol content.</td>
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<tr>
<td>COV29. Using a percentage, how likely do you think you are to die from COVID-19 if you are infected? (sliding bar answer option on Qualtrics)</td>
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<td>COV30. Are you still required to go to your place of work?</td>
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<td>Yes</td>
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<td>No</td>
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<tr>
<td>COV31. Do you currently have a chronic medical condition?</td>
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<td>Yes</td>
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<td>No</td>
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</table>
Appendix C: Provided Mental Health Resource List
<table>
<thead>
<tr>
<th>Name</th>
<th>Website</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Suicide Prevention Lifeline</td>
<td><a href="http://www.suicidepreventionlifeline.org">www.suicidepreventionlifeline.org</a></td>
<td>1-800-273-TALK (8255)</td>
</tr>
<tr>
<td>Mobile Crisis</td>
<td></td>
<td>901-577-9400</td>
</tr>
<tr>
<td>The Crisis Center</td>
<td><a href="http://www.memphiscrisiscenter.org">www.memphiscrisiscenter.org</a></td>
<td>901-274-7477</td>
</tr>
<tr>
<td>National Hopeline Network</td>
<td></td>
<td>1-800-422-HOPE (4673)</td>
</tr>
<tr>
<td>Case Management, Inc.</td>
<td><a href="http://www.cmiofmemphis.org">www.cmiofmemphis.org</a></td>
<td>901-821-5600</td>
</tr>
<tr>
<td>Alliance Healthcare Services</td>
<td><a href="http://www.alliance-hs.org">www.alliance-hs.org</a></td>
<td>901-369-1400 (main), 901-577-9400 (crisis line)</td>
</tr>
<tr>
<td>University of Memphis Psychological Services Center</td>
<td><a href="https://www.memphis.edu/psychology/centers/psc.php">https://www.memphis.edu/psychology/centers/psc.php</a></td>
<td>901-678-2147</td>
</tr>
<tr>
<td>Delta Med Center</td>
<td><a href="http://www.deltamedcenter.com">www.deltamedcenter.com</a></td>
<td>866-687-0381 (main), 901-369-6021 (Behavioral Health)</td>
</tr>
<tr>
<td>Mental Health Resources, PLLC</td>
<td><a href="http://www.mhrmemphis.com">www.mhrmemphis.com</a></td>
<td>901-682-6136</td>
</tr>
<tr>
<td>MHR Treatment for Depression</td>
<td><a href="http://www.treatmentfordepressionmemphis.com/">www.treatmentfordepressionmemphis.com/</a></td>
<td>901-682-5136</td>
</tr>
<tr>
<td>Memphis Mental Health Institute</td>
<td><a href="https://tn.gov/behavioral-health/hospitals/hospitals/memphis.html">https://tn.gov/behavioral-health/hospitals/hospitals/memphis.html</a></td>
<td>901-682-5136</td>
</tr>
<tr>
<td>Omni Community Health Office</td>
<td><a href="http://www.theomnifamily.com">www.theomnifamily.com</a></td>
<td>877-258-8795</td>
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