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CAUSAL ATTRIBUTIONS AND SMOKING BEHAVIORS IN CERVICAL CANCER SURVIVORS: A MIXED-METHODS PILOT STUDY

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THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in the
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By

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ABSTRACT OF THESIS

CAUSAL ATTRIBUTIONS AND SMOKING BEHAVIORS IN CERVICAL CANCER SURVIVORS: A MIXED-METHODS PILOT STUDY

This cross-sectional, mixed-methods study examined the nature of, and association between, causal attributions and current smoking behavior in cervical cancer survivors who were smokers at cancer diagnosis (n=50). As a whole, participants' beliefs about smoking as a risk factor or cause of cervical cancer in general (i.e., global attribution) and/or their own cervical cancer (i.e., personal attribution) reflected far greater endorsement of global than personal attributions. Data collection involved a quantitative survey and an optional semi-structured interview to assess key variables (i.e., smoking behavior and causal attributions). Data were analyzed via descriptive statistics and inferential tests, all of which illustrated greater endorsement of global smoking-related causal attributions versus personal attributions within the sample. In conclusion, the results of this formative study highlights the potential role of causal attributions in understanding the smoking behavior of cervical cancer survivors, the results of which aids understanding of how cancer survivors think about, and make changes in, their smoking behavior.

KEYWORDS**:** Cervical Cancer, Causal Attributions, Smoking

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

Chapter One: Introduction

Overview of Cervical Cancer

In the United States, approximately 250,000 cervical cancer survivors are alive today, with an estimated 13,240 new cases projected for 2018 (American Cancer Society, 2018). The nationwide incidence rate of cervical cancer is 7.4 new cases per 100,000 women each year, and the mortality rate is 2.3 per 100,000 women (National Cancer Institute, 2018). Nationally, cervical cancer deaths have decreased significantly over the past few decades due to more widespread adoption of Pap smear screening and human papillomavirus (HPV) vaccination (National Institute of Health, 2013). In some regions of the country, and for some populations, however, cervical cancer prevention and control have not evidenced any marked improvements (Freeman & Wingrove, 2005). To some extent, this is borne out in the state of Kentucky where the burden of cervical cancer remains high, as indicated by an incidence and mortality rate of 8.7 and 3.0 per 100,000 women, respectively (National Cancer Institute, 2018), with an even higher incidence and mortality rate in the state's Appalachian regions (10.2 and 3.2, respectively) (Hopenhayn, King, Christian, Huang, & Christian, 2008; Kentucky Cancer Registry, 2017). Despite the relatively small number of women who must cope with cervical cancer, this cancer should remain a key public health target because 1) it is one of the more preventable cancers (National Cervical Cancer Coalition, 2017) and 2) behavioral factors after cancer diagnosis can have a significant bearing on clinical outcomes and quality of life (National Cervical Cancer Coalition, 2017; US Department of Health and Human Services, 2014).

Cervical Cancer and Cigarette Smoking

Cervical cancer risk is chiefly associated with HPV infection, but several other health behaviors and related factors play a role (e.g., obesity, smoking, long-term contraceptive use) (Stein & Colditz, 2004). Of all the behavioral factors associated with cervical cancer *risk*, probably none has as significant an effect on cervical cancer *prognosis* as smoking. Persistent smoking after cancer diagnosis carries considerable health risk, including increased risk for cancer and all-cause mortality, cancer recurrence, second primary cancer, and poorer response to and more complications after cancer treatment (US Department of Health and Human Services, 2014). The potential for negative outcomes among cervical cancer survivors in comparison to some other cancer survivors (e.g., prostate, breast, lung) may be particularly high because smoking can interact with HPV to increase recurrence risk (Burger et al., 1996), and as alluded to above, many cervical cancer survivors have HPV (Coker, DeSimone, Bush, Crofford, & Hopenhayn, 2009; Schiffman, Castle, Jeronimo, Rodriguez, & Wacholder, 2007). Finally, there are data to suggest that persistent smoking after cancer diagnosis is associated with worse quality of life (Blanchard, Courneya, & Stein, 2008; Browning, Wewers, Ferketich, Otterson, & Reynolds, 2009; Frumovitz et al., 2005; Piper, Kenford, Fiore, & Baker, 2012). Despite the clear clinical significance of the behavior, only a handful of studies have explored the prevalence of current smoking (or any other tobacco use) among cervical cancer survivors. This is likely due to the fact that cervical cancer is not viewed as a "smoking-related cancer" in the same way as lung or head/neck cancer, for example (American Cancer Society, 2018). That said, available data suggests the prevalence of current smoking among cervical cancer survivors is quite high, with estimates from US population-based and other large studies in the range of 40 to 50% (Brinton et al., 1986;

Coker, DeSimone, Eggleston, et al., 2009; Coups & Ostroff, 2005; D. K. Mayer & Carlson, 2011). In sum, the burden of cervical cancer can be compounded by the health risk behavior of persistent smoking, which can have a meaningful impact on the lives of cervical cancer survivors.

Causal Attributions: Theories and Applications for Cancer

Cancer has many causes, and it is often the case that the cause of any given cancer is unknown. Nonetheless, the beliefs that cancer survivors hold regarding what caused their cancer, or what causes cancer in general, can have a significant bearing on their health behavior performance and change. Several health behavior theories (namely, the Health Belief Model, Attribution Theory, and Theory of Planned Behavior) generally suggest that individuals who believe there are risks associated with their past or current behavior will try to adopt health-promoting behaviors – if they are sufficiently motivated to do so (Ajzen, 1991; Ajzen & Fishbein, 1980; Heider, 1958; Hochbaum, 1958; McBride, Emmons, & Lipkus, 2003; Weiner, 1985). Causal attribution models, in particular, explain that individuals who experience an unexpected negative event typically attempt to find a causal explanation for it, and then try to change their behavior and/or environment to prevent any future risks to their health or well-being (Hall, French, & Marteau, 2003). These models also suggest that individuals tend to categorize potential causes as either external (i.e., a situation, event, or stimulus outside one's control) or internal (i.e., a trait or characteristic within the individual) (Ferrucci et al., 2011; Weiner, 1985), a difference that is theorized to change the amount of responsibility, need for coping, and risk to self-concept experienced by the person (Callebaut, Molyneux, & Alexander, 2016). As it pertains to a negative health event like a cancer diagnosis, causal attributions may determine how individuals adjust to their illness and what steps they

take to promote their health (Callebaut et al., 2016; Ferrucci et al., 2011).

Causal Attributions: Global versus Personal

When asked to identify causes of, or risk factors for, cancer *in general* (i.e., global attributions), cancer survivors consistently identify genetics, other individual-level factors like smoking and obesity (Liang, Chen, & Giovannucci, 2009; Mullens, McCaul, Erickson, & Sandgren, 2003; Torre et al., 2015), and environmental factors (e.g., pollution, sun exposure, and second-hand smoke) (Ferrucci et al., 2011; Lykins et al., 2008; Mullens et al., 2003; Rodriguez et al., 2015; Wold, Byers, Crane, & Ahnen, 2005). While cancer survivors' global attributions usually have some degree of accuracy, the causal list typically generated is incomplete, as there is oftentimes little endorsement of physical inactivity (Gritz et al., 2006) and poor diet (Lykins et al., 2008) among other known risk factors for cancer. Also noteworthy is that while the majority of cancer risk stems from individual-level (and largely behavioral) factors (Willcox, Stewart, & Sitas, 2011), environmental factors are reported at least as frequently as the former (Wold et al., 2005). Overall, the literature on global attributions suggests there is still room for improvement when it comes to cancer survivors' knowledge of what contributes to cancer.

As mentioned above, cancer survivors can accurately identify some of the definitive causes of cancer *in general*; however, when asked to identify causes of *their own* cancer (i.e., personal attributions), the veracity of their beliefs is arguably less because stress and/or "God's will" are often reported as some of the foremost causes (Costanzo, Lutgendorf, Bradley, Rose, & Anderson, 2005; Richman, Troutman, & Torres, 2016; Sterba, Zapka, LaPelle, Armeson, & Ford, 2015; Willcox et al., 2011; Wold et al., 2005). In samples of gynecologic cancer survivors, in particular, some of the

more well established causes of cancer are routinely linked more closely to cancer in general than to survivors' own cancer (Costanzo et al., 2005; Stewart et al., 2001). For example, when asked about smoking, both current and former smokers agreed that smoking might have contributed to their cancer, but current smokers were more likely to believe that smoking was a greater risk factor *for other people* (Weinstein, Marcus, & Moser, 2005; Wold et al., 2005). It is possible that apparent disconnects like this are a form of self-protection, insofar as the admission of one's role in causing one's cancer could carry with it some negative effects (e.g., shame, guilt, despair). Nonetheless, the discordance between global and personal causal attributions creates a situation wherein cancer survivors may underestimate the clinical significance of their own health behavior change.

Causal Attributions: Cervical Cancer and Smoking

Many cervical cancer survivors lack knowledge about the causes of cervical cancer (Akinlotan et al., 2017; Low, Simon, Lyons, Romney-Alexander, & Waller, 2012). Remarkably, cervical cancer survivors tend not to endorse smoking as a cause of cervical cancer, whether of their own cancer, or cancer in general. For example, one study found that gynecologic cancer survivors believe stress is a more powerful risk factor for cancer than smoking and several other known causal factors (Costanzo et al., 2005). While only a handful of studies have looked at cervical cancer specifically, the consensus is that this population has high unmet need when it comes to health information (Brinton et al., 1986; Coker, DeSimone, Eggleston, et al., 2009; Collins, Rollason, Young, & Woodman, 2010; Costanzo et al., 2005; Marteau, Rana, & Kubba, 2002; Plummer et al., 2003; Roura et al., 2014; Schlumbrecht, Sun, Huang, Zandstra, & Bodurka, 2014a). Unfortunately, healthcare providers often fail to educate their patients

about the robust benefits of health behavior change (Lindau et al., 2002; Mayer et al., 2007; Underwood et al., 2012), including smoking cessation after cancer diagnosis (Warren, Sobus, & Gritz, 2014; Weaver et al., 2012). This missed opportunity undercuts efforts at secondary cancer prevention and general health promotion (Grimmett, Wardle, & Steptoe, 2009; Parsons, Daley, Begh, & Aveyard, 2010; Wold et al., 2005). Specifically, for cancer survivors who smoke, and particularly so for cervical cancer survivors, it is possible that fostering beliefs in smoking as a causal attribution could lead to efforts at smoking cessation, which if successful, could ultimately lead to measurable reductions in health risk and improvements in well-being.

Study Aims and Hypotheses

In a sample of cervical cancer survivors who were smokers at the time of their diagnosis, this mixed-methods pilot study first aims to describe, and then measure the relationship between, a) smoking-related causal attributions about cervical cancer and b) current smoking behavior. Regarding causal attributions, both global and personal causal attributions will be measured, as a first step to determining if participants believe the cause of their cervical cancer is similar to or different from the cause of other women's cervical cancer. Regarding smoking behavior, several outcomes will be considered including overall prevalence of current smoking, frequency and amount of smoking, and motivation to quit/abstain from smoking. All analyses for the first aim (i.e., to describe causal attributions and smoking behavior) will be descriptive in nature, with use of both qualitative and quantitative data. In contrast, analyses for the second aim (i.e., to measure the relationship between causal attributions and smoking behavior) will include inferential tests of pertinent quantitative data plus content analysis of qualitative data. In

sum, the mixed-method study design lends itself to use to complementary and simultaneous use of qualitative and quantitative data analysis.

Chapter Two: Methods

Participants and Procedure

Population and Eligibility. Participants were 50 cervical cancer survivors currently living in the state of Kentucky who were diagnosed with a first primary cervical cancer in the past five years. Additional eligibility criteria were: 1) Kentucky residence at diagnosis, 2) age over 21 at the time of enrollment, 3) English literacy and fluency, 4) diagnosis between the age of 21 and 55, 5) lifetime smoking history (i.e., having smoked more than 100 cigarettes), 6) smoking at diagnosis according to a 3-month point prevalence definition, 7) reliable phone access, 8) not being pregnant or planning to become pregnant in the 6 months following enrollment, 9) having no cognitive or psychological impairments or diagnoses, and 10) no prior cancer diagnoses (excluding melanoma).

Recruitment and Enrollment. Participants were recruited through a combination of population sampling (Kentucky Cancer Registry, KCR) and purposive sampling (Kentucky Cancer Link, KCL). KCR is a statewide, population-based cancer registry that is part of the Surveillance Epidemiology and End Results (SEER) system and the CDC's National Program of Cancer Registries. KCL is a statewide organization that provides access to cancer-related screening, services, and support (e.g. mastectomy garments, wigs, patient navigation, transportation, smoking cessation classes) to low-resource residents in Kentucky, that is, uninsured or underinsured adults who fall below the Federal Poverty Line (Kentucky Cancer Link, 2017). The use of both KCR and KCL was intended to produce a sample of cervical cancer survivors who were representative of the population at the state level and who would benefit most from future resource

dissemination related to smoking cessation (Adler et al., 1994; Coups & Ostroff, 2005; Ward et al., 2010).

Potentially eligible cervical cancer survivors (i.e., those who had a documented lifetime history of tobacco use and Kentucky residence at diagnosis) were given the opportunity to opt-in to study participation through invitations sent directly by KCR/KCL. At this stage of recruitment, cancer survivors were informed that they might be eligible to participate in a research study, but only a very brief description of the study was provided. For KCR, the first step involved physician notification and attainment of his or her approval to contact the cancer survivors. If warranted, the second step involved cancer survivor notification, where cancer survivors were asked to indicate whether or not they approve of their contact information being released to study staff. At this step, cancer survivors were contacted by mail and/or phone in order to gain their approval. For KCL, the same approach was used, but cancer survivors were contacted directly without physician involvement. In the case of both KCR and KCL, a research assistant only attempted to contact cancer survivors who "opted in" to study consideration.

Once research assistants received the names and contact info for all cancer survivors who "opted in," they attempted to contact them via phone to screen them for eligibility. Ineligible cancer survivors were thanked for their time and not contacted further. Eligible cancer survivors were informed about the study in greater depth and asked if they would like to participate. If eligible and interested, an attempt was made to enroll cancer survivors into the study via attainment of written informed consent. Once enrolled into the study, the procedures for data collection commenced. In cases where cancer survivors were not reached via phone, research assistants tried to reach them via mail and engage them in study participation via that route.

Data Collection. Data collection consisted of two parts. First, a standardized questionnaire was completed either via a phone interview with a research assistant or a mailed paper-and-pencil form. For both methods of data collection, de-identified data were entered and stored securely in a REDCap database to preserve participant privacy and confidentiality. Second, participants were invited to complete a brief semi-structured interview via phone, an opportunity for them to explain their experiences of smoking (or quitting) after cervical cancer in their own words. A standardized interview guide was used, with the nature and number of follow-up or "targeted" questions tailored to each participant's response to the core set of open-ended questions (Hsieh & Shannon, 2005). Interview data were recorded and transcribed verbatim, with all relevant files de-identified to preserve participant privacy and confidentiality. The questionnaire took approximately 35 minutes to complete, and the interview generally lasted 25 minutes.

Compensation. Participants were compensated $45 for questionnaire and $30 interview completion. Payments were made via check mailed to participants' home address.

Ethical Approval. All procedures were reviewed and approved in advance of implementation by the University of Kentucky Institutional Review Board and Markey Cancer Center Protocol Review and Monitoring Committee.

Measures

Demographics. Standard items were used to assess participants' demographic background (e.g., age, race, relationship status, education level). Items were primarily taken from a recent Behavioral Risk Factors Surveillance System survey (Centers for Disease Control and Prevention, 2015), a yearly population-based health survey of non-institutionalized adults in the United States.

Clinical History. KCR provided the following pieces of information about each participant: time since cancer diagnosis, age at diagnosis, site and stage of cancer diagnosis, type of treatment, recurrence status, and insurance status.

Causal Attributions. Causal attributions about cervical cancer were measured from both a global and personal perspective, all with a focus on smoking as an etiological factor. First, two items on the questionnaire tap causal attributions. One item from the Cervical Cancer Objective Test (Ralston et al., 2003) was used to assess global attributions of cervical cancer: "The risk of developing cervical cancer is higher if *someone* is a smoker". Participants were asked to indicate whether this statement is false (0) or true (1). Similarly, one item from the Perceived Cancer Related Stigma Scale (LoConte, Else-Quest, Eickhoff, Hyde, & Schiller, 2008) was modified to measure personal attributions of cervical cancer: "*My* smoking or other tobacco use contributed to *my* cancer". Participants responded to this item on a Likert scale from 1=*strongly disagree* to 5=*strongly agree*, which was later dichotomized to reflect disagreement (0) or agreement (1). Second, causal attributions were measured through interview questions about the extent to which participants believe smoking impacts cervical cancer (e.g., "What role, if any, do you believe that smoking has in cervical cancer?").

Smoking Behavior. Smoking behavior was measured via a combination of questions that are regularly used in research with the general population of smokers (Bolt et al., 2009; Centers for Disease Control and Prevention, 2015; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) and specifically among cancer survivors (Land et al., 2016). In the questionnaire, smoking behavior was assessed in a comprehensive fashion. First, 30-day and 7-day point prevalence of current smoking were determined at the sample level. Second, and only among current smokers, the frequency (i.e., how often)

and amount (e.g., average number of cigarettes per day in the past week as reported via time-line follow-back) of smoking and level of nicotine dependence (as measured by the Heaviness of Smoking Index (Heatherton et al., 1991) were explored, among other things. Additionally, in the full sample, several components of quit behavior were examined, including: 1) motivation and confidence to quit or maintain abstinence over the next 30 days, as measured on a scale from 0=*very definitely no* to 10=*very definitely yes*; 2) prevalence and number of 24-hour quit attempts since cancer diagnosis; and 3) use of smoking cessation treatment since cancer diagnosis. In the interview, smoking and quit behavior were measured (e.g., "How much and how often did you smoke before and after your diagnosis?" and "What approaches did you use to quit or cut back?").

Data Analysis

Data analysis employed use of quantitative and qualitative methods for the questionnaire and interview data, respectively. First, for the questionnaire data, descriptive statistics (e.g., prevalence, frequency, mean, standard deviation) were used to determine the extent of endorsement of smoking as a cause of cervical cancer on global and personal levels. These same statistics were used to describe thoroughly the sample's smoking (i.e., prevalence, frequency, amount, and motivation to quit/abstain) and quit (i.e., prevalence, number, and method of quit attempts post-cervical cancer diagnosis) behavior. Additionally, chi-square (χ^2) and bivariate correlation (Spearman's rho) analyses of questionnaire data were performed as an initial test of the association between causal attributions and smoking behavior. Second, interview responses that address the issue of causal attributions, smoking and other tobacco use status, and the link between these variables were explored. These analyses involved directed content analysis (Hsieh & Shannon, 2005), where prior research and theories pertinent to causal attributions helped

guide analysis. This analysis involved many steps: 1) reading, re-reading, and then discussing with several co-investigators a random selection of interviews (n=7); 2) identifying key concepts or variables as initial codes; 3) organizing the initial codes into a draft codebook (see Table 1) and creating operational definitions for each code; 4) double-coding (i.e., independent coding by two individuals, with discrepancies among codes discussed and rectified to achieve a "final" set of agreed upon codes for each interview) the aforementioned interviews via line-by-line coding (Charmaz, 2006); 5) finalizing the codebook, which involved hierarchical organization with "lumping" or "splitting" some of the initial codes and adding new codes; 6) revising the previously coded interviews (n=7) to reflect the final codebook; 7) double-coding all remaining interviews (n=14) consistent with the final codebook; and 8) entering and analyzing all coded interviews (n=21) in ATLAS.ti version 8 (Berlin, Germany).

Table *1*

Codebook for qualitative data analysis: Smoking-related causal attributions of cancer

Variable/Code	Operational Definition	Illustrative Quotes
Smoking Causes Cancer in General – Global Casual Attributions		
Smoking directly caused, or is a significant risk factor for…	Yes, it does	"I know that, you know, smoking does cause cancer." (148)
…Cervical cancer …Head, neck, or lung cancer	Maybe, it's possible	"I really didn't correlate the whole smokin' and cancer…but it's hit home a little bit more." (100)
…Any type of cancer	No, it doesn't	"I don't think smoking's got anything to do with any type of cancer, in my personal opinion." (106)
	I don't know	"I really can't say yes on that one, 'cause I really don't know if it would be or not." (120)
Smoking Caused My Cervical Cancer – Personal Casual Attributions		
Smoking directly caused, or is a significant risk factor for participant's own cervical cancer	Yes, it did	"I've only heard that it's not good to smoke…that that's one of the causes…so I knew that was another, you know, thing that wasn't very good for it." (143)
	Maybe, it's possible	"I'm still not sure that it had anything to do with the cervical cancer, but I don't know. That's a possibility." (137)
	No, it didn't	"I don't believe it had any role as far as the cervical cancer." (142)
	I don't know	"Maybe it's because I did smoke, I don't smoke." (127)
Smoking Status - Current		
Former smoker who quit at one point after cancer diagnosis and never smoked again	Former, with continuous abstinence	"Last year I went through cervical cancer. I stopped smokin' and stopped drinkin'." (149)
Former smoker who quit at one point after cancer diagnosis, but smoked a handful of times	Former, with lapses	"I couldn't even tell you how long it's been since I had a cigarette, it's been so long." (100)
Current smoker who made 4 or more QA[1] after cervical cancer diagnosis	Smoker, with many QA	"I'd like to try to quit smoking. I've tried so many times, it's just nothing works!" (120)
Current smoker who made 1-3 QA after cervical cancer diagnosis	Smoker, with a few QA	"I went back to smokin', but it was like a while after the treatment." (152)
Current smoker who made 0 QA after cervical cancer diagnosis	Smoker, with no QA	"I think I smoke probably more now that I did before and that's crazy! Because you think I would wanna quit." (127)

Note: QA= Quit attempt[1]. Options are mutually exclusive.

Chapter Three: Results

Sample Accrual

The details of accrual can be found in Figure 1. As shown, KCR and KCL identified 268 and 48 potentially eligible survivors, respectively. Of those identified by KCR, 34.3% (n=92) consented to study contact, 60.6% (n=63) of whom were successfully reached and screened. Of those screened, 71.4% (n=45) met eligibility criteria, with the most common reason for ineligibility being denial of tobacco use at diagnosis. Finally, the enrollment rate of those eligible was 91.1% (n=41). Of those identified by KCL, 50.0% (n=24) consented to study contact, 70.8% (n=17) of which were successfully reached and screened. Of those screened, 76.5% (n=13) met eligibility criteria, with the only reason for ineligibility being a denial of tobacco use at diagnosis. Finally, the enrollment rate of those eligible was 92.3% (n=12). In total, 53 individuals enrolled in the study, but 5.7% (n=3) were lost to follow-up, which means they provided written informed consent but did not furnish any study data. Therefore, our final sample consists of 50 cervical cancer survivors.

Sample Characteristics

Demographic Variables. A clear majority (94.0%, n=47) of this entirely female sample was White, non-Hispanic. On average, participants were 45.5 (SD=8.1) years old. Roughly half of participants were in a relationship (46.0%, n=23), but many self-identified as divorced (20.0%, n=10) or separated (10.0%, n=5). Many participants reported having less than a high school education (38.0%, n=19), with very few having completed a college degree (8.0%, n=4). Nearly two-thirds of participants were

unemployed (64.0%, n=32), and related to that, roughly half of their annual household income fell under $20,000 per year (54.0%, n=27). Finally, a majority of participants indicated rural or Appalachian residence at the time of study participation (60.0%, n=30). More details about participants' demographic characteristics can be found in Table 2.

Clinical Variables. The average age at diagnosis was 42.8 (SD=8.0) years old, with the average time since diagnosis being 2.7 years (SD=1.3). Stage of cancer at diagnosis spanned from Stage I (56.0%, n=28) to Stage IV (2.0%, n=1). Many participants received multimodal treatment (60.0%, n=30), with the most common treatment regimen among these patients consisting of surgery, radiation, and chemotherapy (30.0%, n=15). At the time of recruitment, 68.0% (n=34) of the sample was disease-free. Very few (6.0%, n=3) participants reported an absence of insurance coverage; the most common coverage was Medicaid (48.0%, n=24). More details about the clinical composition of the sample are available in Table 3.

Aim 1: Causal Attributions

This study involves a description of smoking-related causal attributions among cervical cancer survivors who smoked at diagnosis. Data on participants' causal attributions are pulled from both the questionnaire and interview, and the next two sections reflect analysis of each of these aspects of this mixed-methods pilot study.

Questionnaire Results. Sixty-four percent (n=32) of participants agreed with a statement about the risk of developing cervical cancer being higher if someone is a smoker. This would suggest many of the cervical cancer survivors in this study conceptualize smoking as a risk factor for, or cause of, cervical cancer *in general*. However, when asked about the extent to which they believed *their* smoking (or other tobacco use) contributed to

their cervical cancer, only 28.0% (n=14) "agreed" or "strongly agreed." Given the different levels of endorsement between global and personal attributions as they pertain to smoking and cervical cancer, crosstab analyses were run to explore further these outcomes. Thirty-four percent (n=17) of the sample endorsed neither global nor personal attributions, 26.0% (n=13) endorsed both global and personal attributions, and the remainder endorsed global attributions alone (38.0%, n=19) or personal attributions alone (2.0%, n=1).

Interview Findings. Participants who completed the interview (n=21) responded to this open-ended question: "What role, if any, do you believe that smoking has in cervical cancer?". The most common response to this question reflected participants being completely unaware or unsure of the causal link between smoking and cervical cancer in general (i.e., *global* attributions):

> "You know, I really don't know. I mean, I thought the reason why I got the cervical cancer because I had the HPV virus. They said that some, most women get it, but it normally will just go away, 'cause the body fights it and I guess mine didn't. And maybe that's because I did smoke, I don't know." (127)

> "I don't know if, I don't know if it even plays a role in it. I'm not sure." (137)

> "Well, nobody had ever really told me anything about it at all, about they go hand-in-hand or nothin'." (144)

In comparison to the more common endorsement of uncertainty, a clear minority of participants firmly believed smoking to be associated with cervical cancer risk in general, while some participants remarked that smoking has no association with cervical cancer: For example, one participant said, "It plays a big part. I didn't start smoking until I was thirty. And when I found out that I had cervical cancer, the doctor told me to stop

smokin'." (149), while others made comments like "I don't believe it plays any [role] in cervical cancer" (142) and "there's so many people that get cancer who never smoked or anything, so I don't really think it's linked to smoking." (126). Participants' understanding of the association between smoking and cervical cancer was in stark contrast to their comments about the connection between smoking and "traditional" smoking-related cancers like lung and oral cavity cancer, or the risks of smoking for health in general.

> "I mean, it does [have to do] with lung cancer and throat cancer, but cervical cancer? No." (137)
>
> "I don't believe it plays any [role] in cervical cancer…now lung cancer, something like that…is a different story" (142)
>
> "Cigarettes are known to cause cancer anyways…so if it is, it's probably not cervical cancer. It's probably lung cancer or somethin' like that, I don't know." (156)
>
> "With all the, you know, negative effects that smoking can have on people. I mean, not just cancer, but you know, heart disease, emphysema, I mean…you'd be crazy to pick up a cigarette and smoke." (148)

In terms of participants' causal attributions about their own cervical cancer (i.e., *personal* attributions), few spoke in a manner that suggested their smoking might have a role in their cancer diagnosis. As examples of personal attributions, one participant said, "I got cervical cancer, and I smoked, and I'm still smoking. It was a huge part." (121). Similarly, "I felt guilty every time I lit a cigarette up after I knew I had cancer, because I knew that it contributed to the cancer" (108). The more common responses to questions of personal attributions reflected either uncertainty or disbelief that smoking caused or increased risk related to their personal cancer experience. One participant said, "I don't even know how it really came about, you know? …That's the one thing I never really

found out" (152), with another saying, "I don't think that I would have to worry about catchin' cervical cancer again…smoking causes a lot of different stuff but didn't have nothin' to do with any of that" (131). In sum, participants' global and personal attributions as measured via interview reflect great diversity of opinion.

Aim 1: Smoking and Other Tobacco Use Behavior

This study also involves a description of the tobacco use behavior of cervical cancer survivors who smoked at diagnosis. Data on participants' smoking and non-cigarette tobacco use reflect questionnaire and interview responses alike while all other smoking-related outcomes (e.g., motivation to quit/abstain) are confined to questionnaire data.

Questionnaire Results for Smoking Behavior. Consistent with inclusion criteria, all participants endorsed a lifetime history of cigarette smoking, which was defined as ever having smoked at least 5 packs or 100 cigarettes in total. In addition, and also a consequence of the inclusion criteria, all participants reported smoking within the month prior to their cervical cancer diagnosis. In terms of current smoking behavior as measured via questionnaire, the 30-day point prevalence rate of smoking was 79.5% (n=39/49 respondents), which is very similar to, but not exactly the same as the 7-day point prevalence rate of smoking (77.1%, n=37/48 respondents). When asked the precise number of days they smoked in the past 30 days, participants' responses ranged from 0 (22.0%, n=11) to 30 (62.0%, n=31), with daily smoking being the modal response. In sum, at the time of study participation, the clear majority of the sample could be described as regular smokers. Current smokers reported smoking an average of 16.5 (SD=8.7) cigarettes per day, and nearly three-quarters reported smoking their first cigarette of the day within 30 minutes of waking (71.0%, n=27). Based on the Heaviness

of Smoking Inventory (Heatherton et al., 1991), the average level of nicotine dependence among current smokers was 2.7 (SD=1.5), which falls into the moderate range.

Questionnaire Results for Non-Cigarette Tobacco Use. Roughly half of those who reported a 30-day point prevalence of cigarette smoking (i.e., "current" smokers) also reported a 30-day point prevalence of non-cigarette tobacco use (43.6%, n=17). The nature of smokers' dual tobacco use (or in some cases multi-tobacco product use) was as follows: 15.4% (n=6) electronic cigarettes; 12.8% (n=5) cigars or pipes; 2.6% (n=1) chewing tobacco or moist snuff; 2.6% (n=1) Swedish-style snus; options not mutually exclusive. It should also be noted that while none of the former smokers reported a 30-day point prevalence of non-cigarette tobacco use, a minority did endorse a lifetime history of non-cigarette tobacco use (18.2 %, n=2).

Interview Findings on Smoking and Non-Cigarette Tobacco Use. For the 21 participants who completed the interview, 71.4% (n=15) described themselves in ways consistent with being a current smoker or other tobacco user. For example, one participant stated, "Even everything I went through, I still smoke" (114). Similarly, another participant remarked, "I don't enjoy it per se, but it's relaxing to me…and to a degree it's more stressful, 'cause you know, I know the risk that I'm taking. I know what I'm doing to my body" (153), and still another said, "I still smoke every now and again. It's a stress reliever for me" (148). A small number of participants reported use of another tobacco product in combination with, or instead of, conventional cigarettes. For example, "I started using…the electronic, and I do use that, like, twice a month" (100). The remaining participants (28.6%, n=6) described themselves as former smokers: "It was such a freedom to and relief to be finally free from that" (108); "The big part of why I *did*

recover is because I stopped smoking" (149); and "I'm an ex-smoker" (113). As a whole, the prevalence of continued tobacco use among cervical cancer survivors who were smokers at diagnosis was comparable across the questionnaire and interview data.

Motivation and Confidence to Quit or Abstain from Smoking. Across the total sample, intention and confidence to quit/abstain in the next month were both low (M, SD=4.3, 3.9 and 4.3, 4.0, respectively, both on a 0-10 scale). These variables were positively correlated with each other at the sample level: r=0.52, p<0.001. There was a significant difference (t (47) =3.10, p=.003) between the level of intention to quit among current smokers (M, SD=3.5, 3.2) and the level of intention to maintain abstinence among former smokers (M, SD=7.3, 4.7), such that a more favorable response was found among former smokers. Similarly, the level of confidence to quit among current smokers (M, SD=2.7, 3.1) and the level of confidence to maintain abstinence among former smokers (M, SD=9.8, 0.6) differed significantly from each one another and suggested that former smokers were more confident: t (47) =7.6, p=.000.

Quitting Preferences and Behavior. Across the sample, the majority of participants indicated a desire to quit smoking without the help of professionals (64.0%, n=32) or medications like NRT, Zyban, or Bupropion (58.0%, n=29); options mutually exclusive. Most current smokers (61.5%, n=24) preferred to quit without professional help but were nearly evenly divided on whether they wanted to quit without the aid of medication (51.3%, n=20); options mutually exclusive. In comparison, former smokers overwhelmingly preferred to quit without either professional help (72.7%, n=8) or medication (81.8%, n=9), perhaps a testament to the approach that yielded their current state of abstinence from smoking.

A lifetime history of serious quit attempts (defined as any 24-hour quit attempts) was high for the total sample (90.0%, n=45). Post-cancer diagnosis, 60.0% (n=30) of the sample reported having made at least one 24-hour quit attempt, which reflects 61.5% (n=24) of current smokers and all former smokers (n=11). The average number of 24-hour quit attempts post-cancer diagnosis was 2.7 (SD=3.8; range: 0-20) at the sample level, 2.8 (SD=4.2; range: 0-10) for current smokers, and 1.8 (SD=1.2; range: 1-4) for former smokers. Former smokers reported having been abstinent from smoking, on average, for over a year (M=469.7±388.5 days), although half quit in the year (36.4%, n=4) or month (9.1%, n=1) before questionnaire completion. Some current smokers reported making 24-hour quit attempts in the past year (51.3%, n=20), and among those who tried to quit, the average number of attempts was 1.96 (SD=1.9; range: 1-8). Details about participants' treatment use can be found in Table 4 and is summarized here. Within the total sample, 60.0% (n=30) indicated *ever* having used an evidence-based treatment for smoking cessation (e.g., nicotine replacement therapy, quit line). This utilization rate corresponds to 64.1% (n=25) of current smokers and 45.5% (n=5) of former smokers. As indicated above, half of the former smokers quit more than a year prior to study participation; thus, more details about treatment utilization will be reserved for current smokers. Eighty percent (n=16) of current smokers who tried to quit in the last year reported doing so with the help of an evidence-based cessation treatment. In the context of these current smokers' quit attempts (n=16), these treatments were utilized: 50.0% physician consultation (n=10); 95.0% nicotine replacement therapy (n=19); 25.0% Chantix (n=4); and 12.5% Bupropion (n=2); options not mutually exclusive.

Aim 2. Association between Causal Attributions and Smoking Behavior

For the questionnaire data, a chi-square analysis of independence was used to explore the association between causal attributions and smoking status. This analysis indicated 68.4% (n=26) of current smokers compared 50% (n=6) of former smokers agreed that smoking increases the risk of cancer in general. This difference in global attributions did not yield a statistically significant result: $\chi^2(1)= 1.34$, $p=0.25$. A parallel analysis of personal attributions indicated that 26.3% (n=10) of current smokers as opposed to 33.3% (n=4) of former smokers agreed that their smoking contributed to their cancer. Again, the group difference was not statistically significant: $\chi^2(1)= 0.22$, $p=0.64$. Additionally, a Spearman's rank-order analysis (rho) was run to assess the relationship between participants' causal attributions and intention to quit/abstain from smoking. The results of this analysis demonstrated a small, positive association for global attributions (rho=0.27, $p=0.06$) and a weaker, but still positive association for personal attributions (rho=0.12, $p=0.42$), neither of which was statistically significant.

From the interview data, a clearer pattern was evident, such that current smokers admitted the harms of smoking, but generally minimized its contribution to their cancer diagnosis while former smokers were more inclined to admit the harms in general and the personal impact on their health and wellbeing. To summarize, almost without exception, all participants endorsed some degree of belief that smoking has a long-lasting, negative impact on overall health and health-related quality of life, which was in contrast to comparably low participant endorsement of the role that smoking has in cervical cancer specifically. As illustrated above in both the questionnaire and interview data, many

participants endorsed global causal attributions for cervical cancer or cancer at other sites while few reported personal causal attributions.

Table 2

Demographic characteristics of cervical cancer survivors (N=50)

Variable	% (n)
Age in years [1]	45.53 ± 8.08
Race	
Caucasian, non-Hispanic	94.0 (47)
African American	6.0 (3)
Relationship status	
Single: never married	14.0 (7)
Single: divorced, separated, or widowed	38.0 (19)
Married or partnered	46.0 (23)
Missing	2.0 (1)
Educational attainment	
Less than high school graduation	38.0 (19)
High school graduate or equivalent	18.0 (9)
Some college or technical school	36.0 (18)
College or technical school graduate	8.0 (4)
Employment	
Employed	36.0 (18)
Unemployed	64.0 (32)
Disabled	34.0 (17)
Unemployed ≥ 1 year	16.0 (8)
Unemployed < 1 year	4.0 (2)
Homemaker	8.0 (4)
Retired	2.0 (1)
Geographic residence	
Urban or suburban	36.0 (18)
Rural	60.0 (30)
Missing	4.0 (2)
Appalachian residence	
Yes	35.8 (19)
No	64.2 (34)
Annual household income	
Less than $10,000	24.0 (12)
$10,000 to $19,999	30.0 (15)
$20,000 to $34,999	14.0 (7)
$35,000 to $49,999	10.0 (5)
$50,000 to $74,999	6.0 (3)
$75,000 or more	10.0 (5)
Missing	6.0 (3)

Note. Data are % (n) unless otherwise noted. [1] Data are means ± standard deviations.

Table 3

Clinical characteristics of cervical cancer survivors (N=50)

Variable	Percent
Years since diagnosis [1]	2.70 ± 1.28
Months since treatment [1]	31.41 ± 15.64
Age at diagnosis	42.78± 7.96
Cancer site	
Cervical	98.0 (49)
Other	2.0 (1)
Cancer stage	
I	56.0 (28)
II	20.0 (10)
III	22.0 (11)
IV or metastatic	2.0 (1)
Treatment type	
Surgery only	32.0 (16)
Radiation only	2.0 (1)
Radiation and chemotherapy	28.0 (14)
Surgery and radiation	2.0 (1)
Surgery, radiation, and chemotherapy	30.0 (15)
Other	6.0 (3)
Recurrence status	
No	68.0 (34)
Yes	6.0 (3)
Never disease-free	24.0 (12)
Missing	2.0 (1)
Insurance status	
Not insured	6.0 (3)
Insured Private	34.0 (17)
Tricare	2.0 (1)
Medicaid	48.0 (24)
Medicare	2.0 (1)
Insured other	8.0 (4)

Note. Data are % (n) unless otherwise noted. [1] Data are means ± standard deviations.

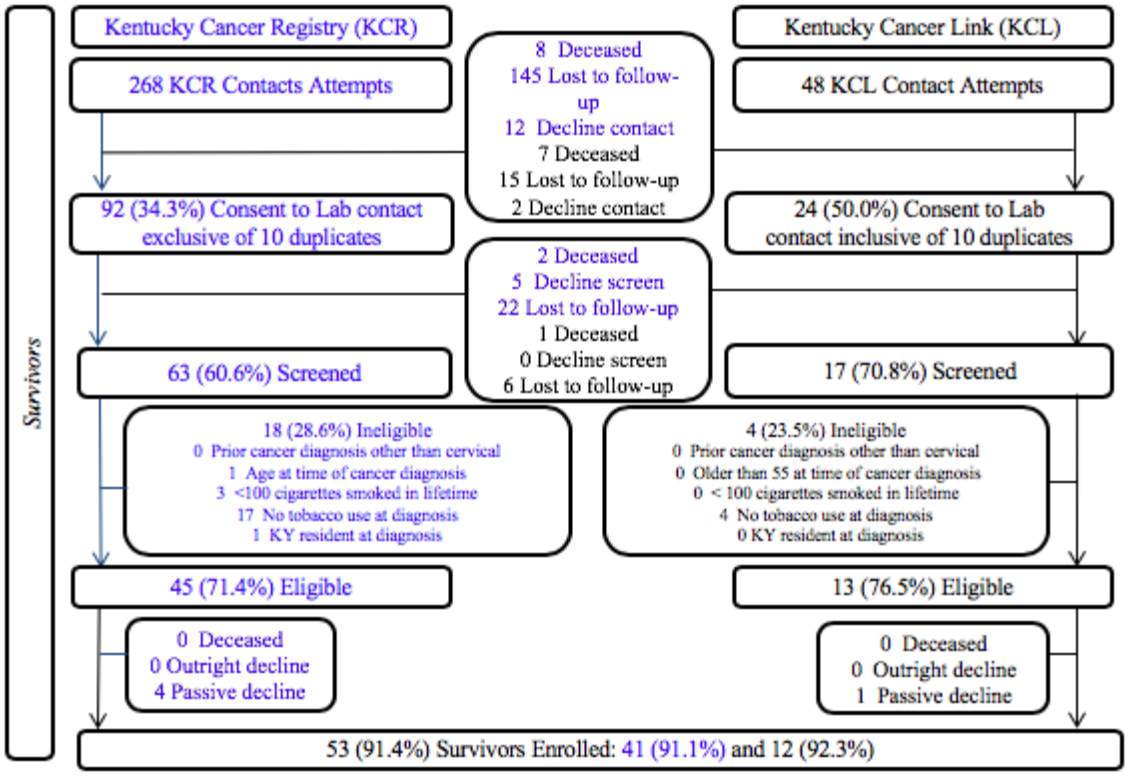
Table 4

Lifetime use of smoking cessation treatment (N=50)

	Prevalence (%) by smoking status		
	Sample (N=50)	Current (n=38)	Former (n=12)
Any treatment	92.0	68.4	41.7
NRT medications [1]			
Patch, gum or lozenge	54.0	63.2	25.0
Nasal spray or inhaler	10.0	13.2	0.0
Non-NRT medications [1]			
Varenicline	30.0	31.6	25.0
Bupropion	18.0	21.1	8.3
Behavioral treatments [1]			
Quitline counseling	14.0	15.8	8.3
Other counseling	8.0	10.5	0.0
Physician consult	50.0	52.6	41.7

Note. NRT= Nicotine Replacement Therapy; [1] Options not mutually exclusive

Figure 1
Study Flow Chart.



Chapter Four: Discussion

Cervical cancer is undeniably and predominately associated with HPV infection (Schiffman et al., 2007; Waggoner, 2003), but research has also demonstrated causal links between smoking and cervical cancer (Coker, DeSimone, Bush, et al., 2009; Mayer & Carlson, 2011; Plummer et al., 2003). Smoking after cervical cancer diagnosis, as is the case with any cancer diagnosis, is a major health threat – one that has potential to shorten cancer survivors' lives (US Department of Health and Human Services, 2014). For this reason, there is both a research and clinical imperative to identify risk and protective factors for smoking among cancer survivors, and to deliver evidence-based interventions for smoking cessation to all persistent smokers (Chuang et al., 2016; Emmons, Sprunck-Harrild, Puleo, & de Moor, 2013; NCCN, 2018). Despite strong theoretical and conceptual models that tie causal attributions to adjustment, motivation, and behavior change after major life events or stressors (Ajzen, 1991; Ajzen & Fishbein, 1980; Heider, 1958; Hochbaum, 1958; McBride et al., 2003; Weiner, 1985), this variable has not received much attention in prior studies of smoking among cancer survivors. Nonetheless, smoking-related causal attributions of cancer may help to explain why changes in smoking behavior do or do not occur after cervical cancer diagnosis.

There is clear consensus among cancer researchers and clinicians about what tends to cause or heighten risk for cancer, but the same cannot be said for cancer survivors (Weinstein et al., 2005; Wold et al., 2005). For individuals with a personal cancer history, the cause of their particular disease may be unclear, and this ambiguity leaves open the door for causal attributions that may or may not involve personal responsibility. For example, a cervical cancer survivor might attribute her cancer to fate, genetics, familial

risk, HPV, smoking, some combination thereof, or none of the above. Indeed, previous studies of causal attributions among cancer survivors have found a wide diversity of opinion as to what causes cancer in general and what caused their cancer specifically (Ferrucci et al., 2011; Liang et al., 2009; Lykins et al., 2008; Mullens et al., 2003; Rodriguez et al., 2015; Torre et al., 2015; Wold et al., 2005). Of particular interest here were the smoking-related beliefs held by cervical cancer survivors who admitted smoking at the time of their diagnosis, with the idea being that this group might be more inclined than the general population of cervical cancer survivors to associate smoking with cervical cancer on both global and personal levels, ultimately raising the possibility of a new target for smoking cessation interventions.

The first major study finding is that the majority of the sample agreed that the risk of developing cervical cancer *in general* was higher among smokers than non-smokers. In other words, cervical cancer survivors tended to endorse global attributions, something that was evident in both questionnaire data and interview findings. The second major finding stands in direct contrast to the first, as far fewer participants agreed that *their* cervical cancer was caused by or associated with *their* smoking, again with consistency across questionnaire and interview responses. Altogether, what this means is that only a minority of cervical cancer survivors who endorsed global attributions responded in a way that also suggested a personal attribution. Prior research that explores cervical cancer survivors' beliefs about smoking as a causal factor of cervical cancer in general has found results similar to those discussed here for global attributions (Costanzo et al., 2005; Lindau et al., 2002; Sherman, Lane, Sherman, & Lane, 2015). In addition, of the few prior studies of personal attributions, cervical cancer survivors were more inclined to

perceive their diagnosis as the result of HPV infection or an act of God, rather than as a result of tobacco use (Costanzo et al., 2005; Sterba et al., 2014), which also mirrors the findings in this study. This congruence in findings between current and past research on the topic exist despite the fact that prior studies recruited participants with varying smoking histories whereas this study focused exclusively on smokers at diagnosis. Overall, it appears there is a clear disconnect between the global and personal smoking-related causal attributions made by cervical cancer survivors.

As a whole, the causal attribution study findings suggest cervical cancer survivors may not have a full understanding of or appreciation for the role of smoking in cervical cancer risk (or prognosis). This is highlighted by the fact that interview participants frequently made mention of the strong, positive link between smoking and cancer in general as well as lung and head/neck cancers specifically, with fewer or weaker comments on the link between smoking and cervical cancer. Similar results of inexact knowledge or misunderstanding of smoking-related cancers are documented in other tobacco-related cancer samples, but most of this work is limited to lung and head/neck cancer (Christensen et al., 1999; Salander, 2007). The results of data analysis pertinent to the second study aim point toward a positive, albeit possibly weak, association between causal attributions and current smoking status and intentions to abstain in the future. Preliminary findings from the questionnaire responses are indicative of some knowledge, but not strong support, of smoking-related causal beliefs. Interview data further illustrates this, as there was a clear difference in causal attribution endorsement among former versus current smokers. Beyond cancer samples, similar knowledge and attribution trends exist in HIV/AIDS patients who continue to smoke after diagnosis despite warnings of

poor immune response (Shuter et al., 2017) and long-term drinkers who continue to consume alcohol in excess despite warnings of poor health (Cotter, Perez, Dunlop, Kite, & Gaskin, 2013). As a whole, this body of research underscores the role that causal attributions play in health behavior performance and change across disease populations. With a focus on the apparent discrepancy between global and personal attributions, a grim interpretation of the findings would indicate that the prevailing education-related cancer prevention and control efforts are inadequate, but that is likely too simplistic of an explanation. At least two other explanations exist. First, it is still common for cancer survivors to encounter disease-related stigma, particularly with cancer types typically associated with one's own behavior (e.g., lung cancer and smoking, cervical cancer and sexually transmitted diseases) (Brown, Brodsky, & Cataldo, 2014; Hamann, Shen, Thomas, Lee, & Ostroff, 2017; Lebel et al., 2013; Lebel & Devins, 2008; Luberto, Hyland, Streck, Temel, & Park, 2016). For those who do perceive cancer-related stigma, other negative social and personal outcomes can co-occur, including the experience of social constraints and feelings of embarrassment and shame (Chambers et al., 2015; Else-Quest & Jackson, 2014; Hamann et al., 2014; Hamann, Ver Hoeve, Carter-Harris, Studts, & Ostroff, 2018; Lebel et al., 2013; LoConte et al., 2008; Marlow, Waller, & Wardle, 2010). For cancer survivors who smoke, the source of stigma could be twofold, as it could stem from the cancer diagnosis itself and others' perception that the disease was self-induced or within the survivor's control (Else-Quest & Jackson, 2014; Else-Quest, LoConte, Schiller, & Hyde, 2009; Weiner, 1993). The experience of stigma and associated negative outcomes may prompt some cancer survivors to adopt a defensive coping strategy such as minimizing the contribution that their behavior may have played

in their cancer and instead espousing alternative cancer attributions (Malcarne, Compas, Epping-Jordan, & Howell, 1995; McBride et al., 2003; A. Price et al., 2012). In sum, the perception of and response to stigma could help explain why cervical cancer survivors in this study tended to endorse global, but not personal smoking-related causal attributions. Second, fatalistic beliefs (i.e., a perception that life/health events are out of one's own control and unavoidable) in general or about cancer specifically also might explain the relatively low endorsement of personal attributions in this study, as they are commonly cited in other studies with cancer survivors (Befort, Nazir, Engelman, & Choi, 2013; Costanzo et al., 2005; Lykins et al., 2008; McBride & Ostroff, 2003; Rodriguez et al., 2015; Sterba et al., 2014). Regardless of the reason, if cervical cancer survivors disregard, minimize, or are unaware of the causal association between smoking and cervical cancer, it is likely they will not perceive continued smoking as an ongoing health risk, and as a result, their smoking behavior may not change.

This brings up the third major finding of this study, which is that the rate of current smoking in this sample (80%) is higher than what is already documented for cervical cancer survivors (typically, 40-50%) (Brinton et al., 1986; CDC, 2018; Coker, DeSimone, Eggleston, et al., 2009; Coups & Ostroff, 2005; Marteau et al., 2002; Mayer & Carlson, 2011; Plummer et al., 2003; Roura et al., 2014; Schlumbrecht, Sun, Huang, Zandstra, & Bodurka, 2014b) plus the rates found amongst other smoking-related cancer survivors (Berg, Carpenter, Jardin, & Ostroff, 2013; Burris, Studts, De Rosa, & Ostroff, 2015; Coups & Ostroff, 2005), as well recent estimates of smoking in the general population of US women (14%) (CDC, 2015). However, two important methodological differences exist across these studies/estimates. First, other samples reflect greater

heterogeneity in terms of their sociodemographic and geographic composition whereas this sample is largely comprised of socioeconomically disadvantaged women who live in rural areas. Second, most other studies survey cancer survivors in general and do not report prevalence rates for current smoking by smoking history at diagnosis (i.e., never, former, or current) (Brown et al., 2014; Burris, Studts, et al., 2015; Land et al., 2016; Mayer & Carlson, 2011) while this study targeted cancer survivors who were current smokers at diagnosis. Remarkably, this study aimed first to enroll women of low socioeconomic status, as the burden of cervical cancer is greatest in this population (Akinlotan et al., 2017; Hopenhayn et al., 2008) and the generalizability of the findings are therefore more pronounced, and second to enroll women at greatest risk for continued smoking (Burris, Studts, et al., 2015), as the resultant findings were thought to be critical to development of more effective smoking cessation interventions for cancer survivors as a whole (Nayan, Gupta, Strychowsky, & Sommer, 2013). Nonetheless, this sampling strategy led to a sample of cervical cancer survivors that is potentially at heightened risk for smoking after cancer diagnosis.

Closely considering the smoking and quitting behavior of cervical cancer survivors in this study, several findings warrant comment. First, among current smokers, nicotine dependence in the sample was moderate, as indicated by the typical time to first cigarette (i.e., within 30 minutes of waking) and average number of cigarettes per day (i.e., roughly ¾ of a pack). Prior research demonstrates that factors related to smoking cessation in the general population also hold true in cancer populations (e.g., the role of motivation and confidence in quit attempts (Biener & Hargraves, 2015; Burris et al., 2016; Schnoll et al., 2013), so it remains imperative to address nicotine dependence,

withdrawal, craving and the like in any smoking cessation intervention for cancer survivors (Cooley et al., 2013; Ostroff et al., 2014; S. Price et al., 2017). Second, nearly half of current smokers reported "dual use," that is the use of conventional cigarettes alongside either e-cigarettes or cigars. Interestingly, former smokers reported lifetime, but not current, use of an alternative tobacco product, suggesting an encouraging trend of total product cessation and abstinence. A paucity of studies has explored alternative tobacco product use in cancer survivors (for exceptions, see (Berg et al., 2013; Borderud, Li, Burkhalter, Sheffer, & Ostroff, 2014), but the current study suggests it may be important to do so in the future. Third, a majority of the total sample reported at least one lifetime quit attempt, with more than half (60%) attempting cessation after diagnosis. Despite low *direct* endorsement of smoking-related causal attributions in the sample, this finding may demonstrate a more generic association between cancer diagnosis and smoking behavior. Fourth, regarding treatment use, former smokers mostly quit unassisted and supported a "cold turkey" approach, while current smokers expressed more openness to help with smoking cessation, which may be a function of their frustration with "failed" quit attempts. Prior research has found few cancer survivors seek help with smoking cessation (Dahm et al., 2009; Medbø, Melbye, & Rudebeck, 2011; Miele et al., 2018; Morphett, Partridge, Gartner, Carter, & Hall, 2015; Schnoll et al., 2013), so it is encouraging that many of the current smokers who recently made quit attempts opted to use nicotine replacement or another evidence-based treatment. That said, most of the cervical cancer survivors in this study are burdened by low socioeconomic status, which may negatively impact their long-term access to high-quality and timely healthcare, inclusive of smoking cessation treatments (Cooper,

Borland, & Yong, 2011; Kruger et al., 2012). Fifth, the high rate of current smoking may be the result of the unfortunate combination of low motivation and confidence to quit, making it important to highlight that there exist proven interventions to boost smokers' motivation and confidence to quit (Burris, Heckman, Mathew, & Carpenter, 2015; Hettema & Hendricks, 2010; Lundahl et al., 2013). Given all of the above, there seems to exist great need for targeted, if not tailored, interventions for cervical cancer survivors who smoke.

The methodological strengths and weaknesses of this mixed-method pilot study deserve comment. First and foremost, this study is the first to describe the smoking behaviors of cervical cancer survivors in any detail, which is a necessary first step toward development of tailored interventions for this high-risk group of cancer survivors. Prior tobacco use studies in this population generally provide point prevalence estimates of smoking with little or no comment on product type(s), frequency, quantity, or nicotine dependency, and only limited information about quit attempt history (Hopenhayn, Christian, Christian, Studts, & Mullet, 2013; Schlumbrecht et al., 2014b). Given that prior US population-based studies show cervical cancer survivors to smoke at a rate that exceeds both women in the general population and other cancer survivor groups (Iyer et al., 2016; Shoemaker, White, Hawkins, & Hayes, 2016; Underwood et al., 2012), it is important to understand their unique smoking and quitting experience. Second, cervical cancer survivors – which represent an understudied population – are typically considered vulnerable and hard-to-reach (Freeman & Wingrove, 2005; Nayan et al., 2013). Consequently, the recruitment efforts of this study, which included partnering with a community-based organization that serves under-insured and poor cancer survivors, is a

strength as it allowed the enrollment of women who truly reflect the larger population of interest. Finally, and related to the above point, this study utilized a combination of population-based and purposive recruitment strategies in an attempt to obtain a representative sample.

Of course, this study is not without limitations. The first limitation is the size of the sample and the fact that it is homogenous in terms of demographic variables of race and ethnicity. These two factors likely limit generalizability of the findings to Caucasian, non-Hispanic women, which is an important consideration given that nationwide, cervical cancer is more common among women of African American and Hispanic heritage (U.S. Cancer Statistics Working Group, 2015) . That said, the sample is representative of the state from which it was drawn (Kentucky Cancer Registry, 2017), which is largely white and non-Hispanic. Second, at the point of contact by the two recruitment sources, the rates of acceptance for study interest were modest (34-50%). This might be due to the manner in which research procedures, costs, and benefits were described by the two recruitment sources, but by and large, the overall accrual rate is consistent with prior studies that used state registries to identify participants (Burris & Andrykowski, 2010; Coker, DeSimone, Eggleston, et al., 2009; Keegan et al., 2013; Vadaparampil et al., 2012). Furthermore, the rates of acceptance for study participation once eligibility was determined by study personnel was very high (91-92%), which speaks to the feasibility of accrual once the population is identified. A third limitation is reliance on self-report for smoking and other tobacco use status, as this study did not use biochemical verification to confirm reports of abstinence. However, smoking rates in the sample were so high that there is little reason to believe that participants misrepresented their tobacco use

behaviors. Furthermore, this approach is not without precedent in other observational studies with cancer survivors (Glasgow et al., 1993; Studts et al., 2006; Wong, Shields, Leatherdale, Malaison, & Hammond, 2012). Fourth, given that some participants were asked to reflect upon and report their experiences and behavior in the five years before data collection (i.e., from diagnosis to date), some of the results are subject to retrospective bias. However, the primary outcomes of interest (i.e., causal attributions and current smoking behaviors) were present-focused outcomes. Finally, not all 50 participants chose to complete an interview, and the findings of the 21 who did may or may not be representative of the full sample or of all cervical cancer survivors. Therefore, it is important to note that post hoc analyses that compared interview and non-interview participants on all demographic and clinical variables (as well as the prevalence of current smoking) yielded no significant differences between groups (data not shown), suggesting that at least within the sample herein, the findings likely generalize. In conclusion, despite its limitations, this study is a significant contribution to the sparse literature on causal attributions and smoking behaviors of cervical and potentially other smoking-related cancer survivors.

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Vita

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EDUCATION AND TRAINING

Graduate:

08/2016-	**Graduate student in Clinical Psychology,** College of Arts and Sciences, University of Kentucky, Lexington, KY; Major Advisor: Jessica L. Burris, Ph.D.
08/2013-05/2016	**Master of Science in Clinical Psychology,** Barry University, Miami Shores, FL; Major Advisor: Frank Muscarella, Ph.D.

Undergraduate:

09/2009-06-2013	**Bachelor of Arts in Psychology**, Rutgers University, New Brunswick, NJ

PROFESSIONAL

08/2018-	**Lexington VA Medical Center, Primary Care** Student Therapist
08/2017-	**Jesse G. Harris, Jr. Psychological Services Center, University of Kentucky** Student Therapist
08/2016-	**Cancer Adjustment, and Risk of Smoking Lab, University of Kentucky** Research Assistant
08/2018- 06/2018	**Salvation Army Group, The Salvation Army.** Group Facilitator
03/2018-04/2018	**Happy Healthy Kids Group, The Harris Center, University of Kentucky** Group Facilitator
08/2015–05/2016	**North Miami Foundation for Senior Citizens** Clinical Intern
06/2015–07/2015	**Haitian Empowerment and Literacy Program (H.E.L.P.),** Miami Shores, FL. Group Facilitator
01/2015-05/2016	**Fort Lauderdale Hospital**, Fort Lauderdale, FL.

Student Therapist

01/2014–01/2015	**What's on Your Mind, Inc.,** Miami, FL Cognitive Trainer
01/2015-05/2016	**Barry University**, Miami Shores, FL. Graduate Assistant
01/2013–04/2013	**Staten Island Mental Health Society**, Staten Island, NY. Crisis Counselor

PUBLICATIONS

Burris, J. L., Riley, R., **Puleo, G.,** Smith, G.T. (2017). *A longitudinal study of the relationship between ever smoking and urgency in early adolescence.*

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