Intimate Partner and/or Sexual Gender-based Violence and Smoking in Ohio Appalachia

Dissertation

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Abstract

Background: Gender-based violence exposure is associated with smoking. Both gender-based violence and smoking are independent risk factors in the development of cervical cancer. Women living in Ohio Appalachia experience cervical cancer at disproportionately high rates. Smoking rates among women living in Ohio Appalachia are higher than among women living in other regions of Ohio. However, little is known about 1) women's exposure to gender-based violence, throughout the life course, in Ohio Appalachia, or 2) the association between gender-based violence exposures, contextual factors, and smoking behaviors among women in the region.

Objective: This dissertation examined the relationship between sexual and intimate partner gender-based violence exposures and smoking, among women in Ohio Appalachia, within a socio-contextual health disparities framework. The goal of this investigation was: 1) to understand if disparate smoking rates of women in Ohio Appalachia, compared to other parts of Ohio, are associated with gender-based violence in the region, and 2) to examine the context of smoking behavior among women exposed to intimate partner and/or sexual gender-based violence in Ohio Appalachia. In

addition, a set of gender-based violence constructs for use in effective abuse assessment among this underserved population were identified.

Method: A two-phase address-based sampling approach was used to recruit a random sample of women, 18 years of age or older, from 1 of 3 selected Ohio Appalachian counties, to participate in an observational, interview administered, cross-sectional survey from August 2012 through October 2013. The analytic sample for this analysis comprised 398 participants, of the 408 women completing interviews, who provided complete gender-based violence exposure histories. All analyses were conducted in SAS or LISREL, including correlation, regression, and confirmatory factor analysis.

Results: Intimate partner and sexual gender-based violence is a notable public health concern in Ohio Appalachia--impacting nearly 6 out of 10 women in the region. Cumulative gender-based violence exposure was associated with smoking among women in Ohio Appalachia, controlling for other known risk factors. Significant differences existed between current and past smokers with gender-based violence exposure histories regarding: perceived stress, exposure to fear invoking control (a type of intimate partner violence), perception of social status, discrimination, adult socioeconomic position, perception of number of smokers in the social environment, and home smoking restrictions. In addition, an eight mechanistic factor model of intimate partner and sexual gender-based violence exposure was validated.

Conclusions: Among this population, where abuse exposure is high and where access to health services are scarce, assessment for eight types of gender-based violence may

open opportunities for more targeted intervention and referral. Due to the unique safety concerns for this population, the social context of a gender-based violence survivor's smoking behaviors and cessation attempts must be considered when adapting cessation programs to this population. Findings from this study suggest that it may be factors within a survivor's environment causing stress—a culture tolerant of gender-based violence, discrimination, social economic standing, and smoking bans within the home—which must be addressed in concert with intrapersonal factors, like self-control and affect regulation, to help women exposed to gender-based violence succeed in smoking cessation.

Dedication

This dissertation is dedicated to my parents, Mary and Julius Nemeth, who always fostered my love for learning and pursuit of a higher good.

To my husband, Aaron Saling, who has been a source of unending support, and to my children, Emerson, Jonas, and Ashton--may you grow in knowledge and seek justice for all on earth. I love you.

And to survivors of sexual and intimate partner violence everywhere-- may your testament be heard and may you find peace and healing.

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Fields of Study

Major Field: Public Health

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Chapter 1: Background & Significance

Intimate Partner and Gender-based Sexual Violence: A Public Health Concern

Gender-based violence against women contributes to increased morbidity and mortality among women worldwide and has been named by the Centers for Disease Control and Prevention as a significant public health issue facing the United States.[1,2] In 2010, the Centers for Disease Control and Prevention launched a national survey to document prevalence of intimate partner violence, dating violence, sexual violence and stalking exposure, all forms of gender-based violence, among adults living in the United States; *The National Intimate Partner and Sexual Violence Survey 2010 Summary Report* details the prevalence of sexual and intimate partner violence, and its impact on physical and mental health.[2] Rape impacts nearly 1 in 5 American women in their lifetime, defined to include completed or attempted forced penetration, or penetration facilitated by alcohol or drugs.[2,3] Nearly 4 in 5 female victims of completed rape experienced their first rape before age 25, with slightly over 2 in 5 experiencing the first rape before age 18.[2] This is similar to a finding that Child Sexual Abuse (CSA) impacts one in four girls by the age of eighteen.[4] Over the course of their lifetime, 35.6% to 44% of women will experience Intimate Partner Violence, defined to include rape, physical violence and/or stalking by an intimate partner.[2,5]

Smoking: Still a Formidable Public Health Epidemic

The dramatic decreases in adult per capita cigarette consumption and the significant reduction in smoking prevalence are championed as one of the greatest public health achievements in second half of the 20th century.[6] Beginning with the 1st Surgeon General's Report in 1964, and supported by effective policy intervention aimed at taxation and smoke-free indoor air restrictions, adult smoking prevalence in the United States has dropped to 19.0% in 2011 from a high of over twice that in 1964.[6-8] Despite this, tobacco use remains the single most preventable cause of disease and premature death in the United States today.[8-12]

Of important consideration for tobacco control efforts moving forward, the prevalence of smoking among adults living in the United States, given the current policy and smoking cessation intervention environment, is not expected to dip below 17% prevalence until 2020 and will not reach a leveling off of 13.5% until mid-21st century (based on the United States 2008 smoking initiation rate of 21.6% and cessation rate of 2.41%).[6] This is well off the Healthy People 2020 goal of a reduction in smoking prevalence among adults in the United States to 12.0%.[13] Despite the fact that 70% of adults in the United States who smoke say they want to quit, with roughly 30% making a serious quit attempt annually, less than 10% are actually successful in their attempt to stay abstinent. Warner suggests this is, in part, due to the fact that today's smokers, when compared to smokers of the past, are more likely to be members of populations

marginalized from the mainstream, including those with the equivalent or less education than a high school degree, those living in poverty, those living with disabilities, including mental illness, and those abusing other substances, for instance.[6,7,14] These marginalized populations are not quitting smoking at the same rate as their counterparts within the more mainstream populations. Warner suggests that tobacco control efforts need to be cognizant of these differences and tailor policy and cessations treatment interventions to center on maximum effectiveness within these marginalized populations.[6,14]

Smoking among Survivors of Gender-based Intimate Partner and Sexual Violence

A stigmatized population that is often absent from tobacco control conversations, including those focused on health disparities among marginalized populations, are those exposed to gender-based sexual and intimate partner violence. Intimate partner and sexual gender-based violence exposure across the life course has been associated with past and current smoking behavior in numerous studies. Child sexual abuse exposure, in particular, has been linked to smoking persistence, and also with nicotine dependence, cigarettes smoked per day, earlier age of regular smoking onset, and more severe withdrawal symptoms among smokers who attempt to quit.[15-24] Anda's landmark study published in *JAMA* in 1999 documenting a strong and graded relationship between a number of adverse childhood experience (ACE) exposures,

including child sexual abuse (CSA), with smoking behavior was subsequently confirmed in two population based studies.[15,19,22] In an exploratory study, women with child sexual abuse histories were 3.8 times more likely to be current smokers and 2.1 times more likely to have initiated smoking before the age of 14 when compared to non-abused women.[17] In a nationally representative sample in the United States, adolescent girls who reported a history of both physical and sexual abuse had odds of regular smoking 5.90 the odds of regular smoking among girls not exposed.[18] A prospective study suggested that multiple sexual violence exposures (including child sexual abuse, physical assault, and witnessing violence) was a robust positive predictor of cigarette smoking later.[16] Despite the increased use of tobacco by child sexual abuse victims, women exposed to child sexual abuse are less likely to have received substance abuse treatment over the course of their lifetime when compared to never exposed women.[25] Adult sexual victimization is also associated with smoking behavior.[26]

When considering smoking among intimate partner violence exposed women, the data is substantial and significant. In studies looking at intimate partner violence exposed women in India and Japan, nearly 70% of women with intimate partner violence exposure smoke.[27,28] In the United States, current or past intimate partner violence exposure elevates odds for smoking,[24,29-37] with current smoking odds ratios of 2.1 for intimate partner violence exposed women when compared to non-exposed women.[33,36] Alarmingly, gender-based violence is associated with women's inability to quit smoking during pregnancy, as well. A study of 104 southern Appalachian pregnant

women revealed that 81% of the participants reported some form of intimate partner violence exposure during the current pregnancy, with 28% reporting physical abuse and 20% reporting sexual violence; more than half of the sample currently smoked, and psychological abuse during pregnancy was associated with a significantly decreased likelihood of quitting or reducing smoking during pregnancy.[29] A second study, conducted in Amsterdam, found a combination of physical and sexual violence to be significantly associated with continued smoking in pregnancy.[38]

Although associations have been demonstrated between gender-based violence exposure through the life course and tobacco use, little is known about the mediating and modifying factors associated with tobacco use and non-use among gender-based violence victims. Recently, population based studies in the United States and Canada have tried to tease out the relationship between childhood abuse exposure and smoking behavior. A Canadian population based study confirmed that the odds of smoking were 1.52 times the odds of not smoking among child sexual abuse survivors when compared to those never victimized, with mental health problems serving as a partial mediator of the relationship between childhood abuse and adult health.[39] A population based study in the United States found that childhood physical and sexual abuse were directly associated with smoking dependence; whereas childhood emotional abuse was indirectly associated with nicotine dependence through current serious mental illness.[40] The same study also found that all three forms of childhood abuse were associated with

more severe nicotine withdrawal symptoms, for those with recent quit attempts, and the withdrawn symptoms were partially mediated by current serious mental illness.[40]

Whereas mental health has been found to mediate the relationship between abuse and smoking, supportive members of one's social network have been found to buffer the relationship, protecting those with abuse exposure from smoking. Using data from the Nurses' Health Study II, Jun et al. not only confirmed earlier findings that young women exposed to both childhood physical and sexual abuse were two times more likely to initiate smoking by age 14 when compared to those not abused, familial emotional support was found to protect against smoking among those who were abused, reducing the impact of abuse by 40% among those receiving high emotional support versus those without.[41] These studies highlight the need to more fully examine the ways in which social contextual factors may be key factors in mediating and moderating the relationship between abuse and smoking.

Cervical Cancer in Ohio Appalachia: The Role of Gender-based Violence and Smoking

The Ohio Appalachian Region

Thirty-two of Ohio's eighty-eight counties are designated Appalachian, containing 17.4% of the state's population.[42] Poverty impacts the region with half of Ohio's Appalachian counties classified by the United States government as distressed or at-risk, ranking them in the bottom quartile of counties, economically, in the United States.[43] In addition, economically disadvantaged counties have the lowest college graduation rates

in the US.[44] The Center for Population Health & Health Disparities at The Ohio State University is focused on generating evidence to support practice aimed at reducing the health disparity of this understudied population.

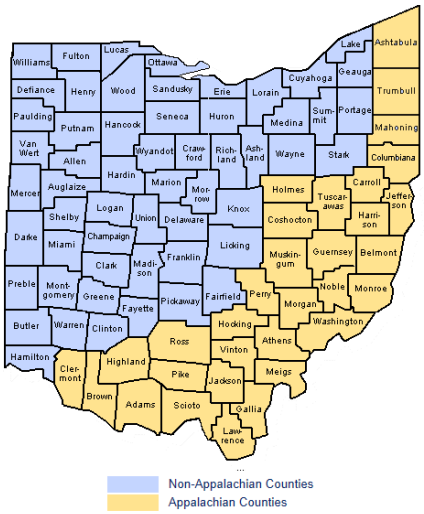

FIGURE 1. MAP OF OHIO APPALACHIAN COUNTIES

Cervical cancer in Ohio Appalachia and current research addressing this disparity

Cervical cancer is a known cause of morbidity and mortality in women worldwide.[45] In the United States, regional differences impact cervical cancer prevalence and outcome. For instance, women living in Appalachian regions of the United States are shown to have disproportionately high rates of cervical cancer incidence and mortality. From 2000-2004, Ohio Appalachian women experienced invasive cervical cancer at an average annual age-adjusted rate of 9.7 per 100,000 females in comparison to non-Appalachian Ohio females who experienced cervical cancer at a rate of 7.8 per 100,000 females.[46] Women in Ohio Appalachia not only contract cervical cancer at rates 24.4% higher than women in non-Appalachian regions of the state, they are more likely to die from cervical cancer; from 2000-2004, the average annual age-adjusted mortality rate among Ohio Appalachian women was 3.4 per 100,000 females compared with a rate of 2.4 per 100,000 females in non-Appalachian regions of the state—a rate 41.7% higher among women in Ohio

Appalachia.[46] A team of researchers at The Ohio State University have been funded through the Center for Population Health & Health Disparities, NIH P50 Grant # 5P50CA105632-06, to conduct research on reasons for and possible ways to prevent future cervical cancer disparity in Appalachia. This dissertation research is an extension of that work.

Cervical Cancer Risk Factors

Human Papillomavirus (HPV), a common sexually transmitted infection, is the primary, and a necessary, cause of cervical cancer.[46,47] Of the 100 known HPV viruses that have been identified, two-thirds of all cervical cancers are caused by HPV-16 or HPV-18.[45,48] Most people who contract HPV, however, do not develop cervical cancer. There are other risk factors which increase the likelihood that a girl or woman exposed to HPV will eventually develop cervical cancer. These factors include: smoking, HIV infection or other immune suppression condition, risky sexual behavior, oral contraceptive use for five or more years, numerous pregnancies carried to term, not having regular Pap screening tests, and lower socioeconomic status.[45,49]

Violence against women: a recently proposed risk factor for cervical cancer

Through a cross-sectional analysis of the 2006-2007 Kentucky Women's Health Registry, Coker et al. demonstrated an association between violence against women (including intimate partner violence, child sexual abuse, and forced sex in adulthood) and ever having cervical cancer.[50] Among the 4732 participants in Coker's study, 41.1% reported lifetime exposure to violence against women (8.4% to child sexual abuse, 9.7%

to forced sex by a non-intimate in adulthood, and 35.9% to intimate partner violence). Of the sample, 2.2% reported ever having cervical cancer. Adjusted for age, education, pack-years smoked, ever having used an illegal drug, and current marital status, women with a history of violence against women had 2.6 times the odds of ever having cervical cancer in comparison to women with no violence against women exposure (95%CI: 1.7-3.9). For women experiencing all three types of violence against women, their adjusted odds for ever having cervical cancer were 6.4 times the odds among women never experiencing violence against women (95%CI: 2.7-14.9).[50]

TABLE 1. PREVALENCE OF INVASIVE CERVICAL CANCER ACCORDING TO VIOLENCE AGAINST WOMEN EXPOSURE STATUS AND EVER SMOKING STATUS, N=4732

	Ever had cervical cancer (n=103)		
	N *in strata*	N *ever had cervical cancer in strata* (%)	*Adjusted odds ratio* of strata compared to referent (95% CI)
Ever experienced violence against women and ever smoker	980	45 (4.6%)	4.9 (2.6-8.9)
Ever experienced violence against women and never smoker	965	23 (2.4%)	2.7 (1.4-5.1)
Never experienced violence against women and smoker	834	18 (2.2%)	2.3 (1.1-4.7)
Never experienced violence against women and never smoker (referent)	1923	17 (0.9%)	1.0 referent

The interactive effect of violence against women and smoking on cervical cancer

Coker also reported that the effect of ever smoking interacted with the effect of ever having violence against women exposure when considering cervical cancer history (see **Table 1**—data presented in table format contained in the text of Coker's article).[50] These findings point to the need to study women smokers who report violence against women exposure as a group particularly vulnerable to cervical cancer development.

What is known about Gender-based Violence and Women Smokers in Ohio Appalachia

Gender-based intimate partner and/or sexual violence in Ohio Appalachia

Although it is known that rape and intimate partner violence disproportionately impact racial and ethnic minorities in the United States, little is known about regional differences which may impact gender-based violence exposure and associated health related outcomes.[2] The National Intimate and Sexual Violence Survey methodology allowed for state level prevalence estimates, but not for regional estimates within states. According to the 2010 survey findings, in Ohio, 16.2% of women experience rape and 35.6% of women experience intimate partner violence at some point in their life.[2]

In Ohio, physical intimate partner violence exposure has been assessed intermittently through the iterations of what is now known as the Ohio Medicaid Assessment Survey, formerly called the Ohio Family Health Survey. The methodology for this series of population-based surveys allows for regional prevalence estimates.[51] In Ohio Appalachia, in 2010, 18.8% of women reported physical violence exposure by an

intimate partner at some point in their lifetime, compared to a statewide lifetime prevalence of 17.8%.[52] Stable population estimates for the Appalachian region of Ohio for the full breadth of gender-based intimate and/or sexual violence exposure do not exist.

Smoking in Ohio Appalachia

In 2012, 25.5% of Ohio adults aged 19 and older smoked every day or some days.[53] In Ohio Appalachia, in 2012, smoking prevalence among the same population was 32.7%--substantially higher when compared to a smoking prevalence of 24.6% in Ohio metropolitan regions, 23.7% in Ohio rural, non-Appalachian regions, and 23.1% in Ohio suburban regions.[53] Regional differences in smoking prevalence persist when considering women in Ohio. In Ohio Appalachia, in 2012, 32.1% (95%CI: 29.4-34.8) of women aged 19 and older smoked every day or some days—compared with 22.7% (95%CI: 21.3-24.1) in metropolitan regions, 24.4% (21.5-27.4) in rural non-Appalachian regions, and 23.3% (95%CI: 20.6-26.1) in suburban regions of the state.[54] Risk factors for smoking among women in the region have been identified and include low socioeconomic position in adulthood (OR 3.05, 95% CI: 1.74-5.34), Center for Epidemiologic Studies Depression (CES-D) scale score $\geq$ 16 (OR 1.99, 95% CI: 1.31-3.05), first pregnancy before age 20 (OR 1.74, 95% CI: 1.14-2.66), and younger categorical age when compared to those over age 50 (age 31-50, OR 2.30, 95% CI: 1.22-4.33; age 18-30, OR 3.29, 95% CI: 1.72-5.34).[55] In Ohio Appalachia, the odds of smoking among women

with a lifetime history of physical intimate partner violence are 3.47 times the odds of smoking among women with no intimate partner violence lifetime exposure.[52]

And what is not known about Gender-based Violence and Women Smokers in Ohio Appalachia: contributions of this current investigation

This investigation will add to what is already known by providing a full spectrum of gender-based prevalence estimates, by type of violence, for women in Ohio Appalachia. Once population estimates are established, analysis will be conducted to determine if gender-based violence cumulative exposure is associated with current smoking among women in the region, taking into account other known risk factors. In addition, social contextual factors associated with smoking behaviors among women exposed to intimate partner and/or sexual gender-based violence will be examined. This type of research will contribute to understanding smoking behaviors among Ohio Appalachian women exposed to gender-based violence, and will provide evidence needed to support both smoking prevention efforts among gender-based survivors in the region and will lay the groundwork for understanding the contextual factors which might need to be addressed in order to tailor cessation interventions for this marginalized and stigmatized population.[13,56]

Theoretical and Conceptual Frameworks Guiding Investigation

The Social Ecological Model

Bronfenbrenner's Ecological Systems Theory

The origins of the Social Ecological Model, a framework employed in contemporary public health practice, reside in Ecological Systems Theory in which Bronfenbrenner posited that individuals develop within concentric spheres of influence, namely: 1) the microsystem, including institutions and groups that individual comes into contact with frequently, like the family, peers, school, and religious organizations; 2) the mesosystem, which is the product of the interactions between members of the individual's microsystem; 3) the exosystem, which is the product of the interactions between members of the individual's microsystem, and those not known to the individual, but rather known to people within the individual's microsystem; 4) the macrosystem, or larger culture; and 5) the chronosystem, understanding that a person's entire ecological system changes through time.[57-61] Bronfenbrenner's Ecological System Theory did not, at first, explicitly include a life course development perspective; yet, positing the "chronosystem" later in theory development, Bronfenbrenner tied the concepts of Systems Theory to a lifecourse perspective.[60,61]

The Social Ecologic Model in Public Health

The ecological perspective has been adopted in public health circles to represent how individual health behaviors, or exposures contributing to poorer health outcomes, may be a result of ecologic influence, as opposed to relying solely on individual explanations. McLaren and Hawe provide an overview of how ecologic theory has made its way into health behavior and health promotion research and practice, starting in the late 1990's.[62] By the first decade of the 21st century, both the Centers for Disease

Control and Prevention, the primary organization charged with ensuring the public's health in the United States, and the World Health Organization, the lead agency in addressing public health globally, both adopted a Social Ecologic perspective to frame our understanding of a spectrum of gender-based violence exposures, and their prevention.[63-66]

The Social Ecologic Model and Gender-based Sexual and Intimate Partner Violence

Although it took more than 20 years for public health agencies to officially adopt the social ecologic framework in relation to gender-based violence, violence specific researchers have utilized social ecologic theory since the 1980's. In 1980, Belsky was the first to apply Bronfenbrenner's Ecological Systems Theory to the study of violence in an article explicating the integrated etiology of child maltreatment, integrating prior theories which focused either on individual characteristics of the child or on characteristics of the child's environment as causes for the maltreatment.[67] Utilizing the framework laid down by Belsky, Heise, in 1998, offered a conceptual model for the factors, in research, associated with violence against women at various levels of the social ecology.[68] Heise proposed witnessing marital violence as a child, being abused as a child and having an absent or rejecting father as personal history factors, at the center of the expanding layers of social influence.[68] The next layer of the ecological depiction, the microsystem, included factors of male dominance and control of wealth in the family, alcohol use, and verbal & marital conflict.[68] The exosystem was comprised of factors including unemployment and low socioeconomic status, isolation of women and

family, and delinquent peer associations.[68] The outer most layer of Heise's ecological depiction, the macrosystem, included male entitlement and a sense of ownership of women, aggressive and dominant forms of masculinity, strict gender roles, and acceptance of both interpersonal violence and physical discipline.[68] The same year Heise published this depiction, White & Kowalski also highlighted the sociocultural contributions to the phenomena of male violence against women.[69]

There is some precedence in research also laying the groundwork for an understanding of how social ecologic influence contributes to re-victimization and health sequelae after prior exposure to sexual violence, in particular. These researchers are interested in highlighting the complex relationships between personal, interpersonal, and social cultural factors in understanding later exposure and mental health outcomes. Liz Grauerholz, in 2000, published an article proposing an ecologic framework of hypothesized factors related to sexual re-victimization in women that were first sexually assaulted in childhood.[70] Rebecca Campbell, and a group of researchers at Michigan State, have recently published an article highlighting the ecologic factors influencing negative psychological sequelae among those exposed to sexual assault.[71] *This dissertation is an extension of social ecologic work relating to gender-based violence, in that it explores a health behavior (smoking) from an ecologic, as opposed to an individualistic perspective, among women exposed to sexual and/or intimate partner gender-based violence in their lifetime.*

Health disparities framework

Eliminating Health Disparities in the United States

Despite the overarching Health People 2010 goal of eliminating health disparities among different groups within the United States population, the first decade of the 21st century was marred by increasing health disparate outcomes between socially disadvantaged and socially privileged populations.[72,73] In an effort to rectify this situation, a subcommittee of the Health and Human Services' Advisory Committee (SAC) for Healthy People 2020 was formed to define health disparity and health equity, in order to specify what needed to be attended to, moving forward, to actually reduce health disparities between subpopulations in the United States.[73] In order to define health disparities and health equity, the subcommittee first agreed upon a definition for social disadvantage: "social disadvantage refers to the unfavorable social, economic, or political conditions that some groups of people systematically experience based on their relative position in social hierarchies."[72] The subcommittee went on to define health disparities:

> Health disparities are health differences that adversely affect socially disadvantaged groups. Health disparities are systematic, plausibility avoidable health differences according to race/ethnicity, skin color, religion, or nationality; socioeconomic resources or position…; gender, sexual orientation, gender identity; age, geography, disability, illness, political or other affiliation; or other characteristics associated with discrimination or marginalization. These categories reflect social advantage or disadvantage when they determine an individual's or group's position in a social hierarchy. Health disparities….are a specific set of health differences of particular relevance to social justice because they may arise from intentional or unintentional discrimination or marginalization and, in any case, are likely to reinforce social disadvantage and vulnerability.[72]

Health equity subsequently is defined by the subcommittee as "social justice in health," and disparities and its determinants become the key metrics by which to assess equity.[72]

It is important to note that with the publishing of Health People 2020 the United States government now recognizes health disparity as the health differences which occur not just because of individual behavior, but because of membership in socially disadvantaged and advantaged groups—some of which are determined at birth, and some of which change over the life course.[13] The health disparities framework, in this regard, is a social-ecologic framework since it acknowledges the social context's influence on health behavior and health outcomes. The Health and Human Services subcommittee concluded that health disparities are 1) systematic and 2) avoidable if the underlying causes of social disadvantage (i.e. racism, classism, gender inequity, and other forms of social hierarchical ordering) were addressed. Consequently, the subcommittee has suggested the need for theoretically based research that seeks to understand and specifically modify the moderating social and contextual factors that have increased health disparities, despite population-based efforts to address health.[72]

Women exposed to gender-based violence experience disparate health outcomes

Gender-based violence against women, in all its forms, has been linked to detrimental health outcomes,[74-83] increased healthcare utilization,[4,5,84,85] and increased healthcare costs.[84-94] Proximal abuse can result in 42% higher health care costs, annually,[85] whereas distal exposure can elevate annual costs 16-19% depending on abuse type.[84,85] The pathway between abuse and detrimental health impact is

complicated by factors in the victims' social environment, namely the abuser's behaviors along with healthcare providers ability to recognize the impact that abuse exposure has on overall health and on access to care for particular health issues.

When considering the health disparities framework, gender-based violence exposure should be considered a health difference arising from intentional discrimination to reinforce social disadvantage, privilege and hierarchy based on the social construct of gender.[95] It should be noted, that although gender-based violence and its elimination is often conflated with women's rights, gender-based violence is inflicted on a variety of marginalized sub-populations within the United States and worldwide.[95] Sexual violence exposure, for instance, is rooted in social hierarchy which ascribes power to that which is masculine.[96-98] In feminist literature and theory, this is referred to as patriarchy. Consequently, gender-based violence is a social reality for vulnerable populations along multiple trajectories of social hierarchy and is used by dominant groups, often male, but not necessarily, to maintain systematic social ordering based on hierarchy. This is evident in the fact that sexual violence exposure, for instance, is elevated among children when compared to adults, among those living with disabilities when compared to those living with full abilities, and among racial minorities when compared to white Americans.[2,4,95,99-103] Gender-based violence, including intimate partner and sexual violence, it should be noted, is one of the mechanisms by which social hierarchy of many forms are maintained.

Sorenson's model for the development of health behavior interventions for populations experiencing disparate outcomes: merging of social ecologic and health disparities in an applicable framework for intervention development

Several key tobacco control experts have noted that smoking disparities have increased, despite population-based efforts to reduce smoking overall, because marginalized populations are quitting smoking at differential rates compared to advantaged populations. Jarvis and Wardle, in a key chapter of Marmot and Wilkinson's *Social Determinant of Health*, argue that while policies in the United Kingdom have reduced overall prevalence of smoking they have increased health inequities—this is because those who are poor are less likely to quit smoking than those with economic advantage. The health inequity, in other words, has to do with differential responsiveness to smoking cessation efforts within marginalized populations, rather than to differential initiation rates to smoking between socially disadvantaged and socially advantaged populations, in the first place. This pattern has been noted by scholars in the United States, as well, including Kenneth Warner.[6,14]

By the late 1990's, Glorian Sorensen's group developed a conceptual model to explicate the role of social contextual factors in understanding differential responsiveness to health intervention programs among socially disadvantaged groups.[104] Noting the lack of empirically based models for addressing social disparities in behavioral risk reduction interventions, the group of researchers working with Sorensen on The Harvard Cancer Prevention Program Project developed, and subsequently tested, a comprehensive conceptual framework to understand the

moderating and mediating role of social context on the effectiveness of health interventions targeting behavioral change, and therefore, subsequently, on health outcomes.[105] Grounded in key constructs known to influence behavior change from social cognitive theory, the transtheoretical model for behavior change, and the theory of reasoned action[106] along with social contextual factors along multiple levels of ecologic influence (i.e. , intrapersonal, interpersonal, organizational, neighborhood/community, and societal levels) Sorensen et. al. depicted a conceptual model in order to explicate the social contextual pathways by which race and class may influence health behaviors; Sorensen's group proposed that risk reduction interventions may be enhanced by attending to the social contextual factors which influence a person's ability to benefit from interventions and to ultimately make behavior change.[104] Describing the conceptual model, Sorensen writes:

> This framework defines a set of **modifying conditions**, that is, factors that independently impact on outcomes, but which are not influenced by the intervention, and **mediating mechanisms**, defined as variables along the pathway between the intervention and the outcomes. We identified mediating mechanisms that social and behavioral theory and prior research have indicated are important to behavior change, and that are potentially modifiable within the context of the targeted channels and planned interventions. **Social context**, including life experiences, social relationship, organizational structures, and societal influences, may function as either modifying conditions or mediating mechanisms, depending on the location within or outside the causal pathway between the intervention and the outcomes (p 190).[104]

The group then used this conceptual model to develop a socio-contextually tailored intervention that would ultimately be effective in helping blue-collar workers quit smoking. Through formative research the group discovered that occupational

safety was a key contextual factor relevant to the lives of blue-collar workers.[105] Sorensen's group hypothesized that a workplace intervention that jointly addressed health promotion along with occupational safety would be more effective at helping blue-collar workers quit smoking when compared to blue-collar workers only receiving health promotion programming.[105] In addition, they proposed that providing occupational safety in conjunction with health promotion programming would have no differential effect among white-collar workers in the same settings.[105] Through the implementation of a group randomized trial, Sorensen et al. found support for both of their hypotheses. Among blue collar workers, quit rates were twice as high at worksites receiving occupational safety alongside the health promotion programs when compared to quit rates at worksites receiving only health promotion programs.[105] In addition, quit rates, among white-collar workers, did not differ between worksite intervention conditions. Sorensen et al. concluded that the social-contextual model is a valid conceptual model to guide further behavioral health interventions with other disadvantaged groups—most significantly because it explicates the role that social context can have, both as a modifier influencing differential outcomes by key attributes, and as a mediating mechanism, influenced by the intervention itself.[105] Subsequently, versions of this model have been tested in other disadvantaged populations, with other behavior change endpoints.

Mary Ellen Wewers, the dissertator's advisor, and colleagues identified risk factors associated with current smoking among women in Ohio Appalachia including low

socioeconomic position, first pregnancy before the age of 20, and depressive symptoms.[55] Wewers developed a lay managed smoking cessation intervention for Ohio Appalachian residence focused on improving adherence to Nicotine Replacement Therapy (NRT) use and behavioral counseling; this intervention specifically used Sorensen's model in its developmental framework.[107] Wewers' study is the first of its kind to tailor a smoking session intervention to the specific population considerations of Ohio Appalachian residents. The intervention is currently being tested using a group-randomized trial in Ohio Appalachia—the quintessential research format for testing behavioral interventions in community. *This dissertation analysis will lead to the furthering of this important cessation development work for residents of Ohio Appalachia by specifically addressing sexual and intimate partner gender-based violence in the region and its role in smoking, and smoking cessation.*

The Measurement of Intimate Partner and Sexual Violence in Health Based Settings

Gender-based intimate or sexual violence not always addressed in health care settings

Despite the fact that women who experience gender-based violence are at increased likelihood to use healthcare services, there is preliminary evidence[108] that suggests that the underlying abuse predisposing them to deleterious health related impact is not detected and/or addressed in ways most helpful to victims in healthcare settings.[109-111] Another recently published study found that women staying in shelter resulting from intimate partner violence cited partners' restriction of access to needed

health care services[112]—this suggests that even though women who experience sexual and/or intimate partner gender-based violence access health care at elevated rates in comparison to non-abused women, needed health services may be at even more elevated rates than that which is currently documented in research due to medical restriction by abusive partners.

Despite its known health impact and documented health-care system related burden, gender-based violence against women is rarely studied 1) in relation to behavioral and/or disease pathways or 2) within an ecological perspective in relation to health outcomes. In addition, specific measures to tap medical restriction as a form of gender-based violence against women have never been proposed or validated. This proposed research would bridge these research divides. *By focusing on the health and wellbeing of Appalachian women who have experienced sexual and/or intimate partner gender-based violence*, *this research contributes to Healthy People 2020's objectives relating to intimate partner violence and sexual violence and will contribute to one of its overarching goals, namely achieving health equity, eliminating disparities, and improving the health of all groups*.[13] In addition, *by honing in on social factors implicated in the pathway between gender-based violence against women exposure and smoking, a behavioral risk factor already implicated in the development of cervical cancer, the research was conducted in such a way as to recognize this risk behavior in relation to ecological influences*, a key tenant acknowledged in the Healthy People 2020 Framework.[13] In addition, *newly created questions developed to investigate medical*

restriction as a form of abusive behavior were included in the study, and a construct validation Confirmatory Factor Analysis was undertaken to determine if medical restriction, indeed, is a distinct form of gender-based violence against women that potentially impacts health related outcomes.

National standards have changed regarding screening in health care settings

The U.S. Preventative Services Task Force is a group of non-federal experts in preventative medicine who independently reviews evidence concerning preventative health care services, including screening, and develops recommendations for primary care clinicians concerning standards for practice.[113] In 2004, the U.S. Preventative Services Task Force declared there was insufficient evidence to recommend routine screening for intimate partner violence in healthcare settings. In 2007, the Centers for Disease Control and Prevention released a compilation of healthcare assessment tools to be used for the screening of intimate partner and sexual violence in healthcare settings, acknowledging the need for healthcare provider's access to tools for screening purposes.[114] By 2013, the Task Force released a new statement, and now recommends that all women of child bearing age be screened for intimate partner violence and referred to intervention services, such as counseling, home visits, and community support services provided by health care clinicians, social workers and community workers.[113] However, the Task Force has declared there is still insufficient evidence to assess for benefits and harms of screening for intimate partner violence among vulnerable adults, such as those ages 18 and older living with mental, physical, or

developmental disability, or elders.[113] In addition, there are no national standards regarding healthcare setting screening for past sexual violence exposure.[113]

Current measurement of sexual and intimate partner violence

Most of the research pertaining to violence against women and its health impact has been conducted in the United States;[115] however, the World Health Organization's Multi-country Study on Domestic Violence against Women lends empirical credence to the gravity of violence and its impact on women's health worldwide, especially in low and medium income countries.[116,117] In 2006, The Center for Disease Control and Prevention published a compendium of tools that can be used to assess various forms of intimate partner violence in a wide variety of settings; the tools in this compendium tend to follow the predominant paradigm for assessing and reporting on the constructs of physical, sexual and psychological abuse, in addition to stalking.[118]

Violence against women has moved, over the past four decades, from being viewed most often as a proximal exposure that can cause need for individuals to seek immediate health care or criminal justice response (criminal justice framework), to being conceptualized, as well, and maybe more importantly for population health, as a distal risk factor in the development of health related behaviors and disease throughout the life course (public health framework).[119,120] The framework employed by the survey methodologist seeking to study this phenomena impacts the types of violence assessed. For instance, the bulk of the studies in the United States seeking to understand sexual and intimate partner violence exposure have been funded by the National Institutes for

Justice, and employ a criminal justice framework which favor the assessment of exposure to that which has been deemed criminal in nature (i.e. forced sexual activity, physical violence, and more recently, stalking). Whereas, studies employing a public health framework are more apt to include the assessment of exposure to acts not considered criminal, yet acts that have grave mental and physical health impact (i.e. physiological abuse and coerced sexual activity). Despite the overall framing, however, the predominant paradigm in gender-based violence against women research and literature is to report prevalence for three main types of abuse: physical, sexual, and psychological abuse. Despite its widespread use, few have investigated whether the three construct conceptualization is the most effective in representing the types of gender-based violence that people experience and the mechanistic way that abuse is limiting or altering health care access. This is of critical importance among populations where abuse exposure is high, and where access to health services is scare, limiting health providers' opportunities for assessment and appropriate referral. In particular, this conceptualization does little to help medical and public health professionals decide how to best intervene with gender-based violence survivors in health based settings. For instance, do abusers ever prohibit survivors from accessing needed health services, or following through with directives given by healthcare professionals? How could this particular type of abuse, if present, exacerbate health disparities? Of note, in the past decade, sexual coercion, an often undetected form of intimate partner violence, has risen to the forefront in women's health literature.[121-123] This has allowed for the

development of specific healthcare interventions to address this type of abusive behavior, and its subsequent impact on women's health.[122] Despite its emergence in some assessment tools and on the prominent national survey, validation studies of reproductive coercion as a distinct construct and type of abuse, separate from other forms of sexual and intimate abuse, are lacking. Through the identification of mechanistic forms of abuse, appropriate health behavior intervention can be developed, tested, and disseminated.

It is possible that the insufficient data to justify screening all populations for gender-based violence exposure, given its established impact on health care use and cost, may have more to do with the fact that the overarching constructs of abuse (i.e. psychological, physical, and sexual) are too broad? The predominant public health three construct conceptualization of intimate partner violence may limit our understanding of the mechanistic way in which abusers control victims and obscure our focus on potential intervention points where health care and community based workers could target effective interventions *This project addressed these issues by testing the traditional three construct model to assess and report intimate partner and/or sexual gender-based violence against an eight construct model with the potential to illuminate a more nuanced and mechanistic way that intimate partner and/or sexual gender-based violence is impacting women.*

Summary of Background Literature

Gender-based violence exposure is associated with an increased likelihood of smoking behaviors throughout the life course. Gender-based violence exposure increases health care cost and use for women, and is associated with a variety of health disparate outcomes for those exposed. Both gender-based violence and smoking are independent risk factors in the development of cervical cancer. Women living in Ohio Appalachia experience cervical cancer at disproportionately high rates compared to women living in non-Appalachian regions of Ohio or the United States. Smoking rates among women living in Ohio Appalachia are higher than among women living in other regions of Ohio. However, little is known about 1) women's exposure to gender-based violence, throughout the life course, in Ohio Appalachia, or 2) the association between gender-based violence exposures and smoking behaviors among women in the region.

Sorensen et al. have proposed a conceptual model for understanding how social contextual factors at the interpersonal, intrapersonal, organizational, community and societal levels can modify the effectiveness of health behavior interventions designed to change behaviors of individuals within populations experiencing disparate health outcomes. Currently, a group randomized trial is being conducted by Wewers and colleagues to test the efficacy of a lay-health smoking cessation intervention in Ohio Appalachia developed using Sorensen's conceptual framework; however, the existent intervention was not developed specifically for women with gender-based violence exposure and their unique social-contextual concerns.

Goal of Investigation & Dissertation Research Question

This dissertation presents a course of investigation which examined the relationship between sexual and intimate partner violence gender-based violence exposures and smoking, among women in Ohio Appalachia, within a socio-contextual health disparities framework. The goal of this investigation was to: 1) understand if disparate smoking rates of women in Ohio Appalachia, compared to other parts of Ohio, are associated with gender-based violence in the region, and to 2) examine the context of smoking behavior among women exposed to intimate partner and/or sexual gender-based violence in Ohio Appalachia. In addition, the predominant public health three construct conceptualization of intimate partner and gender-based violence may limit our understanding of the mechanistic way in which abusers control victims and obscure our focus on potential intervention points where health care and community based workers could target effective interventions. A set of gender-based violence constructs for use in effective abuse assessment among this underserved population in the Appalachian region are identified.

Dissertation Research Question: Is gender-based violence exposure by sexual or intimate partners, and other conditions associated with this exposure, associated with the smoking behaviors exhibited by women in three Ohio Appalachian communities?

Chapter 2: Overview of Research Design & Methods

Specific Aims

This study addressed existing gaps in research related to exposure to sexual and intimate partner gender-based violence, and its association with smoking behaviors, among women in Ohio Appalachia, employing a social contextual health disparities framework. This study addressed the following aims:

Aim #1: Characterize intimate partner and/or sexual gender-based violence exposure among women in three Ohio Appalachian counties and determine this exposure's association with current smoking.

a. **Research question 1a:** What is the prevalence of intimate partner and/or sexual gender-based violence among women living in Ohio Appalachia?

b. **Research question 1b:** What is the distribution of smoking status (never, former, and current) by intimate partner and/or sexual gender-based violence exposure among Appalachian Ohio women?

c. **Research question 1c:** What is the association between exposure to intimate partner and/or sexual gender-based violence and current smoking behavior

among Appalachian Ohio women, accounting for the other known risk factors for smoking among women in this region?

Aim #2: Examine the context of smoking behavior among women exposed to intimate partner and/or sexual gender-based violence in Ohio Appalachia.

a. **Research question 2a:** What is the association between sexual and/or intimate partner gender-based violence exposure and intrapersonal, interpersonal, organizational, and neighborhood/community smoking specific factors for women in three Ohio Appalachian counties?

    i. **Hypothesis 2a(a):** Compared to women with no sexual and/or intimate partner gender-based violence exposure history, women having experienced sexual and/or intimate partner gender-based violence will be at increased odds for participating in behaviors, or being in environments, where detrimental smoking related outcomes are more likely—therefore, among the entire sample, gender-based violence exposure will be significantly associated with these smoking specific variables at the intrapersonal, interpersonal, and organizational levels (i.e. smoking across the life-course, higher density of smokers in their home environment, less favorable explicit

and implicit social influences regarding smoking, and less restrictive smoking bans in living and organizational environments).

ii. **Hypothesis 2a(b):** Among current smokers, gender-based violence exposure will be associated with fewer 24 hour quit attempts in the past 12 months and higher nicotine dependence.

iii. **Hypothesis 2a(c):** Among past smokers, gender-based violence exposure will be associated with more quit attempts before successful cessation.

b. **Research question 2b:** What is the association between sexual and/or intimate partner gender-based violence exposure among women in three Ohio Appalachian counties and other intrapersonal, interpersonal, organizational, and neighborhood/community factors with the potential to either mediate current smoking and or moderate a gender-based survivor's ability to engage in successful smoking cessation?

a. **Hypothesis 2b(a):** Sexual and/or intimate partner gender-based violence exposure among women in three Ohio Appalachian counties will be significantly associated with increased alcohol use, increased

depression, increased stress, increased loneliness, decreased social support, increased discrimination, decreased social participation, decreased perception of neighborhood cohesion, decreased perception of social status, and lower socio-economic status.

c. **Research question 2c:** Are there significant differences between current smokers with gender-based violence exposure and past smokers with gender-based violence exposure on the intrapersonal, interpersonal, organizational or community factors found to have significant associations from Research questions 2a and 2b?

Aim #3: Provide construct validation of the Sexual and Intimate Partner Gender-based Violence Exposure Index.

a. **Research question 3a:** Is it most appropriate to model gender-based violence exposure as a three-factor model, predominant in gender-based violence research, depicting the latent variables psychological, physical, and sexual abuse or an eight-factor model, with latent variables representing abuse types including demeaning emotional abuse, fear invoking control, isolation, physical assault, medical restriction, reproductive coercion, coerced sexual abuse, and forced sexual abuse?

Overview of Methods

Data for this dissertation analysis was collected as part of the survey administered by Project 2 of Community Awareness Resources and Education II (CARE II Project 2)—one of four research projects funded within the larger NIH P50 (Grant # 5P50CA105632-06; Principal Investigator: Electra Paskett) awarded to The Ohio State University's Center for Population Health & Health Disparities to address the elevated cervical cancer morbidity and mortality experienced by women in Appalachia Ohio. Mary Ellen Wewers allowed the author and dissertator to add questions pertaining to intimate partner and/or sexual gender-based violence to CARE II Project 2's survey, a study of Women's Health and Social Networks (Project Title: Social Networks and Health Among Ohio Appalachian Women; OSU IRB Protocol# 2011C0041; Project Leader: Mary Ellen Wewers; Project Manager: Tiffany Thomson). The dissertator worked as a Research Associate on CARE II Project 2 from October 2010 through December 2012, and has continued to attend CARE II and Project 2 meetings.

Study design

Four hundred and eight women enrolled in the observational study and completed an interviewer administered cross-sectional survey from August 2012 through October 2013. At the time of interview, respondents resided in one of three geographically distributed and purposely selected Ohio Appalachian counties and were randomly selected through a multi-step process utilizing a United States Postal Service address-based household sampling frame.

Study population and sample selection

County selection and characteristics

Ohio counties were purposely selected to be sites for participant recruitment based on three considerations: 1) counties have been designated by the Appalachian Regional Commission as counties in Appalachia Ohio;[43] 2) counties had existent infrastructure to support the implementation of the study (i.e. county health departments were knowledgeable concerning the goals of Community Awareness Resources Education (CARE) research initiatives and OSU staff community-based interviewers were in place due to their participation in prior research conducted in the region by Mary Ellen Wewers (Principal Investigator on CARE II Project 2); and 3) the counties were geographically distributed throughout Ohio Appalachia and had a high prevalence of female smokers, of critical concern to the Specific Aims set forth in CARE II Project 2. **Table 2** depicts key characteristics of the populations of Brown, Coshocton, and Lawrence counties, the three counties chosen as recruitment sites for CARE II Project 2.[124]

TABLE 2: CHARACTERIZATION OF THE ADULT POPULATION IN PARTICIPATING COUNTIES

	Brown County	Coshocton County	Lawrence County
Adult Population Estimate (N)	27,043	21,919	41,070
% ever smokers	57%	47%	58%
% current smokers	42%	27%	41%
% Income < 100% federal poverty line	17%	19%	26%
% HS degree	82%	81%	42%

Participant eligibility criteria

Eligible study participants needed to be: 1) women; 2) aged 18 or older; 3) a resident of Brown, Coshocton, or Lawrence County Ohio; and 4) consenting.

Sample selection

The CARE II Project 2 approach utilized Brick's recruitment method for sub-population surveys.[125] Brick's method employs a multi-step Address-Based Sampling (ABS) process to recruit a representative sample of a desired sub-population. First, a United States postal based sampling frame is used to randomly select households. Households are then enumerated for prospective participants. Finally, eligible household residents are then randomly selected into the sample.[125]

Address-Based Sampling is gaining favor as a recruitment method for survey research since telephone-based sampling frames have been prone to increased undercoverage, especially among smokers, a desired population of study both for this dissertation and for the larger aims of CARE II Project 2.[126-130] Analysis of National Health Interview Survey data from January to June 2011 has revealed a discrepancy in smoking behavior among adults living in land-line versus wireless-less only and phoneless households; the prevalence of current smokers, defined to include a person who has smoked more than 100 cigarettes in his or her lifetime and now smokes every day or some days, among adults 18 or older living in households with landline telephone service was 16.5 % (95CI: 15.46-17.70), compared to 25.2% (95CI: 23.74-26.62) among adults in wireless-only households, and 26.6% (95CI: 21.40-32.43) in phoneless

households.[130] The difference in smoking rates by household telephone status poses a significant concern for health researchers utilizing traditional random-digit dial telephone sampling methods since the prevalence of households with only wireless services has increased from less than 5% in 2003 to over 35% in 2011.[130] In order to capture a more representative sample of the general population research sampling firms have started to develop comprehensive address-based sampling frames that include wireless only households and researchers have started to validate the use of Address-Based Sampling methods to lessen the potential of coverage error in the sampling frame and of nonobservation in final survey statistics.[125,128,130]

For the purposes of CARE II Project 2, the study team obtained a listing of households in Brown, Coshocton and Lawrence Counties in 2012 from GENESYS.[131] The household lists, based on the United States Postal Service's Computerized Delivery Sequence File, are updated on a weekly basis and provide nearly 100% coverage of all households in each county.[131] Households, typically in batches of 100 from each county, were randomly selected from the county lists and sent up to three letters of invitation, at 3 week intervals, explaining the study. Household members were asked to complete and return an enumerated form by mail to the Ohio State University research team listing the name and phone numbers of all women ages 18 or older living at the household. If the household contained only one eligible woman, that woman was invited to schedule an in-person interview. In households containing more than one

eligible woman, a random method of selection was used to determine which woman would be selected and invited into the sample.

Eligibility was confirmed by a local, county research staff member through a phone conversation. Research staff attempted to contact the sampled participant ten times before either scheduling and proceeding with an interview, or ceasing to make contact attempts. Once the participant agreed to participate, a local county research staff member scheduled an in-person interview at a place most convenient for the participant. This process was repeated until 400 women from the 3 selected Appalachian counties completed interviews. CARE II Project 2's data was collected from August 2012 through October 2013, and 408 women completed in-person interviews.

Data collection procedures

For the purpose of this dissertation project, specific measures capturing sexual and intimate partner gender-based violence exposure through the lifecourse were added to the already existent CARE II Project 2 survey instrument. Development of the participant instrument and the interview procedures are described below.

Participant survey

Survey procedures

Interviewers used Computer-Assisted Personal Interviewing (CAPI) technology to administer the survey. What follows are the steps required of an interviewer to complete a CARE II Project 2 interview (See **Table 3**)

Training data collectors

All interviewers received a four hour training to orient them to CARE II Project 2, and to alert them to the sensitivities regarding the implementation of this particular survey. The general interviewer training consisted of: 1) overview of CARE II Project 2,

TABLE 3. INTERVIEWER PROCEDURE FOR CARE II PROJECT 2 INTERVIEW

Explain Survey by Telephone & Schedule Interview (including need for privacy during administration)	The interviewer will explain the survey to the selected woman, by phone, and ask the woman to participate in the survey by scheduling an interview. Interviewers should schedule interviews at a time and location convenient for the respondent respective of potential safety concerns (i.e. partner is home)
Consent and Enroll Participant	The interviewer will explain the study, and will review the informed consent and HIPAA forms with the sampled woman. If the woman is still willing to participate, the woman will sign the informed consent and HIPAA forms. A copy of both forms will be given to the participant to keep.
Conduct Interview	The interviewer will conduct the interview using CAPI technology following the project's protocol for survey administration. All survey responses will be directly inputted into a database platform (i.e. REDCap Mobile). (Approximate time: 1 hour).
Provide Resource Sheet	All participants will be offered a resource sheet at the conclusion of the survey listing key resources in the community addressing a variety of women's health issues, including resources for free cervical cancer screening, drug dependency counseling, and advocacy services for survivors of sexual and intimate partner violence.
Provide Gift Card	All women that complete an interview will receive a $50 gift card. The interviewer will ask the respondent to sign for receipt of the gift card. Women will receive the gift card if they complete any portion of the interview, even if they refuse to answer single items or entire survey sections.
Upload Survey Results to Secure Server	Within 24 hours of interview, and in the same day if possible (dependent on available internet connection), interviewers will upload completed surveys from their local CAPI laptop (REDCap Mobile) to the secure server behind the Wexner Medical Center at OSU's firewall (REDCap Enterprise). The Project Manager will review uploaded data to ensure integrity in the process. Once uploaded, interviewers will no longer be able to access completed survey information.
Secure Forms	Interviewers will save study forms in a locked filing cabinet. On a monthly basis, forms will be mailed to the Project Manager.

2) task oriented interviewer behavior, 3) introducing survey to participants and safety considerations when scheduling interview, 4) the survey instrument, including practicing reading the survey directions, questions, and prompts as written, 5) CAPI technology and procedures for uploading survey data to a secure server, 6) probing to reduce item non-response, 7) approaches to administering sensitive question, 8) protocol for survey administration, 9) screening woman sampled from household, and 10) importance of integrity in data collection protocols (deterrent for falsification). In addition, and to account for the sensitivity of the trauma section of the survey, all project staff were also trained, by the current dissertator, in: 1) signs of and brief interventions with people who may be at risk for suicide/self-harm, 2) signs of and brief interventions with people who may have experienced trauma, 3) orientation to local mental health, alcohol and drug services, hospital, and sexual and domestic violence advocacy services (in regional breakouts) and 4) training on implementing the project's "Research Interview and Distress Protocol" in case a participant appeared distressed as a result of the interview.

Informed Consent

On the day of the interview, prior to beginning the interview, the interviewer reviewed the informed consent form with each participant, inviting questions, if any. If the sampled respondent consented to participant in the study, they were asked to sign a copy of the informed consent form. The Ohio State University Internal Review Board (IRB) approved all consent forms, study protocol, and data collection tools.

Development of Distress Protocol

It has been suggested by some survey methodologists that anonymous methods are best for collecting data on sensitive topics, such as illegal or sexual activity, because anonymous methods of data collection help to reduce distress to survey respondents.[128] Juxtaposing this perspective, there is a body of literature which suggests that despite its sensitive nature, participating in trauma research for survivors of gender-based violence is not distressing to all, but a small sub-set, of the population;[63,132,133] most notably those with current posttraumatic stress disorder.[133,134] In fact, gender-based violence survivors may actually benefit from participating in research which directly asks about gender-based violence exposures, with quantitatively higher positive gains reported from respondents participating in interview administered surveys versus written surveys.[132,134-136]

Recognizing that the trauma section questions, in particular, could trigger reactions in a small sub-sample of the sampled population, the dissertator, in the role of Graduate Research Associate at the time, developed the Research Interview and Distress Protocol for CARE II Project 2 (See **Appendix A: CARE II Project 2 Research and Distress Protocol**). All interviewers received training on procedures outlined in the distress protocol to assure that they would know how to respond if a participant were to experience visible distress at any time during survey administration. The distress protocol was based on a similar protocol published in the literature.[137] In addition to the distress protocol, itself, the dissertator also developed county-specific women's

health referral handouts that were offered to all participants, by the interviewer, at the conclusion of the interview. The handouts contained information on where to call or go to receive services for many of the health related topics covered by the survey, including information on local intimate partner and/or sexual gender-based violence crisis intervention programs.

Incentives for participation

Participants received a $50 gift card to reimburse them for their participation and time. In addition, participants were also offered a county resource handout highlighting local women's health related resources.

Measures and Instrumentation

Each participant completed a cross-sectional survey administered, in person, by a local county interviewer. The interviews have provided data for use in the characterization of variables theorized to have associations with gender-based violence exposure, and or smoking, at several social ecological levels (i.e. intrapersonal, interpersonal, organizational, and neighborhood/community).

Intrapersonal factors

Intrapersonal factors measured include:

1) ***sexual abuse and intimate partner violence exposure*** across the life course using modified National Intimate and Sexual Violence Survey (NISVS) measures;[2] to accommodate length consideration, many of the original NISVS questions were either combined, or the response options were altered, or both. In

addition, Ms. Nemeth developed new questions pertaining to health care usage restrictions by intimate partners. The new and altered questions were taken through cognitive interviews and an external expert review by Dr. Amy Bonomi;

2) selected ***Adverse Childhood Experiences*** (ACE) exposures, including parental separation or divorce, witnessing parental intimate partner violence, and parental physical and emotional abuse of participant before the age of 18;[138]

3) ***smoking status*** (never, former, current) based on NHIS categories, ***smoking tobacco use history*** for current and former smokers, including consumption and past quit attempts;[139,140]

4) **nicotine dependence**, for current smokers, using the Fagerström Test of Nicotine Dependence (FTND);[141,142] a composite score of 0-10 is compiled by adding points received based on responses to 6 questions;[142]

5) ***alcohol use*** using the CAGE questions;[143,144]

6) ***depression*** using the Center for Epidemiologic Studies-Depression Scale (CES-D);[145-147]

7) ***perceived stress*** using the Perceived Stress Scale (PSS);[148]

8) ***loneliness*** using the Three Item Loneliness Scale;[149] and

9) ***demographic characteristics***, including socio-economic status, taken from the Baseline Economic Analysis Survey, National Health and Nutrition Examination Survey (NHANES) and the US Census;[140,150]

Interpersonal factors

Interpersonal factors measured include:

1) ***household (HH) smoking status***;

2) ***social influences on smoking cessation*** using van den Putte's 6-factor scale; the scale captures information on explicit social influences, including verbal input to quit smoking (Explicit Verbal Norm) and offerings of information or help with cessation (Explicit Behavioral Norm) along with implicit social influences, including perceptions about how many other people smoke (Descriptive Social Norm), perceptions about how many other people quit smoking (Descriptive Quitting Norm), perception of acceptability of smoking, in general (Injunctive Norm), and perception of if other people think that the survey participant should quit smoking (Subjective Norm);[151]

3) ***social support*** of friends, family, and partner using the Multidimensional Scale of Perceived Social Support (MSPSS); [152-154]

4) ***discrimination***, using the Detroit Area Study Discrimination Scale (DAS-DQ);[155]

Organizational factors

Organizational factors measured include:

1) ***household smoking rules and restrictions*** using Current Population Survey (tobacco supplement) measures;[140]

2) ***workplace smoking exposure and workplace restrictions*** using Current Population Survey (tobacco supplement) measures;[140]

3) ***social participation***, eliciting group and society activity involvement in the past twelve month, using a social participation scale developed by Hanson et al..[156] The social participation index lists 13 items and asks participants to indicate if they have or have not participated in the activity in the past 12 months. If a participant indicates they have participated in three or less activities, their social participation is classified as low. This scale has acceptable reliability (Cronbach's alpha = 0.61);[157]

Neighborhood/community factors

Neighborhood/community factors measured include:

1) ***neighborhood cohesion*** using adapted measures from the Community Counts Survey; participants are asked to strongly agree, somewhat agree, neither agree or disagree, somewhat disagree and strongly disagree concerning 5 statements about people in their neighborhood or community;[158,159]

2) ***social status*** from the MacArthur Scale of Subjective Social Status;[160] Participants are asked to rank their position, by pointing to one rung on a 10 rung ladder, for both their 1) perceived standing in their community (community ladder) and 2) perceived financial standing compared to others in the United States (SES ladder).[160] Subjective social status within the community is scored from 1 to 10 on the community ladder, with 1 indicating the participant pointed to the lowest rung on the ladder and 10 indicating the participant pointed to the

highest rung on the ladder. Subjective social economic status is also scored from 1 to 10 on the SES ladder following the same rules for the community ladder.

Creating composite and derived variables

A table containing relevant coding and composite score creation information for all tobacco control variables can be found in **Appendix B: Tobacco Control Variables**. The dissertator, as part of analysis, created coding necessary to represent the sexual assault and/or intimate partner gender-based violence variables in line with findings from Specific Aim #3. Composite measures and derived variables, from CARE II Project 2, were used for other analysis if available; otherwise the dissertator derived smoking specific and contextual variables, as well.

Data management & analysis

Data management

Study data were collected by the CARE II Project 2 study team, and managed by the CARE II data and analysis core, using REDCap electronic data capture tools hosted through the Ohio State University Wexner Medical Center.[161,162] REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture and data transfer for research studies. The use of REDCap by the CARE II Project 2 study team allowed for:

1) an interface for validated data entry on REDCap Mobile laptops, used by interviewers in the field, and a data transfer protocol, allowing for secure survey data transfer from REDCap mobile devices to the REDCap Enterprise database

housed behind the firewall at the Ohio State University Wexner Medical Center at the conclusion of each interview;

2) audit trails for tracking data manipulation and export procedures, managed by the CARE II data and analysis core;

3) automated export procedures for data downloads to common statistical packages, including SAS; and

4) procedures for importing data from external sources.[161,162]

The dissertator used a dataset prepared by the CARE II Data and Analysis Core for dissertation analysis, and participated in data cleaning and code book creation, in tandem with CARE II's Data and Analysis Core to whatever extent was requested and necessary, including providing the code necessary to derive all gender-based violence variables. Bo Lu, the chair of CARE II's Data and Analysis Core, is a member of the dissertator's dissertation committee. The Final CARE II Project 2 database was used by the dissertator for final dissertation analysis.

Quantitative analysis

Specific aim #3 analysis was conducted first since the answer to the question posed determined how sexual and/or intimate partner gender-based violence was modeled in the analysis for specific aims #1 and 2. The confirmatory factor analysis necessary for specific aim # 3 was conducted in LISREL 9.10,[163] after data preparation in SAS 9.3.[164] All correlation and regression analyses for specific aims # 1 and 2 were

conducted in SAS 9.3.[164] Details of analyses are listed in the methods sections of the corresponding presentation of finding chapters.

Sample size estimation

The sample size of 400, originally estimated to provide the necessary power to examine the primary aims of CARE II Project 2, was sufficient for addressing the primary aims of this dissertation analysis. Aim 1, focused on estimating population proportions, required the largest sample size of the presented aims. The only specific population-based prevalence data for any form of sexual and/or intimate partner gender-based violence in Ohio Appalachia, before this dissertation analysis, came from the Ohio Family Health Survey. In 2010, 18.9% of women in Ohio Appalachia reported experiencing physical violence from an intimate partner at some point in their lifetime, compared to a state-wide lifetime prevalence of 17.8%.[52] The Centers for Disease Control had provided statewide prevalence data for a more inclusive gender-based violence against women measure, namely lifetime prevalence of rape, physical violence and/or stalking by an intimate partner among women, for which women in Ohio in 2010 reported a lifetime prevalence of 35.6%.[2] Since no comparable measure was available for Ohio Appalachia at the time this dissertation was proposed, a ratio comparison was set up, with the available lifetime prevalence data for physical violence by an intimate partner, in order to estimate lifetime prevalence of rape, physical violence or stalking by an intimate partner in Ohio Appalachia. Based on this comparison, we anticipated a lifetime prevalence of 37.8%, among women in Ohio Appalachia, of exposure to rape,

physical violence and/or stalking by an intimate partner. In order to estimate with 95% confidence the proportion of Ohio Appalachia women who report experiencing exposure to intimate partner gender-based violence (inclusive of rape, physical violence and/or stalking) at some point in their lifetime, tolerating a ± 5% margin of error, the following formula was used to calculate sample size (p=expected population proportion and E=margin of error):[128]

$$\text{Sample Size} = \frac{1.96^2 \times p(1-p)}{E^2} = \frac{3.8416 \times (.378\ (1-.378)]}{.05^2} = 361$$

With a sample size of 361 women, the study was sufficiently powered to estimate population proportions for a range of sexual and/or intimate partner violence exposures, and was also sufficiently powered for regression analyses in Specific Aim 1, and latent variable creation and confirmatory factor analysis in Specific Aim 3.[165,166]

Response rate calculation

Response rates for the CARE II Project 2 survey have been reported elsewhere, by members of the CARE II Project 2 team, using definitions obtained from the American Association for Public Opinion Research (AAPOR).[167,168] Final response rates are reported according to AAPOR response rate 1 calculations.[168]

Survey design and weights

To remain consistent with analysis techniques of the primary CARE II Project 2 analyses planned, the dissertator did not apply survey weights in order to estimate statistical parameters for this dissertation.

Statistical analysis performed

Refer to the statistical analysis procedures contained in the methods sections of the dissertation chapters containing presentation of findings for information about analyses performed.

A note about the creation of a composite gender-based violence exposures variable (GBV Exposure Index Score)

Eight types of gender-based violence are reported based on the findings from the gender-based construct analysis from specific aim #3. Due to high degree of correlation between the gender-based violence type constructs, a four level composite variable representing cumulative exposure to the 8 types of sexual and/or intimate partner gender-based violence, the *Gender-based Sexual And Intimate Partner Violence Exposures Index Score (GBV Exposure Index)*, was created for use in analysis, and to represent theoretically or quantitatively meaningful cut points in terms of the relationship between gender-based sexual and/or intimate partner violence exposures and smoking status. Cut points were determined by looking at the percent distribution of current smoking by the number of exposure to the eight abuse types and noting where percentage of smokers clustered and then appeared to jump. In addition, logistic regression models were run to compare model fit based on reasonable variations on abuse type number assigned to each category to substantiate cut point choice. A participant was categorized into one of four GBV Exposure Index levels: No exposure, Low exposure (exposure to any one type of gender-based sexual and/or intimate partner violence), Moderate Exposure (exposure to any 2 to 6 types of gender-based

sexual and/or intimate partner violence), or High Exposure (exposure to 7 or 8 types of gender-based sexual and/or intimate partner violence), range 0-3. The same GBV Exposure Index variable is used throughout the dissertation to represent gender-based sexual and/or intimate partner violence exposure in analysis. There is precedent in literature for creating cumulative violence exposure variables. Creating composite cumulative exposure variables in health behavior research has been soon to have significant predictive power in the area of Adverse Childhood Experiences,[15] in particular. There is evidence, as well, that cumulative gender-based violence also correlates to worse health outcomes.[50]

Chapter 3: Aim 1 Manuscript
An update on risk factors for smoking in rural women: the role of gender-based sexual and intimate partner violence

ABSTRACT

Background: Women living in Ohio Appalachia experience cervical cancer at disproportionately high rates. Both gender-based violence and smoking are independent risk factors in the development of cervical cancer, and interact to heighten risk. Smoking rates among women living in Ohio Appalachia are higher than among women living in other regions of Ohio. However, little is known about 1) women's exposure to intimate partner and sexual gender-based violence, throughout the life course, in Ohio Appalachia, or 2) the association between gender-based violence exposures and smoking among women in the region.

Methods: Randomly selected Ohio Appalachian women completed an interviewer administered cross-sectional survey (n=398). Logistic regression and correlation analyses were utilized.

Results: Almost 57% of women in Ohio Appalachia have experienced intimate and/or sexual gender-based violence. Among current smokers, 77.5% reported gender-based

violence exposure. The distribution of the Gender-based Violence (GBV) Exposure Index score, a categorical score representing cumulative exposure to eight abuse types, was significantly different across smoking status (p=<.0001), with prevalence shifting towards higher exposure categories when moving from never, to former, to current smokers. When controlling for known risk factors including high depressive symptomology, age, and adult socioeconomic position, cumulative sexual and/or intimate partner violence exposure was an independent risk factor for current smoking behavior (p=0.0002). **Discussion:** The impact of sexual and intimate partner gender-based violence, and this exposure's impact on health sequel, must be directly addressed in order to reduce health burden associated with higher rates of smoking among women in Ohio Appalachia.

Introduction

Despite public health efforts in curbing the tobacco epidemic in the United States in the 20th century, tobacco use remains the single most preventable cause of morbidity and premature mortality today.[8-12] Approximately 443,000 adults in the United States die annually from smoking related morbidities.[169] However, recent findings have increased this estimate by another 17%.[12] Today's smokers, when compared to smokers of the past, are more likely to be marginalized, including those with less education, living in poverty, living with disabilities, including mental illness, and abusing other substances.[6,7,14] It has been noted that clustering of these risk factors for smoking occurs within populations residing in certain geographic regions of the United States, including in Appalachia.[55,170,171]

Regional differences in smoking prevalence persist for Ohio women. In Ohio Appalachia, in 2012, 32.1% (95%CI: 29.4-34.8) of women aged 19 and older smoked every day or some days—compared with 22.7% (95%CI: 21.3-24.1) in metropolitan regions, 24.4% (95%CI: 21.5-27.4) in rural non-Appalachian regions, and 23.3% (95%CI: 20.6-26.1) in suburban regions of the state.[54] Due to the differential smoking rates in Ohio Appalachia, women living in this region are at increased risk for tobacco-attributable disease.[172] For instance, smoking is one of the risk factors linked to elevated cervical cancer incidence and mortality in the region.[45,49] From 2000-2004, Ohio Appalachian women experienced invasive cervical cancer at an average annual

age-adjusted rate of 9.7 per 100,000 females--24.4% higher than women in non-Appalachian regions of the state.[46] Women in Ohio Appalachia not only develop cervical cancer at rates higher than women in non-Appalachian regions, they are more likely to die from cervical cancer; from 2000-2004, the average annual age-adjusted mortality rate among Ohio Appalachian women was 3.4 per 100,000 females—a rate 41.7% higher than among non-Appalachian residing women.[46]

Another recently identified risk factor for cervical cancer is exposure to violence against women, defined to include intimate partner violence, child sexual abuse, and forced sex in adulthood.[50] A cross-sectional analysis of the 2006-2007 Kentucky Women's Health Registry demonstrated after controlling for other known risk factors for cervical cancer development, women with any history of violence against women had 2.6 times the odds of ever having cervical cancer in comparison to women with no exposure (95%CI: 1.7-3.9); whereas the odds of ever having cervical cancer increased to 6.4 (95%CI: 2.7-14.9) among women with exposure to all three types of abuse compared to those never exposed.[50] In addition, and of central importance to this study, while ever smoking (OR 2.3, 95% CI: 1.1-4.7) and ever having experienced violence against women (OR 2.7, 95% CI 1.4-5.1) were both associated with cervical cancer, the combined effect of ever smoking and ever having experienced violence against women raised the odds of cervical cancer incidence substantially (OR 4.9, 95% CI: 2.6-8.9). Although elevated rates of smoking among women in Ohio Appalachia are a known risk factor for cervical development in the region, no estimates exists for a spectrum of

gender-based violence exposure types which, if present, could be contributing independently, or in interaction with smoking, to cervical cancer disparities in Ohio Appalachia.

In addition, it is believed due to the documented relationship between various forms of gender-based violence and smoking from extant literature that gender-based violence, if present, may also be contributing in its own right to the elevated rate of smoking among women in the region. Abuse in childhood and adolescents has been associated with smoking in numerous studies. For instance, in a nationally representative U.S. sample, adolescent girls who reported a history of both physical and sexual abuse had odds of regular smoking 5.90 that of girls not exposed.[18] Cumulative exposure to multiple abuse forms in childhood and adolescence was a robust positive predictor of cigarette smoking later.[16] In addition, child sexual abuse exposure, in particular, has been linked to smoking persistence, and also with nicotine dependence, cigarettes smoked per day, earlier age of regular smoking onset, and more severe withdrawal symptoms among smokers who attempt to quit.[15-24] Despite the increased use of tobacco by victims, women exposed to child sexual abuse are less likely to have received substance abuse treatment over the course of their lifetime when compared to never exposed women.[25] Adult sexual and intimate partner violence exposure is also associated with smoking, along with other risk factors for smoking. [26-28] In the United States, current or past intimate partner violence exposure elevate odds for smoking,[24,29-37] with current smoking odds ratios of 2.1 for intimate partner violence exposed women

when compared to non-exposed women.[33,36] Whereas, women in currently abusive relationships are at increased risk for smoking, adding single or multiple instances of physical and sexual abuse by a partner further accentuates this risk.[173]

Risk factors for smoking have been identified for women in Appalachia and include low socioeconomic position in adulthood (OR 3.05, 95% CI: 1.74-5.34), Center for Epidemiologic Studies Depression (CES-D) scale score $\geq$ 16 (OR 1.99, 95% CI: 1.31-3.05), first pregnancy before age 20 (OR 1.74, 95% CI: 1.14-2.66), and younger categorical age when compared to those over age 50 (age 31-50, OR 2.30, 95% CI: 1.22-4.33; age 18-30, OR 3.29, 95% CI: 1.72-5.34).[55] Preliminary evidence suggests that physical intimate partner violence may also be an associated factor.[29] In a population based sample, the unadjusted odds of smoking among Ohio Appalachian women with a lifetime history of physical intimate partner violence was 3.47 times the odds of smoking among women with no exposure.[174] Given the public health implications to our understanding of health disparities in the region, further investigation is warranted to understand how a spectrum of intimate partner and sexual gender-based violence exposure through the life course is associated with current smoking in the region.

The aim of this study was: 1) to characterize intimate partner and sexual gender-based violence exposure by type and by graded, cumulative exposure among women in Ohio Appalachia and 2) to determine this exposure's association with current smoking among women in the region. This investigation uses data collected as part of one of

four studies stemming from the National Cancer Institute (NCI)-funded Appalachian Center for Population Health and Health Disparities P50 CA105632-06 to answer the questions: 1) What is the prevalence of a spectrum of intimate partner and/or sexual gender-based violence abuse types among women living in Ohio Appalachia? 2) What is the distribution of smoking status (never, former, and current) by intimate partner and/or sexual gender-based violence exposure among Appalachian Ohio women? 3) What is the association between cumulative exposure to a spectrum of intimate partner and/or sexual gender-based violence abuse types and current smoking behavior among Appalachian Ohio women, accounting for the other known risk factors for smoking among women in this region, including depression, age, and adult socioeconomic position? This investigation will help us more fully understand the relationship between two known risk factors for cervical cancer development, in general, and how gender-based violence, in particular, may be contributing to elevated cervical cancer and smoking disparities experienced by women in the region.

Materials and Methods

Study design and recruitment. A two-phase address-based sampling approach described elsewhere[175] was used to recruit a random sample of women, 18 years of age or older, from selected Ohio Appalachian counties, to participate in an observational, interview administered, cross-sectional survey.[27] A recruitment letter, household enumeration questionnaire, self-addressed stamped envelope, and $2 bill were sent to

each household randomly sampled from a U.S. Postal Service list. A household resident was asked to return the completed enumerated household questionnaire by mail (i.e. enumerated for women 18 years of age or older). An eligible woman (i.e. 18 or older and residing in one of the three counties) was randomly selected by research staff for participation in the study from each enumerated household questionnaire. A paid local research interviewer, trained by the research team, contacted the selected participant to explain and invite participation into the research study, and, if interested, set a time for consent and interview. The University's Institutional Review Board approved the study.

Interview Procedure. Local interviewers received training in a trauma-informed distress protocol[137] designed for this study. All interviews were conducted at a private location chosen by the study participant. After consenting the participant, interviewers read all survey questions and response options out loud to the participant and used REDCap electronic data capture tools to record answers on a secure laptop.[162] Consent to proceed was obtained twice during the module containing abuse exposure questions. Upon completion, all participants were offered a list of county-specific women's health resources and received a $50 gift card.

Measures. Demographic variables obtained for use in this analysis included: age (18-29, 30-49, and ≥50 years); race (white vs. other); education (less than HS, HS diploma, General Educational Development (GED), and >high school diploma); marital status (married, divorced or separated, widowed, never been married, and living with a partner); annual household income; number and age of people living at residence of

participant; and health insurance (private, government-assisted, or none). In addition, the following measures were collected and/or variables derived.

Abuse exposure measures

Sexual and/or Intimate Partner Gender-based Violence Type Exposure. Sexual and/or intimate partner gender-based violence exposure was measured by 22 questions using modified National Intimate and Sexual Violence Survey (NISVS)[2] measures and medical restriction questions developed by the study team. Based on prior methodological analysis,[176] sexual and/or intimate partner gender-based violence was modeled using eight constructs or types of abuse--demeaning emotional abuse, fear invoking control, isolation, physical assault, medical restriction, and reproductive coercion by an intimate partner in addition to coerced and forced sexual abuse by an intimate partner or other.

Gender-based Sexual And Intimate Partner Violence Exposures Index Score (GBV Exposure Index). A four level composite variable representing cumulative exposure to the 8 types of sexual and/or intimate partner gender-based violence, the GBV Exposure Index, was created. The variable represented theoretically or quantitatively meaningful cut points that were determined in relation to percent distribution of current smoking by exposure to an increasing number of eight gender-based violence abuse types. A participant was categorized into one of four GBV Exposure Index levels: No exposure, Low exposure (exposure to any one type of gender-based sexual and/or intimate partner violence), Moderate Exposure (exposure to any 2 to 6 types of gender-based

sexual and/or intimate partner violence), or High Exposure (exposure to 7 or 8 types of gender-based sexual and/or intimate partner violence), range 0-3.

Smoking measure

Smoking Status. Questions from the National Health Interview Survey (NHIS) and the National Cancer Institute-sponsored Tobacco Use Supplement to the Current Population Survey were used to assess smoking status. Participants were categorized as never smokers if they reported never having smoked 100 cigarettes in their lifetime; as former smokers if they had smoked 100 cigarettes in their lifetime but did not smoke now; and as current smokers if they had smoked 100 cigarettes in their lifetime and now smoke cigarettes every day or most days.[139,140,177]

Measures for other known risk factors for smoking

Other risk factors for smoking

Adult Socioeconomic Position (SEP). A woman's adult socioeconomic position was defined as high if the participant met the following three requirements: 1) a poverty income ratio above the sample's median cutoff point; 2) private health insurance, and 3) education >high school diploma. If the participant did not meet these three requirements, adult SEP was defined as low.[55]

Depressive symptomology as measured by the Center for Epidemiologic Studies Depression scale (CES-D).[178] The CES-D is a 20-item instrument, range score 0 to 60, used to assess frequency of past week feelings and behaviors for use in the general population to determine if further investigation of depressive symptoms should be

considered. A cut point of ≥16 as standardly used within epidemiologic surveys was used to indicate depressive symptoms of clinical concern.[178]

Adverse Childhood Experiences (ACE). Selected ACE exposures were measured including parental separation or divorce, witnessing parental intimate partner violence, and parental physical and emotional abuse of participant before the age of 18.[179] An ACE Score was totaled, with participants receiving 1 point for each ACE exposure, range 0-4.

Statistical analysis. Analysis was performed in SAS, Version 9.3.[164] To answer research question 1, descriptive statistics were calculated for each abuse exposure variable. To answer research question 2, participants were categorized by smoking status (i.e., never, former, and current) and descriptive statistics were calculated for each demographic variable. Chi-square tests were performed for categorical variables and Kruskal-Wallis tests were performed for ordinal variables to determine if the distribution of each demographic and abuse exposure variable differed across smoking status. To answer research question 3, and mirroring the modeling for smoking status on the published risk factor for smoking paper among this population,[55] a multivariable logistic regression model was fit with the binary outcome of smoking status (1=current smoker; 0=former and never smoker). Univariate analysis with binary smoking status was performed for all known risk factors for smoking among this population[55] contained in the dataset and all abuse exposure variables, using LOGISTIC procedure in SAS. Interaction analysis between all known risk factors for smoking with Gender-based

Sexual And Intimate Partner Violence Exposures Index Score were also performed. All univariate terms found to have significant associations (p=.05) were then added to a multivariable logistic regression model to allow for the independent effect of each variable, controlling for other known risk factors. The model fit was examined using Hosmer-Lemeshow test and area under the receiver operating characteristic (ROC) curve.[180]

Results

Response rate. Calculations for household response rate and sampled individual participation rate were based on AAPOR RR1 formula. [181] Screening packets were mailed to 1950 households and 776 enumerated questionnaires were returned, resulting in a 44.4% response rate for household enumeration after accounting for ineligible households. Of households responding, 599 eligible women were selected into the sample, with 408 women completing interviews, resulting in a 71.0% participation rate based on AAPOR RR1.[181]

Sample characteristics, including gender-based violence exposure, by smoking status. The analytic sample comprised 398 participants who provided complete gender-based violence exposure histories (97.5% of sample). Of those, demographic characteristics and abuse exposure distributions by never, former, and current smoking status are presented in **Table 4** and **Table 5**, respectively. **Figure 2** depicts the percentage of

TABLE 4. DISTRIBUTION OF SAMPLE DEMOGRAPHIC CHARACTERISTICS AND BY CURRENT SMOKING STATUS

Characteristic	*Total* (N=398) %	*Never smokers* (N=226) %	*Former smokers* (N=92) %	*Current Smoker* (N=80) %	*p-value*[a]
Age, categorical					0.0055**
18-29 years old	13.57	15.04	5.43	18.75	
30-49 years old	31.41	26.99	33.70	41.25	
50+ years old	55.03	57.96	60.87	40.00	
Race, White					0.0867
White	96.48	97.79	96.74	92.50	
Other	3.52	2.21	3.26	7.50	
Education					
Less than high school (HS)	6.28	1.77	10.87	13.75	0.0006***
HS diploma	25.63	25.22	27.17	25.00	
GED	2.51	1.33	4.35	3.75	
>HS diploma	65.58	71.68	57.61	57.50	
Marital Status					<.0001****
Married	66.08	74.78	61.96	46.25	
Divorced or Separated	12.06	8.85	15.22	17.50	
Widowed	8.54	7.96	13.04	5.00	
Never been married	7.54	5.75	4.35	16.25	
Living with partner	5.78	2.65	5.43	15.00	
Income at or below 100% poverty threshold (n=350)	15.14	8.67	10.98	37.50	<.0001****
Adult Socioeconomic Position (n=377)					<.0001****
Hi	35.28	46.19	28.09	14.10	
Low	64.72	53.81	71.91	85.90	
Depressive Symptoms of Clinical Concern					
CES-D score					0.0030**
<16	82.23	87.44	79.35	70.89	
≥16	17.77	12.56	20.65	29.11	

[a] Chi-square test performed for categorical variables. Kruskal-Wallis test performed for ordinal variables. Significance Level: *∝< .05, **∝< .01, ***∝< .001, ****∝< .0001

never, past and current smokers by Gender-based Violence Exposure Index Score. As GBV Index Score increases, the percentage of never smokers decreases. In all categories, except among those with the highest level of exposure, there are more past smokers than current smokers. Among women who reported 7 or 8 types of gender-based violence exposure, 61% currently smoke, whereas only 13% are former smokers, and 26% are never smokers.

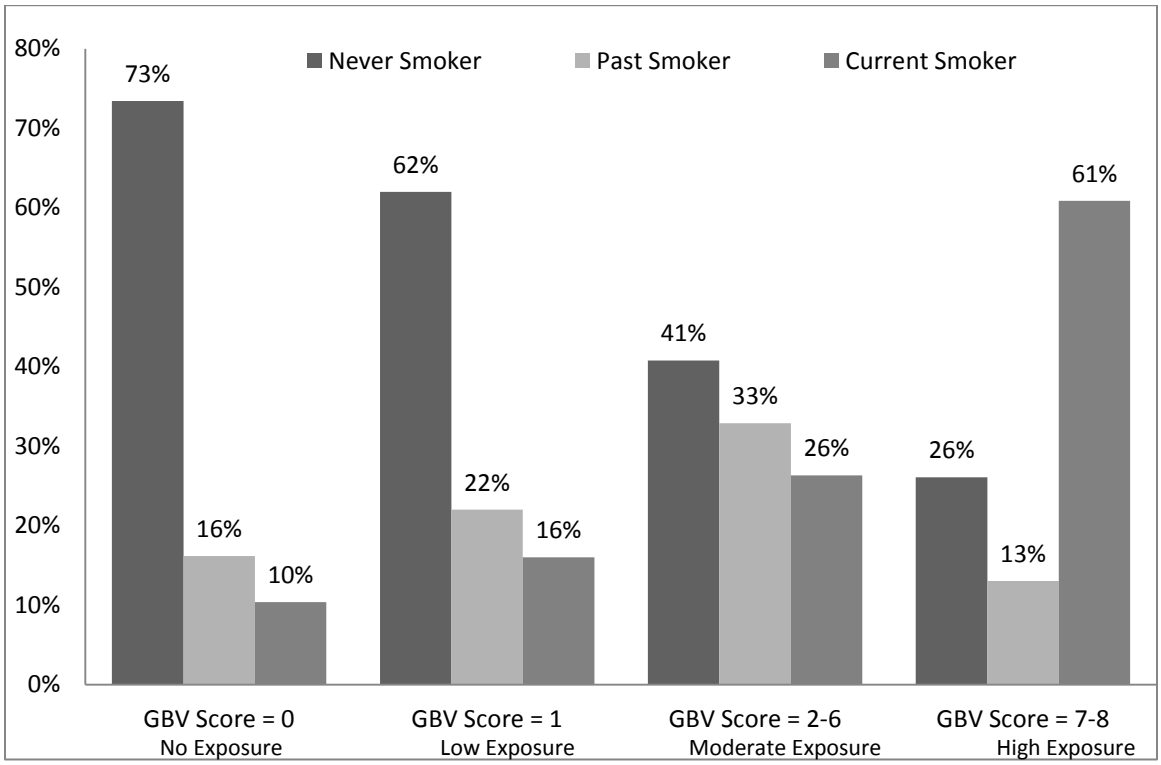

FIGURE 2. PERCENTAGE OF NEVER, PAST AND CURRENT SMOKERS BY GENDER-BASED VIOLENCE EXPOSURE INDEX SCORE

Association between gender-based violence abuse exposure and smoking status. Of women, 56.8% reported never smoking (226/398), 23.1% report past smoking (92/398), and 20.1% reported current smoking (80/398). There was a significant difference in sexual and/or intimate partner gender-based violence lifetime exposure, and for each abuse type, across smoking status, with prevalence increasing in each case when moving from never smokers, to former smokers, to current smokers (See **Table 5**). Among current smokers, 77.5% reported sexual and/or intimate partner violence lifetime exposure, compared to 69.6% among former smokers and 43.8% among never smokers (p=<.0001). The categorical distribution of the GBV Exposure Index score (p=<.0001) was also significantly different across smoking status, with prevalence of exposure shifting towards higher GBV Exposure Index categories when moving from never, to former, to current smokers. Among never smokers, the mean GBV Exposure Index score (range: 0-3) was 0.77 and the median was 0 exposures, compared to a mean of 1.30 and a median of 2.00 exposures among former smokers, and a mean of 1.63 and a median of 2 exposures among current smokers; the distribution of GBV Exposure was different by smoking status (p=<.0001).

Association between demographic characteristics and smoking status. The distribution of categorical age (p=0.0055), education (p=0.0006), marital status (p=<.0001), adult socioeconomic position (p=<.0001) and depressive symptoms of clinical concern (p=0.0030) were all significantly different between smoking status exposure categories (**Table 4**). Among never smokers, 58% were 50 or older, 27% were

TABLE 5. DISTRIBUTION OF GENDER-BASED VIOLENCE AND ACE EXPOSURE BY CURRENT SMOKING STATUS

Characteristic	*Total* (N=398) %	*Never smokers* (N=226) %	*Former smokers* (N=92) %	*Current Smoker* (N=80) %	*p-value*[a]
Sexual and/or Intimate Partner Gender-based Violence Lifetime Exposure (any)	56.53	43.81	69.57	77.50	<.0001****
Intimate Partner Psychological Abuse	51.76	40.27	61.96	72.50	<.0001****
Demeaning Emotional Abuse	31.41	22.12	42.39	45.00	<.0001****
Fear Invoking Control	40.45	29.65	46.74	63.75	<.0001****
Isolation	43.72	33.19	52.17	63.75	<.0001****
Intimate Partner Physical Abuse	21.61	12.39	27.17	41.25	<.0001****
Physical Assault	20.85	11.95	26.09	40.00	<.0001****
Medical Restriction	6.03	3.98	5.43	12.50	0.0219*
Sexual Abuse by an Intimate Partner or Other	33.67	22.57	46.74	50.00	<.0001****
Reproductive Coercion (intimate partner)	9.30	5.75	10.87	17.50	0.0067**
Coerced Sexual Abuse	22.36	14.60	28.26	37.50	<.0001****
Forced Sexual Abuse	22.86	11.95	34.78	40.00	<.0001****
Gender-based Violence Exposures Index Score					<.0001****
No Exposure	43.47	56.19	30.43	22.50	
Low Exposure (exposure to any one type of abuse)	12.56	13.72	11.96	10.00	
Moderate Exposure (exposure to any 2-6 types of abuse)	38.19	27.43	54.35	50.00	
High Exposure (exposure to 7 or 8 types of abuse)	5.78	2.65	3.26	17.50	
Adverse Childhood Experiences Exposure (ACE) Score (n=396)					0.0014**
No Exposure	45.20	53.54	39.13	28.21	
Exposure to 1 ACE	26.77	25.66	30.43	25.64	
Exposure to 2 ACE	14.90	12.39	15.22	21.79	
Exposure to 3 ACE	6.57	3.98	8.70	11.54	
Exposure to 4 ACE	6.57	4.42	6.52	12.82	
					p-value[b]
Gender-based Violence Exposures Index (range 0-3)					<.0001****
Mean (sd)	1.06(1.02)	0.77(0.94)	1.30(0.95)	1.63(1.02)	
Median (var)	1.00(1.05)	0.00(0.89)	2.00(0.90)	2.00(1.05)	
Adverse Childhood Experiences Exposure Score (n=396, range 0-4)					<.0001****
Mean (sd)	1.03(1.21)	0.80(1.09)	1.13(1.22)	1.55(1.35)	
Median (var)	1.00(1.46)	0.00(1.18)	1.00(1.48)	1.00(1.84)	

[a] Chi-square test performed for categorical variables. [b] Kruskal-Wallis test performed for ordinal variables. Significance Level: *∝< .05, **∝< .01, ***∝< .001, ****∝< .0001

30 to 49 years of age and 15% were 18 to 29 year old; whereas among current smokers, 40% were 50 or older, 41% were 30 to 49, and 19% were 18 to 29 years of age. Current smokers were less educated than former smokers who reported less education than never smokers. Whereas75% of never smokers, and 62% of former smokers reported current marriage, only 46% of current smoker did; however, a higher percentage of current smokers reported never being married (16%) or living with a partner (15%) in comparison to never (6% and 3%, respectively) and former smokers (4% and 5%, respectively). High adult socioeconomic position was concentrated among never smokers (46%) versus only 28% among former smokers and 14% among current smokers. CES-D scores of 16 or higher, indicating that a person reported depression symptoms of concern were most concentrated among current smokers (29%), followed by former smokers (21%), and then never smokers (13%).

Sexual and intimate partner gender-based violence exposure is a risk factor for current smoking behavior. A univariate model was fit for each of 8 sexual and/or intimate partner gender-based violence exposure types, for the GBV Exposure Index score, for adverse childhood experiences (by exposure level and for the ACE composite score), and for known risk factors for smoking among rural women,[55] including categorical age, adult socioeconomic position, and depressive symptoms of clinical concern (**Table 6**).

Maximum likelihood estimates from the final adjusted model for risk factors for smoking among this population are presented in **Table 7**. When controlling for age and adult socio-economic position, cumulative sexual and/or intimate partner violence

TABLE 6. UNIVARIATE ODDS RATIOS AND 95% CONFIDENCE INTERVALS OF CURRENT SMOKING

	OR (95% CI) of being a current smoker vs. nonsmoker[a]	*p-value*
Sexual and/or Intimate Partner Gender-based Violence Exposure Types (n=398)		
No Exposure to Gender-based Violence	1.0	
Demeaning Emotional Abuse	2.11 (1.27,3.49)	0.0038**
Fear Invoking Control	3.33 (2.00,5.54)	<.0001****
Isolation	2.79 (1.68,4.64)	<.0001****
Physical Assault	3.49 (2.04, 5.98)	<.0001****
Medical Restriction	3.10 (1.32, 7.27)	0.0092**
Reproduction Coercion (intimate partner)	2.72 (1.33, 5.57)	0.0061**
Coerced Sexual Abuse (intimate partner or other)	2.63 (1.55, 4.49)	<.0001****
Forced Sexual Abuse (intimate partner or other)	2.93 (1.72, 4.97)	<.0001****
Gender-based Violence Exposures Index (n=398)		
No Exposure	1.0	
Low Exposure (exposure to any one of 8 types of abuse from above)	1.64 (0.67, 4.03)	0.2812
Moderate Exposure (exposure to any 2 to 6 types of abuse)	3.08 (1.68, 5.64)	0.0003***
Hi Exposure (exposure to 7 or 8 types of abuse)	13.40 (5.08, 35.31)	<.0001****
Gender-based Violence Exposure Index Score (range: 0-3)	2.03 (1.56, 2.64)	<.0001****
Adverse Childhood Experiences Exposure		
No Exposure	1.0	
Exposure to 1 ACE	1.66 (0.86, 3.21)	0.1326
Exposure to 2 ACE	2.89 (1.41, 5.93)	0.0038**
Exposure to 3 ACE	3.78 (1.50, 9.51)	0.0048**
Exposure to 4 ACE	4.46 (1.80, 11.05)	0.0012**
ACE Score (range: 0-4)	1.50 (1.24, 1.82)	<.0001****
Categorical Age		
18-29 years old	2.25 (1.11, 4.54)	0.0241*
30-49 years old	2.10 (1.21, 3.62)	0.0080**
50+ years old	1.0	
Adult Socioeconomic Position		
Low	1.0	
High	0.24 (0.12, 0.47)	<.0001****
Depressive Symptoms of Clinical Concern		
CES-D score <16	1.0	
CES-D score ≥ 16	2.34 (1.31, 4.17)	0.0038**

[a]nonsmoker combines never and former smoker categories Significance Level: *∝< .05, **∝< .01, ***∝< .001, ****∝< .0001

TABLE 7. MAXIMUM LIKELIHOOD ESTIMATES FROM MULTIVARIATE LOGISTIC REGRESSION MODEL

Parameter	*df*	*estimate*	*s.e.*	*OR*	*95%CI*	*Wald* x^2	*p value*
Intercept	1	-0.9701	0.5044			3.6989	0.0544
Gender-based Violence Exposures Index (No, Low, Moderate, High)	1	0.5467	0.1454	1.73	1.30-2.30	14.1407	0.0002***
CES-D Score (<16, ≥16)	1	0.3118	0.3318	1.37	0.71-2.62	0.8830	0.3474
Age (18-29, 30-49, 50+)	1	-0.3463	0.1857	0.71	0.49-1.02	3.4781	0.0622
High Adult Socio-Economic Position (Yes/High, No/Low)	1	-1.2788	0.3558	0.28	0.14-0.56	12.9149	0.0003***

Significance Level: *∝< .05, **∝< .01, ***∝< .001 Area under the receiver operating characteristic (ROC) curve = 0.7331. Hosmer-Lemshow goodness-of-fit test chi-square statistic = $6.3784_{(8)}$, p=0.6049.

exposure is an independent risk factor for current smoking behavior (p=0.0002). The odds of current smoking among those with a low GBV Exposure Index score (exposure

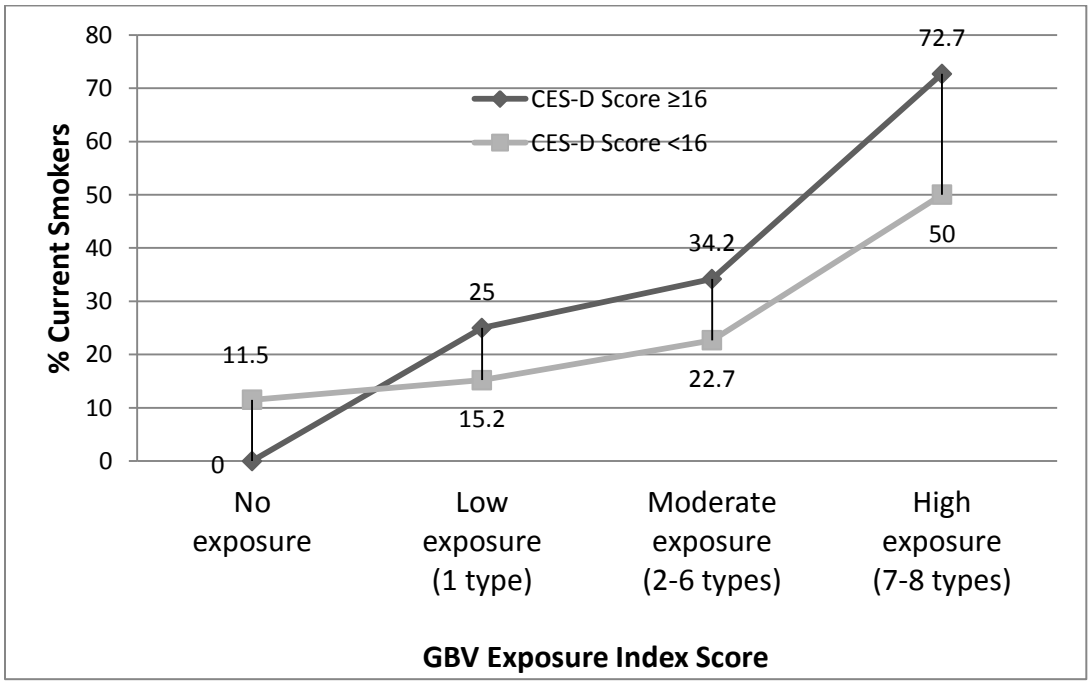

FIGURE 3. PERCENTAGE OF CURRENT SMOKERS BY GENDER BASED VIOLENCE EXPOSURE INDEX CATEGORY AT DEPRESSION SYMPTOM STATUS

to 1 type of abuse) is 1.73 (95%CI:), among those with a moderate GBV Exposure Index score (exposure to 2-6 types of abuse) is 2.98, and among those with a high GBV Exposure Index score (exposure to 7 or 8 types of abuse) is 5.16 times the odds of current smoking among those with no gender-based violence exposure, controlling for depression, age and adult socio-economic position. When controlling for known risk factors, including GBV Exposure score, high socioeconomic position in adulthood is a protective factor against current smoking (OR: 0.28, p=0.0003). Current smoking prevalence is higher among women with high depressive symptomology (CES-D Score ≥16) for women at each level of gender-based violence exposure (**Figure 3**); however, when controlling for GBV Exposure score, age, and adult socioeconomic position, depressive symptomology is no longer a significant predictor of current smoking (p=0.3474) and categorical age is only marginally significant (p=0.0622).

Discussion

Intimate partner and sexual gender-based violence is not only a notable public health concern in Ohio Appalachia, but is a human rights issue—impacting nearly 6 out of 10 women in the region. Estimates for gender-based sexual and intimate partner violence in Ohio Appalachia rival estimates for exposure among populations most at-risk in the United States, including racial and ethnic minorities, and appear to be above

estimates for rape and intimate partner violence across Ohio.[2] Gender-based violence exposure should be considered as a possible factor contributing to cervical cancer disparity in the region.

Cumulative exposure to multiple forms of gender-based violence is an independent risk factor for smoking among women in Ohio Appalachia. There was a significant difference in any intimate partner and/or sexual gender-based violence lifetime exposure, and for each abuse type, across smoking status, with prevalence increasing in each case when moving from never smokers, to former smokers, to current smokers. Among current smokers, an overwhelming majority reported sexual and/or intimate partner violence lifetime exposure. The categorical distribution of the GBV Exposure Index score, a composite score representing cumulative exposure to eight abuse types, was also significantly different across smoking status, with increased prevalence of exposure to multiple gender-based violence abuse types moving from never, to former, to current smokers. Based on these findings, anyone seeking to encourage or assist women in Appalachia with tobacco cessation must acknowledge that gender-based violence exposure, and its sequale, are likely impacting women's smoking behavior and ability to engage in successful cessation.[182]

A reduction in smoking behavior, and ultimately in smoking attributable disease, among women in Ohio Appalachia, will occur only if the impact of sexual and/or intimate partner gender-based violence and this exposure's impact on health, including

increased risk for depression,[71,183-185] are directly addressed. Depressive symptoms are negatively correlated with the ability to cope with stress for women exposed to intimate partner violence.[186] Inability to cope with stress may create vulnerability for addiction.[187,188] Although not all women who were exposed to intimate partner and/or sexual gender-based violence also reported depressive symptoms of clinical concern, those that did were more likely to smoke. The highest concentration of participants with high depressive symptomology (CES-D Score >= 16) were among those with moderate and high gender-based violence exposure. Although depressive symptomology, when controlling for gender-based violence cumulative exposure, age, and adult socioeconomic position, no longer was a significant risk factor for smoking, further investigation is warranted. Depression's role as a potential mediator between cumulative gender-based violence and smoking should be examined using longitudinal study designs to better tease out the temporal relationship between these factors. These findings support recent literature calling for an integration of smoking cessation programs with intimate partner recovery programs—addressing the traumatic exposure, mental health sequale, and nicotine dependence—in order to help survivors of intimate partner violence quit smoking;[189] however, no known study has assessed the efficacy of addressing intimate partner or sexual violence in the cessation process.[190]

Community-based and criminal justice advocacy programs, which historically work through rape crisis centers, domestic violence shelters, and court-based settings, should consider how health justice, in addition to criminal justice, is part of the

restorative process to help gender-based sexual and intimate partner violence survivors heal. In the past decade, there has been a swell of understanding within these settings of the need for trauma-informed services for survivors.[191] Findings from this study suggest tobacco cessation might be one of a sequence of behavioral health interventions to prove restorative and health promoting to a population that experiences disparate health outcomes.[85,183,192] Recently, it has been articulated that it would be helpful for those specializing in work with survivors of violence to assess for smoking and to provide prevention and smoking cessation in traditional intervention setting, for intimate partner violence, in particular.[193]

There are limitations impacting analysis and study findings. First, cross-sectional data cannot be used to determine temporality—limiting interpretations regarding the relationship between cumulative exposures to multiple forms of gender-based violence, depression and smoking. Second, we did not collect data on age at first pregnancy, a known risk factor for smoking among rural women,[55] so the updated risk factor analysis did not control for the impact of age of first pregnancy on current smoking. However, reproductive coercion, a factor measured and represented as one of eight types of abuse analyzed as well as in the composite GBV Index Score, is associated with unintended pregnancy,[194] especially among adolescents.[195] Third, there was a high degree of correlation between the GBV Exposure Index Score and the ACE Score variable ($r_s = 0.45789, p =< .0001$) causing a problem of multi-collinearity when both variables were added to the adjusted multivariate logistic model. When added to the

final adjusted model for smoking, ACE was no longer significant, and it reduced the significance of GBV Exposure Index Score, as well. Due to its high degree of correlation with the GBV Exposure Index Score, and in consideration of the primary study aim, ACE was excluded from the final model despite the literature documenting its association to smoking. It is important to note that the ACE score used was only a subset of the items found on the full ACE measure,[15] and that child sexual abuse, though excluded from the ACE Score modeling here, was included in the final GBV Exposure Index Score. Finally, survey research is liable to coverage bias through underrepresentation of smokers and of women exposed to sexual and intimate partner violence.[97] Indeed, only 20% of our sample reported current smoking, when the population estimate for women in the region is 32%.[53,54] Given this, and the high correlation between current smoking and gender-based violence exposure in the sample, intimate partner and sexual violence gender-based violence estimates produced for this region, in this analysis, are probably conservative, and underrepresent the true population parameter.

Conclusions

Gender-based violence is a fundamental determinant of health (and health disparity) among women in Ohio Appalachia, and should be assessed in health settings.[196] Those seeking to reduce disparate disease burden among women in Ohio Appalachia should consider the role gender-based violence plays in exhibited health behavior, behavioral interventions, disease progression and treatment.[171,197,198] There is

a need for tobacco cessation professionals to join efforts with organizations that have a clear strength in assisting survivors of sexual and intimate partner violence, to provide holistic, trauma-informed health and healing services to gender-based violence survivors. For tobacco cessation efforts geared towards women in Ohio Appalachia, in particular, this means recognizing the overwhelming prevalence of gender-based violence in the region, in the first place, and understanding how programs aimed to promote tobacco cessation must also address mental health and other trauma and safety concerns among a majority of their client population. In an area of the country where both tobacco cessation and sexual and intimate partner violence advocacy services are limited, it also means ensuring that general practitioners and public health professionals either receive training to directly address gender-based violence, mental health, and cessation, or work to redirect resources to establish such efforts.

Chapter 4: Aim 2 Manuscript
The social context of smoking behavior among women exposed to sexual and intimate partner gender-based violence

ABSTRACT

Background: The prevalence of smoking, the leading cause of premature morbidity and mortality, is particularly high among survivors of intimate partner and sexual violence. The aim of this study was to characterize the context of smoking behavior among women exposed to gender-based violence in order to determine key factors that might serve as key mediators to directly address in a smoking cessation intervention or moderators which could enable or prevent this vulnerable group of women from successfully completing the smoking cessation process.

Methods: Ohio Appalachian women were randomly selected to complete a cross-sectional, interview administered survey (n=398). Correlation analyses were performed in SAS.

Results: Graded, cumulative gender-based violence was associated with intrapersonal and contextual factors which could be influencing both current smoking and gender-based survivors' attempts to quit. Significant differences existed between current and

past smokers with gender-based violence exposure histories regarding: perceived stress, exposure to fear invoking control (a type of intimate partner violence), perception of social status, discrimination, adult socioeconomic position, perception of number of smokers in the social environment, and home smoking restrictions.

Discussion: Because of the power differentials at play in most intimate partner and sexual violence abuse situations, and the unique safety concerns for this population, the social context of a gender-based violence survivor's smoking behaviors and cessation attempts must be considered when adapting cessation programs to this population. Findings from this study suggest that it may be factors within a survivor's environment causing stress—a culture tolerant of gender-based violence, discrimination, social economic standing, and smoking bans within the home—which must be addressed in concert with intrapersonal factors, like self-control and affect regulation, to help this vulnerable population succeed in smoking cessation.

Introduction

Tobacco use remains the single most preventable cause of disease and premature death in the United States today.[8-12] There is increasing disparity in the prevalence of smoking between socially privileged and socially marginalized populations living in the United States. Marginalized populations, including the impoverished and those living with disability, including mental illness, do not quit smoking at the same rate as their counterparts within more privileged populations. [6,7,14] Effective policy-related and treatment-focused efforts are needed for these marginalized populations.[6,14] Women survivors of sexual and/or intimate partner violence across the life course are a population at risk for smoking;[15,20,22,28,32,173,189,193] however, to date, this is a population rarely mentioned as a stigmatized and marginalized population within tobacco control literature.

Whereas smoking prevalence is higher among those exposed to sexual and/or intimate partner violence when compared to non-exposed women, it has also been found that in certain subpopulations of women smokers there is a high concentration of sexual and/or intimate partner violence lifetime exposure.[199] For instance, in a population-based sample of women in Ohio Appalachia where 32% of all women smoke, 78% of current smokers and 70% of former smokers reported gender-based violence exposure, whereas only 44% of never smokers reported such an exposure; and graded, cumulative gender-based violence exposure to multiple sexual and intimate partner

abuse types, when controlling for age, socioeconomic position, and depression, is an independent risk factor for current smoking.[199]

In a population of smokers where the prevalence of sexual and/or intimate partner gender-based violence is so high, it is plausible that gender-based violence exposure, and its health consequences including increased risk for depression and post-traumatic stress,[71,200] are likely impacting women's smoking behavior and ability to engage in successful cessation. Despite this, over the course of their life, women exposed to sexual abuse in childhood are less likely to have received substance abuse treatment.[25] In addition, when compared to non-exposed women, survivors of intimate partner physical, sexual, and non-physical abuse experience burdensome health disparities; women exposed to gender-based violence, even in the remote past, use healthcare more often, have higher health care cost, and experience worse health outcomes.[85,201] Given the wide range of smoking attributable disease,[12] and recognizing the high rate of smoking among the population[15,20,22,28,32,173,189,193] and the health disparate outcomes the population experiences, in general, [85,115,184,201] women survivors of sexual and intimate partner gender-based violence should be considered a priority population for tailored smoking cessation interventions.

Noting the lack of empirically based models for addressing social disparities in behavioral risk reduction interventions, Sorensen et. al. depicted a conceptual model that explicated the social contextual pathways influencing health behavior.[202] According to the model, risk reduction interventions may be enhanced by attending to

the social contextual factors which influence a person's ability to benefit from interventions and to ultimately make behavior change.[202] To test this model, the group developed an intervention, inclusive of context, that would ultimately be effective in helping blue-collar workers quit smoking. Through formative research occupational safety surfaced as a key contextual factor relevant to the lives of blue-collar workers.[105] Among blue collar workers, smoking quit rates were twice as high at worksites receiving occupational safety alongside the health promotion programs when compared to quit rates at worksites receiving only health promotion programs.[105] Sorensen et al. concluded that the social-contextual model is a valid conceptual model to guide further behavioral health interventions with other disadvantaged groups—most significantly because it explicates the role that social context can have, both as a modifier influencing differential outcomes by key attributes, and as a mediating mechanism, influenced by the intervention itself.[105]

Studies addressing contextual factors influencing smoking and the cessation process, among abuse survivors, focus almost exclusively on child abuse. A recent population based study in the United States found that childhood physical and sexual abuse were directly associated with smoking dependence; childhood emotional abuse was indirectly associated with nicotine dependence through current serious mental illness.[40] The same study also found that all emotional, physical and sexual childhood abuse were associated with more severe nicotine withdrawal symptoms, for those with recent quit attempts, and the withdrawn symptoms were partially mediated by current

serious mental illness.[40] Whereas mental health has been found to mediate the relationship between some forms of abuse and smoking, supportive members of one's social network have been found to buffer the relationship, protecting those with abuse exposure from smoking. Using data from the Nurses' Health Study II, Jun et al. not only confirmed earlier findings that young women exposed to both childhood physical and sexual abuse were two times more likely to initiate smoking by age 14 when compared to those not abused, familial emotional support was found to protect against smoking among those who were abused, reducing the impact of abuse by 40% among those receiving high emotional support versus those without.[41] These studies show promise in the utility of identifying key mediators and moderators in understanding smoking behaviors among those experiencing abuse. More research is needed, however, to understand the social context of smoking behavior among women exposed to a full range of sexual and intimate partner gender-based violence in order to understand how to maximize smoking cessation behavioral interventions to meet the needs of this disadvantaged population.

The overall purpose of this study was to characterize the context of smoking behavior among women exposed to intimate partner and/or sexual gender-based violence in Ohio Appalachia, a population where smoking among women and where gender-based violence exposure rates are high.[203] The goal was to determine key factors that might serve as potential mediators or moderators in allowing women survivors of intimate partner and/or sexual gender-based violence to successfully

complete a smoking cessation process. In pursuit of this aim the following research questions were addressed: 1) What is the association between sexual and/or intimate partner gender-based violence exposure and intrapersonal, interpersonal, organizational, and neighborhood/community smoking specific factors for women in Ohio Appalachia? 2) What is the association between sexual and/or intimate partner gender-based violence exposure among women in Ohio Appalachia and other intrapersonal, interpersonal, organizational, and neighborhood or community factors with the potential to either mediate current smoking and or moderate a gender-based survivor's ability to engage in successful smoking cessation? 3) Are there significant differences between current smokers with gender-based violence exposure and past smokers with gender-based violence exposure on the intrapersonal, interpersonal, organizational or community factors found to have significant associations from Research questions 1 and 2?

Materials and Methods

Recruitment and study design. Analysis for this project utilized data collected on the Women's Social Networks and Health study, one of four projects of the National Cancer Institute (NCI)-funded Appalachian Center for Population Health and Health Disparities P50 CA105632-06 grant. A random sample of adult women from Ohio Appalachia were recruited to participate in an observational, interview administered, cross-sectional survey using a two-phase address-based sampling approach.[125] A $2 bill

along with a letter of recruitment, household enumeration questionnaire, and stamped return envelope were sent to each randomly sampled household from a county specific U.S. Postal Service list. The letter requested for a completed household enumeration questionnaire to be returned in the envelope provided. From each returned questionnaire containing at least one eligible woman (i.e. 18 or older and residing in one of the three counties), one woman was randomly selected for participation in the study. A community-based interviewer, trained and hired by the university, called each selected participant and invited participation. If interested, a time for consent and interview was set. The University's Institutional Review Board (IRB) approved the study.

Interview Procedure. Study participants determined a private location at which the interview would take place. All interviewers were trained to implement an IRB approved trauma-informed distress protocol.[137] Interviewers obtained additional consent to proceed with the trauma-exposure questions, the last model of the survey, and used REDCap electronic data capture tools to record survey responses.[162] Participants received a $50 gift card and a list of county-specific women's health resources, if desired.

Measures. Demographic variables collected include: age (18-29, 30-49, and ≥50 years); race (white vs. other); education (less than HS, HS diploma, General Educational Development (GED), and >high school diploma); annual household income; number, age and smoking status of people living at residence of participant; and health insurance

(private, government-assisted, or none). In addition, the following measures were collected and/or variables derived.

Abuse exposure measures included:

Sexual and/or Intimate Partner Gender-based Violence Type Exposure. Eight types of sexual and/or intimate partner gender-based violence[204] were derived from questions modeled after those on the National Intimate and Sexual Violence Survey[2]-- demeaning emotional abuse, fear invoking control, isolation, physical assault, medical restriction, and reproductive coercion by an intimate partner; and coerced and forced sexual abuse by an intimate partner or other.

Gender-based Sexual And Intimate Partner Violence Exposures Index Score (GBV Exposure Index). A participant was categorized into one of four GBV Exposure Index levels: No exposure, Low exposure (exposure to any one type of gender-based sexual and/or intimate partner violence), Moderate Exposure (exposure to any 2 to 6 types of gender-based sexual and/or intimate partner violence), or High Exposure (exposure to 7 or 8 types of gender-based sexual and/or intimate partner violence), range 0-3. If not expressly stated otherwise, the GBV Exposure Index variable is used throughout analysis to represent cumulative, graded exposure to sexual and/or intimate partner gender-based violence exposure.

***Intrapersonal Smoking Variables included*:**

Smoking Status and consumption. Questions from the National Health Interview Survey (NHIS) and the National Cancer Institute-sponsored Tobacco Use Supplement to

the Current Population Survey were used to assess smoking status, consumption and age at first smoke. Participants were categorized as never smokers if they reported never having smoked 100 cigarettes in their lifetime; as former smokers if they had smoked 100 cigarettes in their lifetime but did not smoke now; and as current smokers if they had smoked 100 cigarettes in their lifetime and now smoke cigarettes every day or most days.[139,140,177]

Nicotine Dependence and Heaviness of Smoking Index. for current smokers, using the Fagerström Test of Nicotine Dependence (FTND);[141,142] a *Nicotine Dependence* composite score of 0-10 is compiled by adding points received based on responses to 6 questions. Questions with points assigned to each response option are as follows: 1. "How soon after you awake do you smoke your first cigarette?": Within 5 minutes (3 pts), 6-30 minutes (2 pts), 31-60 minutes (1 pt), after 30 minutes (0 pts). 2. "Do you find it difficult to refrain from smoking in places where it is forbidden?": Yes (1 pt)/No(0 pt). 3. Which cigarette would you hate to most give up?": The first one in the morning (1 pt)/All others (0 pts). 4. "How many cigarettes/day to you smoke?": 10 or less (0 pts), 11-20 (1 pt), 21-30 (2 pts), 31 or more (3 pts). Point values for questions 1 and 4 were summed to form the *Heaviness of Smoking Index*.

Quit attempts. Current smokers were asked, "In the past 12 months, how many times have you quit smoking for at least 24 hours?" Former smokers were asked, "In your entire life, how many times did you quit smoking for at least 24 hours in an attempt to quit smoking for good." [205,206]

***Contextual Smoking Variables included*:**

Household composition and smoking status, needed to derive *density of current smokers in home environment*, were obtained using a series of questions regarding number of household members less than 14 years old, 14-18 years old, and 18+ years old and their smoking status. Questions were created for use in the Community Awareness, Resources and Education (CARE) series of studies. [55,172]

Social Influences on Smoking Cessation were assessed using van den Putte's 6-factor scale; the scale captures information on explicit social influences, including verbal input to quit smoking (Explicit Verbal Norm) and offerings of information or help with cessation (Explicit Behavioral Norm) along with implicit social influences, including perceptions about how many other people smoke (Descriptive Social Norm), perceptions about how many other people quit smoking (Descriptive Quitting Norm), perception of acceptability of smoking, in general (Injunctive Norm), and perception of if other people think that the survey participant should quit smoking (Subjective Norm).[207]

Smoking policy at home and work. Household smoking rules and restrictions and workplace exposure and restrictions were assessed using Current Population Survey (tobacco supplement) measures.[140] For purposes of analysis, response options were dichotomized, with no smoking allowed anywhere in the home/public areas at work versus smoking being allowed anywhere or at some times and in some places in the home/public areas at work.

***Other contextual variables with the potential to impact smoking cessation*:**

Perceived Stress Scale (PSS).[148]

Loneliness measured using the Three Item Loneliness Scale.[149]

Alcohol use using the CAGE questions. A cut point of 2 or higher was used to designate abusive alcohol consumption. [143,144]

Depressive symptomology as measured by the Center for Epidemiologic Studies Depression scale (CES-D).[178] A cut point of ≥16 was used to indicate high depression symptoms of clinical concern.

Adult Socioeconomic Position (SEP). A woman's adult socioeconomic position was defined as high if the participant met the following three requirements: 1) a poverty income ratio above the sample's median cutoff point; 2) private health insurance, and 3) education >high school diploma. If the participant did not meet these three requirements, adult SEP was defined as low.[55]

Social support of friends, family, and partner using the Multidimensional Scale of Perceived Social Support (MSPSS).[152-154]

Discrimination using the Detroit Area Study Discrimination Scale (DAS-DQ).[155]

Perception of Social Status from the MacArthur Scale of Subjective Social Status.[160] Participants are asked to rank their position, by pointing to one rung on a 10 rung ladder, for both their 1) perceived standing in their community (community ladder) and 2) perceived financial standing compared to others in the United States (SES ladder).[160] Subjective social status within the community is scored from 1 to 10 on the

community ladder, with 1 indicating the participant pointed to the lowest rung on the ladder and 10 indicating the participant pointed to the highest rung on the ladder. Subjective social economic status is also scored from 1 to 10 on the SES ladder following the same rules for the community ladder.

Social Participation eliciting group and society activity involvement in the past twelve month, using a social participation scale developed by Hanson et al.[156] The social participation index lists 13 items and asks participants to indicate if they have or have not participated in the activity in the past 12 months. If a participant indicates they have participated in three or less activities, their social participation is classified as low.[157]

Neighborhood Cohesion using adapted measures from the Community Counts Survey.[158,159]

Statistical analysis. All data cleaning and analysis was performed in SAS, Version 9.3.[164] A combination of correlation analyses and test for trends were performed to answer research questions including: Spearman Rank, Chi-square, Cochran-Armitage, and Wilcoxon-Mann-Whitney.

Results

Response rate. Response rates were calculated based on the RR1 AAPOR formula. [181] The response rate for household enumeration was 44.4%. Four hundred and eight women completed interviews, resulting in a 71.0% participation rate.[167] Analysis for this

study was limited to the 398 women (97.5% of total sample) with complete sexual and intimate partner violence exposure questions.

Sample characteristics (n=398). Among the entire study sample, 226 (58.8%) were classified as never smokers, 92 (23.1%) as former smokers, and 80 (20.1%) as current smokers. The sample was primarily White (96.5%), 50 years of age or older (55.0%), and married (66.1%). All sample participants identified as women (100%). With a median Income to Poverty Ratio of 2.65, only 15.1% of the sample lived at or below 100% of the poverty threshold based on age and household size. Overall, 56.5% reported exposure to at least one form of intimate partner and/or sexual gender-based violence at some point in their life with 31.4% reporting demeaning emotion abuse, 40.5% reporting fear invoking control, 43.7% reporting isolation, 20.9% reporting physical assault, 6.0% reporting medical restriction, and 9.3% reporting reproductive coercion by an intimate partner. In addition, 22.4% reported coerced sexual abuse and 22.9% reported forced sexual abuse by an intimate partner or other. While 42.5% reported no exposure to any of these 8 forms of sexual and/or intimate partner gender-based violence, 12.6% reported exposure to one form of abuse (GBV Index Score=Low Exposure), 38.2% reported exposure to 2 to 6 types of abuse (GBV Index Score=Moderate Exposure) and 5.8% reported exposure to 7 or 8 types of abuse (GBV Index Score=High Exposure). The percentage of non-smokers (a combination of never and former smokers) by Gender-based Violence Exposure Index (GBV Exposure Index) Score can be found in **Figure 4**.

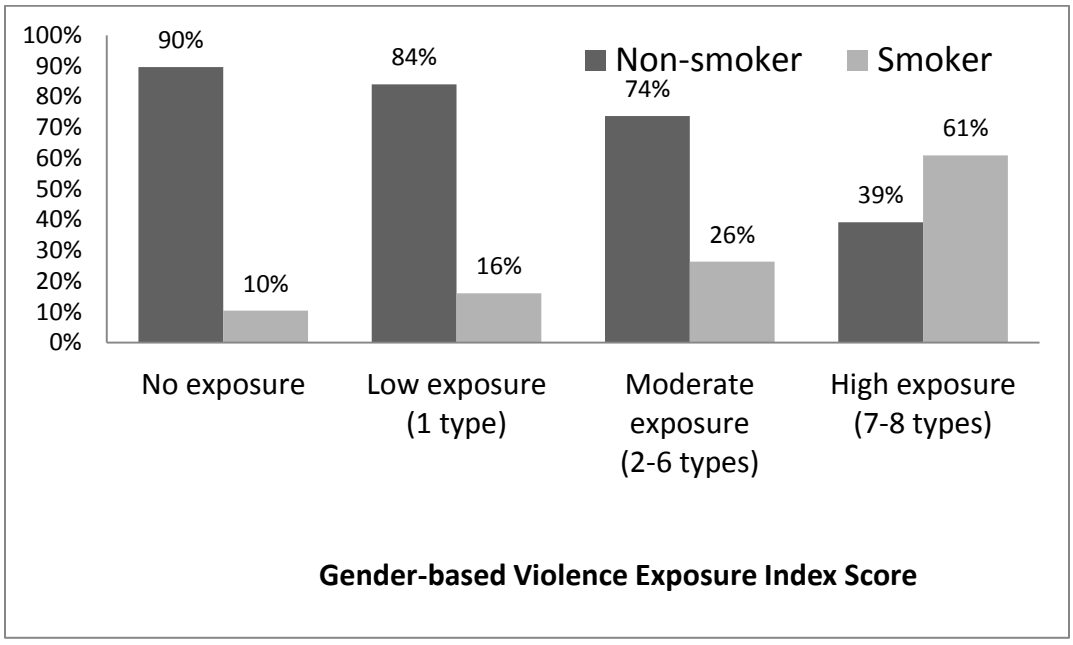

FIGURE 4. PERCENTAGE OF NON-SMOKERS AND CURRENT SMOKERS BY GENDER-BASED VIOLENCE EXPOSURE INDEX (GBV EXPOSURE INDEX) SCORE

Research question 1: Associations between intrapersonal and contextual smoking related variables and GBV Exposure Index level are presented in **Table 8**. Whereas, no association was found between intrapersonal smoking related variables and gender-based violence cumulative exposure, many of the contextual smoking related variables had a significant linear relationship with sexual and/or intimate partner violence gender-based violence exposure as represented by the GBV Exposure Index. Density of current smokers in the home environment, both taking into account everyone living in the home ($r_s = 0.26, p =< .0001$) and only those 18 and older ($r_s = 0.27, p =< .0001$), is associated with gender-based sexual and/or intimate partner

violence exposure--becoming more dense with increasing GBV Exposure Index score. Restrictive smoking policy at home is also significantly associated with gender-based violence ($x^2(3) = 12.95, p = 0.005$)—86.61% of women with no gender-based violence exposure report a smoking ban within their home versus only 65.22% of women with high exposure to gender-based violence. In regard to social influences on smoking among the study sample, with increasing gender-based violence exposure women are more likely to perceive a higher number of people quitting smoking in the environment (Descriptive Quitting Norm, $r_s = 0.11, p = .03$). Those with exposure are also more likely to perceive smoking to be acceptable in society (Injunctive Norm, $r_s = 0.13, p = .01$). Women smokers with higher gender-based violence exposures are also more often told directly that they should quit smoking (Explicit Verbal Norm, $r_s = 0.30, p = .0122$) while also perceiving fewer smokers in their environment

(Descriptive Smoking Norm, $r_s = -0.27, p =< .0001$). People offering to help or provide information about cessation (Explicit behavioral norm) and perception by the smoker as to if people think she should quit smoking (subjective norm) were not related to the GBV Exposure Index score. Among the entire study sample, cumulative gender-based violence was not associated with smoking policies at work. Among current smokers, no associations were found for any of the intrapersonal smoking factors including: 24 hour quit attempts in the past 12 months, nicotine dependence or heaviness of smoking. Among ever smokers, gender-based violence exposure also was

TABLE 8. ASSOCIATION BETWEEN GENDER-BASED VIOLENCE EXPOSURE (GBV EXPOSURE INDEX) AND CONTEXTUAL SMOKING VARIABLES

	Gender-based Violence Exposures Index Level					
	No exposure N=173	*Low exposure (1 type)* N=50	*Moderate exposure (2-6 types)* N=152	*High exposure (7-8 types)* N=23		
	mean (sd)	*mean (sd)*	*mean (sd)*	*mean (sd)*	*Correlation Coefficient*[a]	*p-value*
Contextual Smoking Variables (among Study Sample)						
Density of current smokers in home environment	0.10(0.22)	0.14(0.25)	0.21(0.31)	0.36(0.33)	0.25653	<.0001****
Density of current smokers among all those 18 and older in home environment	0.12(0.27)	0.18(0.32)	0.27(0.37)	0.53(0.44)	0.26850	<.0001****
Social Influences on smoking cessation						
Descriptive Quitting Norm (n=382)	0.40(0.65)	0.40(0.61)	0.47(0.64)	0.77(0.81)	0.11290	0.0274*
Injunctive Norm (n=396)	7.73(2.53)	8.18(2.75)	8.42(2.59)	8.22(2.26)	0.12732	0.0112*
Intrapersonal Smoking Variables (among Current Smokers)						
24 hour quit attempts in the past 12 months (n=75)	5.27(13.51)	8.29(19.31)	5.56(24.52)	2.15(4.00)	-0.02231	0.8493
Nicotine Dependence (FTND) (n=72)	3.53(2.10)	2.88(2.23)	3.89(2.36)	3.31(2.39)	0.00473	0.9685
Heaviness of Smoking Index (n=78)	2.25(1.39)	1.88(1.73)	2.38(1.48)	2.07(1.59)	0.00046	0.9968
Contextual Smoking Variables (among Current Smokers)						
Social Influences on smoking cessation						
Explicit verbal norm (n=80)	1.67(1.46)	1.50(1.31)	2.43(1.47)	2.71(1.20)	0.27903	0.0122*
Explicit behavioral norm (n=80)	0.44(0.78)	0.63(1.06)	0.85(1.10)	1.07(1.38)	0.16469	0.1443
Descriptive Smoking Norm (n=80)	9.90(2.19)	9.56(2.35)	8.70(2.75)	7.75(2.26)	-0.27331	<.0001****
Subjective Norm (n=77)	4.63(1.02)	4.88(0.35)	4.79(0.57)	4.71(0.61)	-0.01596	0.8904
Intrapersonal Smoking Variables (among Current and Past Smokers)						
Age of first smoke (n=172)	17.98(3.51)	18.63(6.02)	18.68(8.91)	16.82(5.28)	-0.09147	0.2327
Intrapersonal Smoking Variable (among Past Smokers)						
# of quit attempts before successful cessation (n=91)	3.15(2.33)	2.91(2.17)	3.06(2.05)	1.00(0.00)	-0.04684	0.6593
	%	%	%	%	$x^2(df)$[a]	*p-value*
Contextual Smoking Variables (among Study Sample)						
Smoking policy at home					12.9451(3)	0.0048**
No smoking anywhere in home	86.71	80.00	72.37	65.22		
Smoking allowed anywhere or at some times and in some places within home	13.29	20.00	27.63	34.78		
Smoking policy at work (n=247)					0.7033(3)	0.8724
Not allowed in public areas	96.83	96.15	95.00	100.00		
Allowed in some public areas	3.17	3.85	5.00	0.00		

[a]Spearman's Rank Correlation coefficient (r_s) calculated for ordinal and continuous variables. [a]Chi-square test performed for categorical variables. Significance Level: *$\propto <$ .05, **$\propto <$ .01, ***$\propto <$ .001, ****$\propto <$ .0001

not associated with age of first smoke, pack years smoked; and among past smokers, to number of quit attempts before successful cessation.

Research question 2: Associations between gender-based violence exposure and non-specific smoking variables are found in **Table 9**. Cumulative sexual and intimate partner gender-based violence exposure is associated with many contextual variables that could impact ability to access and successfully complete the process of smoking cessation. In relation to **intrapersonal variables**, perceived stress ($r_s = 0.26, p =< .0001$) and loneliness ($r_s = 0.19, p =< .0001$) both intensify with gender-based violence exposure index level, as does high depressive symptomology (Z=-5.70, p= $< .0001$) and low adult socioeconomic position (Z=-2.36, p=0.0184). High alcohol use also has an increasing linear relationship with increasing cumulative gender-based violence abuse exposure (Z=-2.28, p=0.0241); however, high levels of alcohol use are relatively rare in the sample. Race, in this predominately white sample, was not associated with GBV Exposure Index Score.

Most **contextual variables**, as well, had strong linear relationships to GBV Exposure Index level. Total Multidimensional Score of Perceived Social Support ($r_s = -0.18, p = 0.0003$), along with the Significant Other Social Support Subscale ($r_s = -0.14, p = 0.0065$), and the Family Social Support Subscale ($r_s = -0.21, p =< .0001$), significantly decreased with increase in gender-based violence exposure index level. The Friend Social Support Subscale did not show a significant trend ($r_s = -0.09,$

TABLE 9. ASSOCIATION BETWEEN GENDER-BASED VIOLENCE EXPOSURE AND SOCIO-CONTEXTUAL VARIABLES

	Gender-based Violence Exposures Index Level					
	No exposure N=173	*Low exposure (1 type)* N=50	*Moderate exposure (2-6 types)* N=152	*High exposure (7-8 types)* N=23		
	mean (sd)	*mean (sd)*	*mean (sd)*	*mean (sd)*	*Correlation Coefficient*[a]	*p-value*
Intrapersonal Variables						
Perceived Stress Scale	17.24 (6.43)	19.34 (7.15)	21.26 (8.44)	25.43 (10.25)	0.25989	<.0001****
Loneliness	3.60 (1.04)	3.90 (1.05)	4.27 (1.50)	4.70 (1.82)	0.19403	<.0001****
Interpersonal Variables						
Multidimensional Scale of Perceived Social Support						
TOTAL	72.68 (9.88)	72.02 (9.55)	69.16 (11.96)	63.17 (14.32)	-0.17864	0.0003***
Significant Other Subscale	25.02 (3.70)	25.14 (3.55)	23.98 (4.04)	22.96 (5.69)	-0.13623	0.0065**
Family Subscale	24.38 (3.43)	23.50 (3.96)	22.53 (4.89)	19.17 (7.40)	-0.21498	<.0001****
Friend Subscale	23.28 (3.93)	23.38 (3.45)	22.66 (4.53)	21.04 (5.51)	-0.09184	0.0672
Discrimination						
Daily Mistreatment (n=396)	5.42 (5.72)	6.66 (4.76)	8.00 (6.03)	11.65 (6.26)	0.28384	<.0001****
Lifetime History of Discrimination (n=397)	0.41 (0.68)	0.64 (0.78)	0.97 (1.13)	1.74 (1.14)	0.33541	<.0001****
Recent Discrimination (n=185)	0.45 (0.69)	0.35 (0.57)	0.26 (0.49)	0.70 (1.13)	-0.03750	0.6123
Perception of Social Status						
In relation to your community (n=393)	6.11 (1.91)	5.86 (1.58)	5.59 (2.09)	5.57 (2.23)	-0.09956	0.0486*
In relation to others in United States	5.45 (1.57)	5.22 (1.33)	4.76 (1.66)	3.96 (1.40)	-0.24065	<.0001****
Organizational Variables						
Social Participation (n=379)	5.93 (2.20)	6.66 (2.42)	5.99 (2.49)	5.35 (2.55)	0.01044	0.8357
Neighborhood/community Variable						
Neighborhood Cohesion (n=393)	21.41(3.20)	21.32 (2.74)	19.75 (3.91)	19.04 (4.92)	-0.21349	<.0001****
	%	%	%	%	*Z*[b]	*2 sided p-value*
Intrapersonal Variables						
Alcohol use (n=397)					-2.2763	0.0241*[c]
CAGE <2	97.69	93.88	90.79	95.65		
CAGE >=2	2.31	6.12	9.21	4.35		
Depression (n=394)					-5.7033	<.0001****
CES_D <16	91.76	92.00	72.85	52.17		
CES_D >=16	8.12	8.00	27.15	47.83		
Race						
White	96.53	98.00	95.39	100.00	0.0321	0.5364[c,d]
Other	3.47	2.00	4.61	0.00		
Interpersonal Variable						
Adult Socioeconomic Position					2.3581	0.0184*
High	40.88	34.69	32.65	13.64		
Low	59.12	65.31	67.35	86.36		

[a] Spearman's Rank Correlation coefficient (r_s) calculated for ordinal and continuous variables. [b]Cochran-Armitage Trend Test performed for two level categorical variables. [c] [b]Cochran-Armitage Trend exact test performed due to low cell counts. [d]One-sided p value. Significance Level: *∝< .05, **∝< .01, ***∝< .001, ****∝< .0001

$p = 0.0672$). Daily mistreatment doubled and lifetime history of discrimination quadrupled when moving from women with no gender-based violence exposure to those with high exposure, showing a significant and graded association to cumulative gender-based violence exposure across all categories (daily mistreatment $r_s = 0.28, p =< .0001$; lifetime history of discrimination $r_s = 0.34, p =< .0001$). Recent discrimination was not linearly associated with cumulative gender-based violence exposure, however. Perception of social status in relationship to the community ($r_s = -0.10, p = 0.0486$) and in relation to others in the United States ($r_s = -0.24, p =< .000$) both significantly decreased in relationship to an increase in cumulative gender-based violence exposure. Perception of neighborhood cohesion also decreased with increasing gender-based violence exposure ($r_s = -0.21, p =< .0001$). Social participation was the only contextual variable not showing a linear relationship to cumulative gender-based violence exposure.

Research question 3: Socio-contextual differences between current and past smokers with gender-based violence exposure histories are found in **Table 10**. All analysis for this research question was limited to ever smokers (former versus current) reporting at least one type of sexual and/or intimate partner gender-based violence exposure at some point in their life. **Intrapersonal variables.** Although there was a higher concentration of lower adult socioeconomic position among current smokers ($x^2(df$)= 4.3107(1), p=0.0379), perceived stress was lower among current smokers than former smokers (U=4181.5, one-sided p=0.0217). Loneliness, alcohol use, and

depressive symptomology were not significantly different between current and former smokers with gender-based violence exposure histories. **Interpersonal variables.** There was significantly more women reporting fear invoking control exposure among current smokers (82.3%) in comparison to former smokers (75.0%) (U=4236.0 one-sided p=0.0267). There were no other significant differences between current and former smokers on abuse type or cumulative abuse variables. In addition, perceived social support by significant others, family, and friends were also not found to be significantly different by group. However, whereas only 35.5% of current smokers reported a complete smoking ban within the home, 85.9% of former smokers reported a complete smoking ban, a significant difference ($x^2(df$)= 33.73(1), p<.0001). Whereas there was no significant difference between former and current smokers regarding descriptive quitting norms, current smokers were significantly more likely to have a higher perception of the acceptability of smoking, in general (Injunctive Norm) (U=4833.0, p<.0001). **Neighborhood/Community & Societal variables.** Neighborhood cohesion was not significantly different by group. Notably, however, women with gender-based violence exposure who are current smokers, in comparison to former smokers, reported lower perception of social status in relation to the community (U=3594.0, p=0.0026), and in relation to the United States (U=4542.5, p=0.0010), and also reported higher daily mistreatment (U=4211.0, p=0.0345) and higher lifetime history of discrimination (U=4542.5, p=0.0010).

TABLE 10. SOCIO-CONTEXTUAL DIFFERENCES BETWEEN CURRENT AND PAST SMOKERS WITH GENDER-BASED VIOLENCE EXPOSURE HISTORIES

	Former Smokers with Gender-based Violence Exposure History (N=64)	Current Smokers with Gender-based Violence Exposure History (N=62)		
	mean (sd)	*mean (sd)*	*U*	One-Sided Pr > Z [a]
Intrapersonal Variables				
Perceived Stress Scale	23.34(8.01)	20.46(8.87)	4181.5	0.0217 *
Loneliness	4.33(1.66)	4.24(1.28)	4038.5	0.3014
Interpersonal Variables				
# of Types of Gender-based Violence exposed to (range:1-8)	3.55(1.88)	4.13(2.30)	4178.0	0.1177
Intimate Partner Psychological Abuse	0.891(0.315)	0.936(0.248)	4026.0	0.1885
Demeaning Emotional Abuse	0.609(0.492)	0.581(0.498)	3880.0	0.3729
Fear Invoking Control	0.672(0.473)	0.823(0.385)	4236.0	0.0267*
Isolation	0.750(0.426)	0.823(0.385)	4081.0	0.1622
Intimate Partner Physical Abuse	0.391(0.492)	0.532(0.503)	4218.0	0.0564
Physical Assault	0.375(0.488)	0.516(0.504)	4217.0	0.0565
Medical Restriction	0.078(0.271)	0.161(0.371)	4102.0	0.0762
Sexual Abuse Types by an Intimate Partner or Other	0.672(0.473)	0.645(0.483)	3884.0	0.3775
Reproductive Coercion (intimate partner)	0.156 (.366)	0.226(0.422)	4075.0	0.1619
Coerced Sexual Abuse (intimate partner or other)	0.406(0.495)	0.484(0.504)	4091.0	0.1921
Forced Sexual Abuse (intimate partner or other)	0.500(.504)	0.516(0.504)	3969.0	0.4296
Multidimensional Scale of Perceived Social Support				
TOTAL	68.13(12.93)	66.85(12.86)	3793.5	0.2423
Significant Other Subscale	23.89(4.18)	23.45(4.29)	3790.0	0.2342
Family Subscale	21.83(5.58)	21.58(5.78)	3891.5	0.4125
Friend Subscale	22.41(4.75)	21.82(5.28)	3891.5	0.2811
Social Influences on smoking cessation				
Descriptive Quitting Norm	0.40(0.53)	0.53(0.72)	4048.0	0.2088
Injunctive Norm	8.14(2.41)	9.92(1.84)	4833.0	<.0001****
Neighborhood/Community Variables				
Neighborhood Cohesion	19.98(4.02)	19.52(4.22)	3594.0	0.2618
Perception of Social Status				
In relation to your community	5.67(2.24)	4.71(1.66)	3594.0	0.0026**
In relation to others in United States	4.88(1.56)	3.84(1.44)	3117.5	<.0001****
Societal Variables				
Discrimination				
Daily Mistreatment	7.56(7.03)	8.97(5.71)	4211.0	0.0345*
Lifetime History of Discrimination	0.81 (1.01)	1.45(1.24)	4542.5	0.0010*

continued

Table #10 continued

	%(n)	%(n)	$x^2(df)$[a]	p-value
Intrapersonal Variables				
Alcohol use			0.4050(1)	0.5245
CAGE <2	92.1(58)	88.7(55)		
CAGE >=2	7.9(5)	11.3(7)		
Depression (n=394)			2.3486(1)	0.1254
CES_D <16	75.0(48)	62.3(38)		
CES_D >=16	25.0(16)	37.7(23)		
Adult Socioeconomic Position			4.3107(1)	0.0379*
High	24.2(15)	10.0 (6)		
Low	75.8(47)	90.0(54)		
Interpersonal Variables				
Smoking policy at home			33.73(1)	<.0001****
No smoking anywhere in home	85.9(55)	35.5(22)		
Smoking allowed anywhere or at some times and in some places within home	14.1(9)	64.5(40)		

[a]**Wilcoxon-Mann-Whitney test** performed for ordinal and continuous variables. **Chi-square test** performed for categorical variables.

Discussion

Because of the power differences at play in most intimate partner and sexual violence abuse situations,[98] and the unique safety concerns for those currently in abusive relationships in rural settings,[208] the social context of a gender-based violence survivor's smoking behaviors and cessation attempts must be considered in the adaptation of cessation programs to this population.[105,202] Although this is especially true for those currently in abusive relationships, this investigation has demonstrated that current context may play a role in the smoking behaviors of those with past, cumulative abuse exposures, as well, given this exposures associations with contextual variables, including smoking specific variables.

Social context and smoking among women exposed to gender-based violence. Novel findings from this study suggest that graded gender-based violence exposure to increasing types of abuse(i.e. GBV Index Score) is significantly associated with smoking related variables in a survivor's environment including higher likelihood of being told directly to stop smoking (Explicit Verbal Norm), increasing perception that more people in their environment smoke (Descriptive Smoking Norm), and less restrictive home smoking bans. Many non-smoking specific social contextual variables at the interpersonal, neighborhood/community, and societal levels, as well, were significantly associated to GBV Exposure Index level, and may be compromising a gender-based violence survivor's ability to access or successfully complete a cessation program. Social support, in general, and by significant other and family, each decreased with increasing gender-based violence exposure; in addition perception of neighborhood cohesion, including willingness of neighbors to offer support, along with perceived social status within the community and within the United States decreased with increasing gender-based violence exposure. Conversely, mistreatment on a daily basis, as well as lifetime exposure to discrimination, increased with increasing level of gender-based violence exposure.

Whereas social support wasn't different by group, several key interpersonal factors were different between current and former smokers with gender-based violence exposure histories. Current smokers were significantly more likely to have a higher perception of the acceptability of smoking, in general. Concerning abuse specific

variables, fear invoking control exposure was high among both groups, but even more so among current smokers. In addition, there was a stark difference in prohibitions of smoking within the home—whereas only 7 out of 20 current smokers with gender-based violence exposure histories reported a home policy of no smoking anywhere in the home, 17 out of 20 former smokers with gender-based violence exposure reported such a ban.

The social environment of survivors must be considered when developing smoking cessation interventions. No known study has evaluated the impact of social context on smoking cessation for women survivors of gender-based violence, or those in currently abusive relationships. Although it appears that interventions to modify home smoking policies, for instance, may promote cessation among survivors of violence, it is critical to understand safety concerns that may arise for any survivor of intimate partner violence or sexual assault seeking to change contextual factors in the course of tobacco cessation treatment. Control is central to the abuse process,[98,209] so the development of a cessation intervention should take into account the client's perspective on the modifiability of these contextual factors, and any compromises to safety that may come as a result of trying to enact such change.

In addition, those seeking to promote cessation among survivors of gender-based violence would benefit from lessons learned regarding the social environment of women exposed to intimate partner violence as it relates to mental health. Prior

findings suggest that: 1) empathetic, non-judgmental support promotes mental health in women who have violent partners and talking about the abuse in a caring environment fosters mental health promotion; 2) criticism by peers was higher among battered women who had more social contact with other battered women, therefore advocates trained in non-critical support and communication might be the best deliverers of effective interventions; 3) practical aid, rather than emotional support, provided greatest benefit to mental health—so assisting with the hassles of daily living and complexities that come with abuse, and removing barriers for accessing services, should be considered priority for agencies serving survivors; and 4) the greatest benefit to mental health came through positive relationships with women who weren't in abusive relationships, as well--so assisting survivors in locating new sources of support in order to diversity their network of support to include more women who have not been battered is recommended practice when working with women who have violent partners.[210]

Although the afore mentioned study focused exclusively on mental health promotion among women with violent partners, the lessons learned may serve as potential moderators impacting a gender-based violence exposed women's ability to fully engage with a smoking cessation intervention. Focusing on non-judgmental, empathetic, and trauma-informed methods of intervention with this population may be critical, as well, since women with gender-based violence exposure who are current smokers, in comparison to former smokers, reported lower perception of social status in

relation to the community and in relation to the United States, lower adults socioeconomic position, and also reported higher daily mistreatment and higher lifetime history of discrimination. Further research is needed to understand how addressing directly the unique smoking specific contextual factors that are heightened in the environment of women who are exposed to gender-based violence, while attending to safety concerns,[211] might aid in tobacco cessation efforts among women exposed to gender-based violence.

Intrapersonal factors and smoking among women exposed to gender-based violence. Given this social context, it is understandable that this study demonstrated increased stress, loneliness, depressive symptomology and alcohol abuse all significantly intensify with increasing gender-based violence cumulative exposure. Although it should be noted that only perceived stress differed significantly when comparing current and former smokers with gender-based violence exposure. Offering new insight, current smokers reporting gender-based violence exposure histories had less perceived stress than former smokers—which supports the notion that smoking helps survivors cope with stress and that quitting removes a helpful stress reducing coping mechanism. Despite this potential explanation, this finding is difficult to interpret in light of current literature, and warrants qualitative probing among current and former smokers with gender-based violence exposure in regards to the source of the perceived stress. A finding of higher stress among former smokers in comparison to current smokers appears to be in direct opposition to the one study published on perceived stress and

cessation.[212] Hajek et. al found that smoking cessation lowered perceived stress one year post cessation among highly dependent smokers who reported smoking helped them cope with stress at baseline; however, the cohort Hajek studied were smokers admitted to hospital following a myocardial infarction or for coronary artery bypass surgery.[212] It is unknown if the population Hajek studied was under the type of chronic stress which can consume the lives of gender-based violence survivors.

The finding of heightened perceived stress among former versus current smokers with gender-based violence exposure more likely adds to a growing support for the stress-vulnerability model of addiction[187,188] which posits that cumulative stress over time leads to a persistent homeostatic dysregulation and cumulative physiological response altering brain motivational and self-control pathways; this process ultimately leads to higher impulsivity among those experiencing cumulative stress, and makes one less likely to resist smoking in the face of future stress.[187,188,213] Those experiencing cumulative stress also perceive greater satisfaction and find greater reward in smoking.[213] While impulsivity, a product of the physiologic response to stress, has been found to partially mediate the relationship between cumulative adversity and smoking status.[214] A recent case control study noted that in comparison to controls, alexithymia (the ability to regulate emotion) and depressive symptoms were negatively correlated with the ability to cope with stress for women exposed to intimate partner violence.[186] Although it should be noted that there were no significant differences in this study between current and former smokers on depression, the percentage of women with

increased depressive symptomology was higher among current smokers in comparison to former smokers. Extant literature demonstrates that regardless of depression status, smokers show decreases in negative affect while smoking; however, the relative reinforcing effects of smoking and the impact of smoking on reward and positive affect regulation when smoking after abstinence are only experienced by depression prone smokers.[215] If smoking is one way in which survivors of intimate partner and sexual violence are coping with stress, and given the high concentration of perceived stress and depression among women with moderate and high gender-based violence exposure histories, then smoking cessation programs that address positive affect regulation and self-control may be beneficial in helping gender-based survivors quit smoking. In addition, it should be noted that cumulative intimate partner violence exposure increases posttraumatic stress (note: not the type of stress specifically measured in the study),[216] and that posttraumatic stress partially mediates drug use.[217] The same mediation process may be at work with cumulative gender-based violence exposure, post-traumatic stress, and smoking.

Given the current state of the literature, it is plausible to hypothesize that the cumulative stress that women exposed to increasing types of intimate partner and sexual violence experience is leading to a coping response in which alexithymia is blunted, impulsivity increases, and depression takes hold; where the perceived rewards and satisfaction from smoking are increased along with the regulation of affect, in particular positive affect, especially among those with depression; and where the

proclivity to relapse is heightened in the face of changed self-control pathways and continued stress. Further investigation into the relationship between stress regulation, impulsivity, alexithymia, perception of stress, depression, positive affect regulation, learning to manage fear invoking control as part of the abuse process, and smoking among women exposed to a range of sexual and/or intimate partner violence is warranted to more fully understand this relationship and its potential impact on the smoking cessation process for women with gender-based violence exposure histories.

Limitations. There are limitations impacting study findings and interpretation. First, cross-sectional data cannot be used to determine temporality—and this complicates interpretations regarding socio-contextual factors impacting the process of cessation. Although this study highlighted potential factors that might be operating through the process of smoking cessation for women exposed to sexual and intimate partner violence, further modeling and longitudinal investigations are warranted to determine the cluster of factors which might be best to target in a smoking cessation intervention for this vulnerable population. Second, it is probable that both smokers and survivors of sexual and intimate partner violence were under-represented in this study sample (while the population estimate for women smokers in the Appalachian region is 32%, only 20% of this study sample were current smokers). [53,54,97] Current and former smokers and those women reporting gender-based violence exposure histories represented in the sample may be different than ever smokers and women exposed to gender-based violence on critical elements that should also be taken into

account when working with this population through the process of cessation. These results should be considered a first attempt at understanding the context of smoking behaviors for women who have ever smoked who also report gender-based violence exposure. Finally, a limitation of this study and critical element missing from the interpretation of the data, in particular, is the perspective of women smokers who have also experienced gender-based violence. Survivors of gender-based violence, both those within currently abusive relationships, or with contact with their perpetrators, along with those with past abuse, need to be asked directly about their primary concerns, and what they see as the primary barriers to quitting smoking. It is possible that factors not identified through survey research might surface as critical elements for this vulnerable population. It's possible that "feeling less pain," or "dealing with social misperceptions of what happened," or "just getting through the day" would rise to the top as critical concerns for survivors—smoking cessation, indeed, may be very low on the list of immediate concerns. This is understandable given the extensive ramifications which come with gender-based violence victimization. Further qualitative investigation is necessary to tease out other mediating mechanisms, not identified here, that might need to be directly addressed concurrently with tobacco cessation in order for this population to fully engage with behavioral interventions and succeed at cessation. Despite these limitations, this is the first known study that quantifies social and contextual factors that may impact the high rate of smoking among women exposed to

gender-based violence, and may moderate a woman's ability to move successfully through a smoking cessation process.

Conclusions

Health disparate outcomes among women exposed to gender-based violence are not inevitable and can be greatly reduced if health professionals seek to understand how to meet the needs of survivors within the course of behavioral treatments. A key aspect of this tailoring process must include widening the focus of intervention to not just the individual, but to the survivor's environment, where more may be out of their control than within it. In the book *Counseling to End Violence Against Women,* Whalen proposes that the process of helping survivors of gender-based violence heal must include not only individual counseling, but counseling that connects survivors to the larger social justice work of ending violence against women, including addressing social context which condones and even promotes such violence.[218] Findings from this study suggest, in fact, that it may be factors within a survivor's environment causing stress—a culture tolerant of gender-based violence, discrimination, social economic standing, and smoking bans within the home—which must be addressed in concert with intrapersonal factors, like self-control and affect regulation, to help this vulnerable population succeed in smoking cessation.

Smoking, the leading cause of preventable mortality and morbidity, is particularly high among survivors of intimate partner and sexual violence. And current

women smokers, in Ohio Appalachia in particular, are also overwhelmingly survivors of intimate partner and/or sexual violence. The inquiry in to how best help women smokers exposed to gender-based violence move through successful cessation is nothing short of health justice work, and will take the collective attention and commitment of both those within the health professions with knowledge of nicotine addiction and cessation alongside community-based advocacy organizations that have been working with survivors of gender-based violence for decades.

Chapter 5: Aim 3 Manuscript
Measuring sexual and intimate partner gender-based violence in health settings: transcending the three construct model predominant in public health research and practice

ABSTRACT

Objective: To determine a set of mechanistic gender-based violence constructs for use in abuse assessment among an underserved population in the Appalachian region where gender-based violence exposure is pervasive and health care access is limited.

Methods: Adult women selected through household random sampling in rural Appalachia completed an in-person interview containing 22 gender-based violence exposure questions (n=398). Confirmatory factor analysis was used to determine if gender-based violence data's variance and covariance was best explained in modeling psychological abuse as 1 or 3 constructs; physical abuse as 1 or 2 constructs; and sexual abuse as 1 or 3 constructs.

Results: Model fit significantly improved in all cases when moving from a one construct to a multi-factorial modeling of the gender-based violence exposure data when using scaled normal-theory weighted least-squares difference testing (psychological abuse:$\chi^2_{(3)} = 8.42, \mathrm{p} = 0.038$; physical abuse:$\chi^2_{(1)} = 4.62, \mathrm{p} = 0.032$; sexual abuse:$\chi^2_{(3)} = 10.23, \mathrm{p} = 0.017$.)

Conclusions: Results support the use of an 8 construct assessment of sexual and intimate partner gender-based violence including demeaning emotional abuse, fear invoking control, isolation, physical assault, medical restriction, and reproductive coercion by an intimate partner in addition to coerced and forced sexual abuse by an intimate partner or other.

Introduction

Gender-based sexual and intimate partner violence is a significant public health issue leading to increased morbidity and mortality.[1,2] Twenty percent of U.S. women will be the target of sexual victimization by forced sexual assault, alcohol or drug facilitated assault or attempted rape and 36-44% will be targeted for sexual, physical or psychological abuse by an intimate partner.[2,3,219] Women with sexual and/or intimate partner gender-based violence exposure histories experience diminished health outcomes,[74-78,81-83,220,221] despite higher healthcare utilization and higher healthcare costs.[84-94] Proximal intimate partner abuse can result in 42% higher health care costs, annually,[85] whereas distal exposure can elevate annual costs 16-19% depending on abuse type.[84,85]

The Patient Protection and Affordable Care Act now includes intimate partner violence screening and counseling as a covered preventive services.[222] In addition, in 2013, reversing its 2004 decision, the U.S. Preventative Services Task Force (USPSTF) now recommends that all women of child bearing age be screened for intimate partner violence in healthcare settings and referred to intervention services, such as counseling, home visits, and community support services provided by health care clinicians, social workers and community workers.[196] Despite this, there are limitations in the recommendation in reference to the screening of other vulnerable populations, including those living with mental, physical, or developmental disability, or elders. In

addition, there are no national standards regarding healthcare setting screening for past sexual violence exposure outside of an intimate relationship.[196]

Despite the fact that women who experience gender-based violence are at increased likelihood to use healthcare services, evidence suggests that the underlying abuse predisposing them to deleterious health related impact is not detected and/or addressed in ways most helpful to victims in healthcare settings.[108-111] In addition, women staying in shelter resulting from intimate partner violence cited partners' restriction of access to needed health care services.[112] This suggests that even though women who experience sexual and/or intimate partner gender-based violence access health care at elevated rates in comparison to non-abused women, needed health services may be at even more elevated rates than that which is currently documented in research due to medical restriction by abusive partners. Medical restriction is a type of abuse not normally asked about in traditional screening tools.

In 2006, the U.S. Centers for Disease Control and Prevention published a compendium of tools that can be used to assess various forms of intimate partner violence in a wide variety of settings.[223,224] In support of the 2013 USPSTF recommendation, Nelson et al. published a systematic review of the literature on intimate partner violence screening tools for health based settings.[225] The assessment tools referred to in both situations focus primarily on two or three of the predominant forms of intimate partner violence referenced in public health literature: physical, sexual, and psychological abuse. This three construct paradigm is prominent in current

screening tools and measurement of sexual and intimate partner gender-based violence for health based purposes.

Despite its widespread use, few have investigated whether the three construct conceptualization is the most effective in representing the types of gender-based violence that people experience, and the mechanistic way that abuse is limiting or altering health care access. This is of critical importance among populations where abuse exposure is high, and where access to health services is scarce, limiting health providers' opportunities for assessment and appropriate referral. In particular, this conceptualization does little to help medical and public health professionals decide how to intervene with gender-based violence survivors in health based settings. For instance, abusers may prohibit survivors from accessing needed health services, or following through with directives given by healthcare professionals. This particular type of abuse, if present, could exacerbate health disparities for this vulnerable and isolated population. Of note, in the past decade, sexual coercion, an often undetected form of intimate partner violence, has risen to the forefront in women's health literature.[121-123] This has allowed for the development of specific healthcare interventions to address this type of abusive behavior, and its subsequent impact on women's health.[122] Despite its emergence in some assessment tools and on the prominent national survey, validation studies of reproductive coercion as a distinct construct and type of abuse, separate from other forms of sexual and intimate abuse, are lacking. The predominant public health three construct conceptualization of intimate partner violence may limit

our understanding of the mechanistic way in which abusers control victims and obscure our focus on potential intervention points where health care and community based workers could target effective interventions.

The first step in addressing these concerns begins with understanding if there are indeed more than three abuse type constructs underlying data associated with detecting sexual and/or intimate partner gender-based violence. This methodological study aimed to test the traditional three constructs of psychological, physical and sexual gender-based abuse exposure against eight constructs with support in gender-based violence literature including demeaning emotional abuse,[226] fear invoking control,[227] isolation,[209] physical assault,[209] medical restriction, and reproductive coercion by an intimate partner[121] in addition to coerced sexual abuse[228] and forced sexual abuse by an intimate partner[209] or other.

Methods

Study design and recruitment. A random sample of women, aged 18 years or older, were recruited from three Ohio Appalachian counties using a two-phase address-based sampling approach similar to the design used by Brick and others to recruit a sub-population for cross-sectional, observational survey.[27] Initially, households were randomly sampled from a U.S. Postal Service list, stratified by county, and sent a recruitment letter, household enumeration questionnaire, self-addressed stamped

envelope, and $2 bill. A household member was asked to enumerate the household for women ages 18 and older, and to return the questionnaire by mail. Upon receipt of an enumeration questionnaire, one eligible woman (i.e. ,18 or older and residing in one of the three counties) was randomly selected by research staff for participation in the study. A local interviewer contacted the selected participant to explain the research study, invite participation, and set a time for an in person interview, if interested. The study was approved by the University's Institutional Review Board.

Interview Procedure. Interviews were conducted in a private location chosen by the participant, and interviewers were trained in a distress protocol[137] developed for specific use in this study and approved by the Institutional Review Board. After consenting the participant, interviewers administered a computer assisted in-person interview using REDCap electronic data capture tools.[161,162] Each participant received a $50 gift card for participation and a list of local women's health resources, if not refused.

Measures. Sexual and intimate partner gender-based violence exposure was measured by 22 questions using modified National Intimate and Sexual Violence Survey (NISVS) measures;[2] to accommodate length consideration, many of the original NISVS questions were combined. In addition, response options were altered to elicit number of partners or people inflicting the type of abuse, rather than just ascertaining exposure or non-exposure. New questions pertaining to health care usage restrictions by intimate partners were developed. The new and altered questions were taken through cognitive interviews and reviewed by experts in the field of intimate partner violence

measurement to assure combined questions made theoretical sense. Participants were asked to identify how many partners had ever inflicted each form of intimate violence, and how many persons have ever inflicted each form of sexual violence, by intimates or others. Response options of 0, 1, 2, 3, 4, or 5 or more partners were offered for each question. Respondents indicating 5 or more partners or persons inflicting abuse were assigned a value of 5 for analysis purposes.

Psychological Abuse. Questions pertaining to psychological abuse, and the assigned variable name, included how many romantic or sexual partners have ever:

1) told you that you were a loser, a failure, or not good enough (*loser*);
2) told you that no one else would want you (*nonewant*);
3) acted very angry towards you in a way that seemed dangerous (*danger*);
4) said things like "If I can't have you, then no one can"(*must have*);
5) threatened to commit suicide when he or she was upset with you (*suicide*);
6) tried to keep you from seeing or talking to family or friends (*keptfrom*);
7) made decisions for you that should have been yours to make, such as what clothes you wear, things you eat, or the friends you have (*nodecide*);
8) kept track of you by demanding to know where you were and what you were doing (*keptrack*);
9) kept you from leaving the house when you wanted to go (*kepthome*); and
10) kept you from having money for your own use (*keptmony*).

In the **One Factor Psychological Abuse Model**, all ten observed measures were loaded onto one Psychological Gender-based Intimate Partner Violence construct (*PSYCHOLG*). In the **Three Factor Psychological Abuse Model**, variables *loser* and *nonewant* were loaded onto a Demeaning Emotional Abuse construct (*DEMEAN*), variables *danger*, *musthave* and *suicide* were loaded onto a Fear Invoking Control construct (FEAR), and variables *keptfrom*, *nodecide*, *keptrack*, *kepthome*, and *keptmony* were loaded onto an Isolation construct (*ISOLATE*).

Physical Abuse. Questions pertaining to physical abuse, and the assigned variable name, included how many romantic or sexual partners have ever:

1) beaten you (*beat*);
2) tried to choke or suffocate you (*choke*);
3) burned you or used a knife or gun on you (*weapon*);
4) kept you from going to see a doctor or seeking medical care (*noDx*);
5) told you not to follow doctor's orders, like denying you medication, or suggesting that you don't follow through with recommended medical care (*noDxorde*).

In the **One Factor Physical Abuse Model**, all five observed measures were loaded onto one Physical Gender-based Intimate Partner Violence construct (*PHYSICAL*). In the **Two Factor Physical Abuse Model**, variables *beat, choke,* and *weapon* were loaded onto a Physical Assault construct (*ASSAULT*), and variables *noDx* and *noDxorde* were loaded onto a Medical Restriction construct (*MXRSTRCT*).

Sexual Abuse. Questions pertaining to sexual abuse, and the assigned variable name, included how many romantic or sexual partners have ever:

1) tried to get you pregnant when you did not want to become pregnant or tried to stop you from using birth control (*getpreg*);
2) refused to use a condom when you wanted one to be used (*nocondom*); and
3) physically harmed you while you were pregnant, including hitting or pushing you, throwing you down stairs, choking or suffocating you (*harmpreg*).

It also included the following questions, and the assigned variable name:

4) When you were drunk, high, drugged, or passed out and unable to consent, how many people ever had vaginal sexual with you, made you have anal sex, made you perform oral sex, made you receive oral sex, or put their fingers or an object in your vagina (*noconsex*);
5) How many people have ever used physical force or threats to make you have vaginal sex, have anal sex, make you perform oral sex, make you receive oral sex or put their fingers or an object in your vagina (*forcesex*);
6) How many people have you had vaginal, oral, or anal sex with after they pressured you by doing things like telling you lies, making promises, or repeatedly asking for sex (*presssex*); and
7) How many people have ever used physical force or threats to try to have vaginal, oral, or anal sex with you, but sex did not happen (*triedsex*).

In the **One Factor Sexual Abuse Model**, all seven observed measures were loaded onto one Sexual Gender-based Violence by Intimate or Other construct (*SEXUAL*). In the

Three Factor Sexual Abuse Model, variables *getpreg, nocondom,* and *harmpreg* were loaded onto a Reproductive Coercion construct (*REPCOERC*), variables *noconsex* and *presssex* were loaded onto a Coerced Sexual Abuse construct (COERCSEX), and *forcesex* and *triedsex* were loaded onto a Forced Sexual Abuse construct (*FORCESEX*).

Analysis. Data cleaning and descriptive statistics were calculated using SAS, Version 9.3.[164] As can be expected with count data in health settings where there is a high frequency of 0 responses (indicating non-exposure), significant skewness (range 0.75-5.09) and kurtosis (range -1.00-27.24) were noted, so appropriate analysis methods were employed. The use of polychoric correlations and diagonally weighted least squares estimation is recommended when analyzing ordinal, nonnormal data.[229] Raw data was entered into PRELIS to obtain a polychoric correlation matrix and asymptotic covariance matrix, which were subsequently uploaded into LISREL 9.10.[163] Confirmatory factor analysis using Diagonally Weighted Least Squares method of estimation in LISREL 9.10 was used to determine if the variance and covariance in the data was best explained in the psychological abuse data by a 1 or 3 construct model (psychological abuse vs. demeaning emotion abuse, fear invoking control, and isolation); in the physical abuse data by a 1 or 2 construct model (physical abuse vs. physical assault and medical restriction); and in the sexual abuse data by a 1 or 3 construct model (sexual abuse vs. reproductive coercion, coerced sexual abuse, and forced sexual abuse).[166] In each comparison, the same set of observed data was loaded onto either a one construct model, or a multiple construct model.

The primary goodness-of-fit index used to assess model fit was the Satorra-Bentler scaled chi-square—a goodness-of-fit chi square adjusted for bias of multivariate nonnormality found in this data.[230] The Satorra-Bentler scaled chi-square value reported in LISREL is a rescaling of the normal-theory weighted least-squares (NTWLS) chi-square. Non-significant chi-square values indicate a good fit.[166]

Scaled normal weighted least-squares chi-square (NTWLS) difference test chi-square values were used to determine if the multi-construct model significantly increased model fit over the more naïve one construct model for psychological, physical, and sexual abuse.[230] A significant chi-square value indicates an improved model fit when moving from the less restrictive to the more restrictive confirmatory factor model.[230] The NTWLS test is conducted by subtracting the NTWLS chi-square value from the less restrictive model from the NTWLS chi-square value from the more restrictive model, and then dividing this difference by a scaling factor computed to correct for multivariate kurtosis found in the data.[230]

Results

Response rate and sample characteristics. Response rates were ascertained using AAPOR response rate 1 calculations.[168] Of the 1950 households mailed screening packets, 776 returned questionnaires, resulting in a 44.4% response rate for household enumeration. Of those responding, 599 women were eligible and selected into the

TABLE 11. PARTICIPANT DEMOGRAPHICS AND BY GENDER-BASED VIOLENCE EXPOSURE STATUS

	Total (N=398)	Never exposed to gender-based violence (N=173)	Ever exposed to gender-based violence (N=225)	*p-value*[a]
Age, *n* (%)				<.01
18-30 years old	54 (13.6%)	22 (5.5)	32 (8.0%)	
30<50 years old	125 (31.4%)	40 (10.1%)	85 (21.4%)	
≥50 years old	219 (55.0%)	111 (27.9%)	108 (27.1%)	
Race, White, *n* (%)	384 (96.5%)	167 (42.0%)	217 (54.5%)	.96
Education, n (%)				0.67
Less than high school (HS)	25 (6.3%)	8 (2.0%)	17 (4.3%)	
HS diploma	102 (25.6%)	46 (11.6%)	56 (14.1%)	
GED	10 (2.5%)	4 (1.0%)	6 (1.5%)	
>HS diploma	261 (65.6%)	115 (28.9%)	146 (36.7%)	
Marital Status, n(%)				<.0001
Married	263 (66.1%)	135 (33.9%)	128 (32.2%)	
Divorced or Separated	48 (12.1%)	5 (1.3%)	43 (12.1%)	
Widowed	34 (8.6%)	19 (4.8%)	15 (3.8%)	
Never been married	30 (7.5%)	11 (2.8%)	19 (4.8%%)	
Living with partner	23 (5.8%)	3 (0.8%)	20 (5.0%)	
Household Income, n (%) (N=350, 48 missing)				.03
<$20,000	60 (17.1%)	16 (4.6%)	44 (12.6%)	
$20,000-$50,000	120 (34.3%)	50 (14.3%)	70 (20.0%)	
>$50,000	170 (48.6%)	79 (22.6%)	91 (26.0%)	
Currently Insured, *n* (%)	353 (88.7%)	159 (40.0%)	194 (48.7%)	.08

[a]Chi-square test performed on categorical variables

sample, and 408 women subsequently consented and completed interviews, resulting in a 71.0% participation rate.[231] The analytic sample for this analysis comprised 398

participants who provided complete gender-based violence exposure histories. Sample characteristics are presented in **Table 11** by gender-based violence exposure status. Nearly 6 in 10 women reported some sort of sexual and/or intimate partner gender-based violence at some point in their lifetime. Lifetime psychological gender-based abuse by an intimate partner was reported by 52% of participants (31% demeaning emotional abuse, 40% fear invoking control, and 44% isolation). Lifetime physical gender-based abuse by an intimate partner was reported by 21% of participants (21% physical assault and 6% medical restriction). Thirty-four percent of women in the region reported lifetime exposure to gender-based sexual abuse by an intimate partner or other (10% reproductive coercion, 23% coerced sexual abuse, and 23% forced sexual abuse).

Model fit: Psychological Gender-based Intimate Partner Violence. **Figure 5** presents path diagrams displaying standardized factor loadings for a one factor versus three factor model of psychological intimate partner gender-based violence exposure. For the One Construct Psychological Abuse Model, in which all of the observed psychological abuse measures were loaded onto one construct, factor loadings ranged in value from 0.66 to 0.91. All factor loadings were significantly different from 0. The Satorra-Bentler Scaled chi-square indicated a *poor fit* (Satorra-Bentler Scaled $\chi^2_{(35)}$=55.07, p=0.02). Whereas, for the Three Construct Psychological Abuse Model, in which all observed psychological abuse measures were loaded onto one of three constructs (Demeaning Emotional Abuse, Fear Invoking Control, or Isolation), it indicated a *good fit* (Satorra-

Bentler Scaled $\chi^2_{(32)}$= 35.86, p=0.29). In the Three Construct Psychological Abuse model factor loadings ranged in value from 0.68 to 0.95. All factor loadings were significantly different from 0. Although acceptable, *keptmony* was a relatively weaker measure in both models. The scaled difference chi-square test (NTWLS) demonstrated that model fit significantly improved when modeling the psychological abuse data as three constructs (Scaled NTWLS difference test $\chi^2_{(3)}$= 8.42, p=0.038).

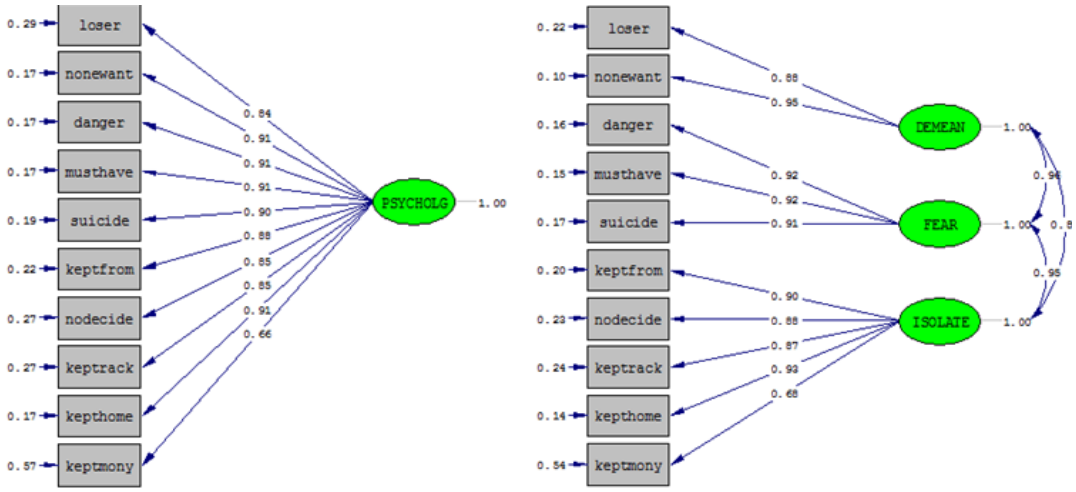

FIGURE 5. MODELING PSYCHOLOGICAL GENDER-BASED INTIMATE PARTNER VIOLENCE (STANDARDIZED FACTOR LOADINGS)

Model fit: Physical Gender-based Intimate Partner Violence. Path diagrams displaying standardized factor loadings for a one factor versus two factor model of physical intimate partner gender-based violence exposure are presented in **Figure 6**.

The Satorra-Bentler Scaled chi-square indicated a *good fit* for both the One Construct Physical Abuse Model, in which all of the observed physical abuse measures were loaded onto one construct (Satorra-Bentler Scaled $\chi^2_{(5)}$=6.98, p=0.22), and for the Two Construct Physical Abuse Model, in which all observed physical abuse measures were loaded onto one of two constructs (Physical Assault or Medical Restriction) (Satorra-Bentler Scaled $\chi^2_{(4)}$=0.95, p=0.92). Factor loadings from the one construct model ranged in value from 0.86 to 0.94, whereas in the two construct model factor loadings ranged from 0.87 to 0.95. All factor loadings, in both models, were significantly different than 0. Factor loadings indicated that all measures were strong, including the two newly developed measures to ascertain medical restriction by intimate partners. When comparing the models to each other, the scaled difference chi-square test demonstrated model fit significantly improved when modeling the physical abuse data as two constructs (Scaled NTWLS difference test $\chi^2_{(1)}$= 4.62, p=0.032).

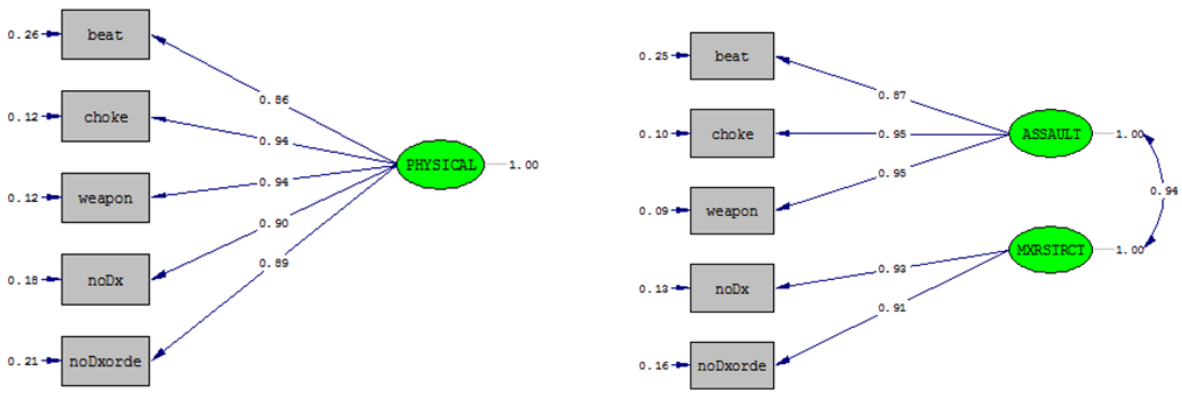

FIGURE 6. MODELING PHYSICAL GENDER-BASED INTIMATE PARTNER VIOLENCE (STANDARDIZED FACTOR LOADINGS)

Model fit: Sexual Gender-based Violence by an Intimate Partner or Other. Figure 7 presents path diagrams displaying standardized factor loadings for a one factor versus three factor model of exposure to sexual gender-based violence by an intimate partner or other. For the One Construct Sexual Abuse Model, in which all of the observed sexual abuse measures were loaded onto one construct, the factor loadings ranged in value from 0.82 to 0.93; all factor loadings were significantly different than 0. The Satorra-Bentler Scaled chi-square indicated a *poor fit* for the one construct model (Satorra-Bentler Scaled $\chi^2_{(14)}$=25.08, p=0.03). For the Three Construct Sexual Abuse Model, however, in which all observed sexual abuse measures were loaded onto one of three constructs (Reproductive Coercion , Coerced Sexual Abuse , or Forced Sexual Abuse), the Satorra-Bentler Scaled chi-square indicated a *good fit* (Satorra-Bentler Scaled $\chi^2_{(11)}$=8.74, p=0.65). In the three construct model, the factor loadings ranged in value

from 0.84 to 0.95, and all factor loadings were significantly different than 0. All measures appear to be strong and necessary to ascertain information about the constructs. The scaled normal weighted least-squares chi-square difference test demonstrated that model fit significantly improved when modeling the sexual abuse data as three constructs (Scaled NTWLS difference test $\chi^2_{(3)} = 10.23, \mathrm{p} = 0.017$).

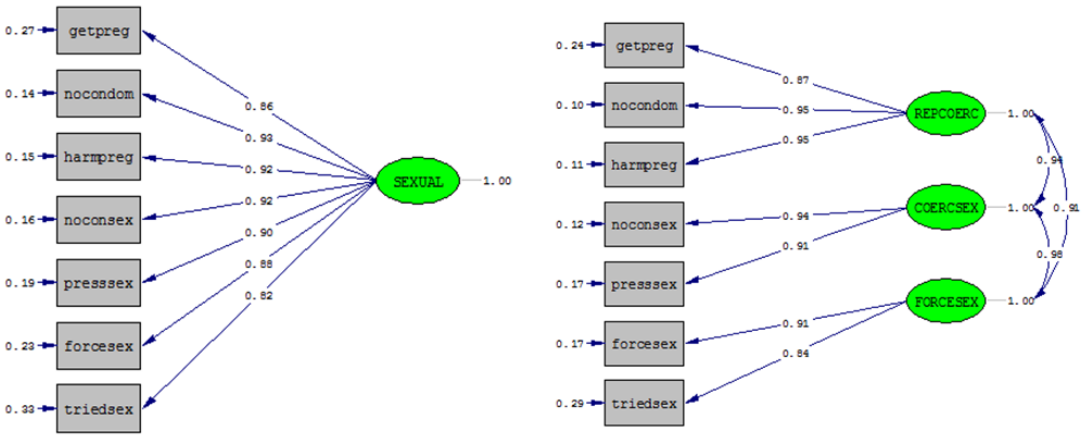

FIGURE 7. MODELING SEXUAL GENDER-BASED VIOLENCE (STANDARDIZED FACTOR LOADINGS)

Discussion

Despite its widespread use, few have investigated whether the three construct conceptualization of intimate partner and sexual gender-based violence (i.e., psychological, physical and sexual abuse) is most effective in representing the types of gender-based violence that people experience, including capturing information about the mechanistic way that abuse is limiting or altering health care access. This is of critical importance among populations where abuse exposure is high, and where access to health services is scare, limiting health providers' opportunities for assessment and

appropriate referral. Our study tested different models to assess and best represent gender-based violence occurrence in a traditionally underserved, high risk region in the United States: rural Appalachia.

Model fit significantly improved in all cases when moving from a one construct to a multi-factorial modeling of gender-based violence exposure data. Within the high risk population included in the study, results support the use of a three construct modeling of psychological gender-based intimate partner violence for use in research and practice, including measuring and modeling gender-based demeaning emotional abuse, fear invoking control, and isolation by an intimate partner. Similarly, results suggest the use of a two construct modeling of physical gender-based intimate partner violence, comprising gender-based physical assault and medical restriction by an intimate partner. Finally, results support the use of a three construct modeling of sexual gender-based violence by an intimate partner or other to include gender-based reproductive coercion by an intimate partner and gender-based coerced and forced sexual abuse by an intimate partner or other.

There are limitations to the current investigation. First, due to the way data were collected about coerced and forced sexual abuse, it is difficult to disentangle the effect of gender-based violence by intimates from coerced or forced sexual abuse by strangers. It should be noted that a majority of all gender-based sexual violence, including coerced and forced sexual abuse, was perpetrated by people the survivor

knew, supporting prior research findings.[2] In the present study, of those women that reported either coerced or forced sexual abuse exposure, 60.0% reported this abuse by a current or intimate partner, 44.9% reported sexual abuse by an acquaintance, including a first date, 16.9% reported abuse by a family member other than an intimate partner, whereas only 6.2% reported sexual abuse by a stranger. In addition, all but one participant reporting sexual abuse by a stranger also reported some form of intimate partner violence. A replication study might be performed that would allow for such isolation.

Second, survey research is liable to coverage bias through underrepresentation of women exposed to sexual and intimate partner violence.[97] Despite this, population-based surveying employing random sampling is the preferred method to obtain data for population inference.[128] Address-Based Sampling (ABS), as was used here, has been gaining favor as a recruitment method for survey research since telephone-based sampling frames have been prone to increased undercoverage, especially among socially marginalized populations.[126-128,130] In order to capture a more representative sample of the general population, research firms have developed comprehensive address-based sampling frames that include wireless only households and researchers have started to validate the use of ABS methods to lessen the potential of coverage error in the sampling frame and of nonobservation in final survey statistics.[125,128,130] Despite our use of a sampling frame that may be more representative of the general population, we only had a 44.4% response rate for household enumeration, and a

71.0% participation rate. The National Intimate Partner and Sexual Violence Survey, a national random digit dial (RDD) telephone survey, in 2010, had a response rate ranging from 27.5% to 33.6% of households called, and a cooperation rate of 81.3% who agreed to interview among those deemed eligible for survey.[2] Despite concerns, our household response rate was higher than the standard survey used to obtain population estimates of gender-based violence.[2]

These limitations notwithstanding, the study findings offer promising directions in assessment and intervention for researchers and practitioners interested in reducing health disparities among this vulnerable and stigmatized population. For instance, isolating mechanistic types of abuse represented in the multi-factorial modeling of gender-based sexual and intimate partner violence data (i.e., gender-based isolation, medical restriction, or sexual coercion by an intimate) offer promising opportunities for health disparity researchers. Future areas of investigation may include isolating mechanistic types of abuse that may require specialized, contextual interventions in health care settings for those exposed.[202] Tailored intervention, taking into account the mechanistic type of abuse experienced, might allow women with abuse exposure to more fully access and benefit from health care services offered and prescribed courses of treatment. [109,202]

Chapter 6: Conclusions

This dissertation presented a course of investigation which examined the relationship between sexual and intimate partner violence gender-based violence exposures and smoking, among women in Ohio Appalachia, within a socio-contextual health disparities framework. This dissertation answered the overarching research question: Is gender-based violence exposure by sexual or intimate partners, and other conditions associated with this exposure, associated with the smoking behaviors exhibited by women in three Ohio Appalachian communities?

Primary findings from dissertation analysis reveal:

1. ***Gender-based violence is prevalent in Ohio Appalachia***. Intimate partner and sexual gender-based violence is not only a notable public health concern in Ohio Appalachia, but is a human rights issue—impacting nearly 6 out of 10 women in the region. Estimates for gender-based sexual and intimate partner violence in Ohio Appalachia rival estimates for exposure among populations most at-risk for exposure in the United States, including racial and ethnic minorities, and appear to be above

estimates for rape and intimate partner violence across Ohio.[2] Those seeking to reduce disparate disease burden among women in Ohio Appalachia should consider the role gender-based violence exposure plays in exhibited health behavior, behavioral interventions, disease progression and treatment.[171,197,198]

2. ***Intimate partner and sexual gender-based violence exposure is a risk factor for current smoking among Ohio Appalachia women.*** When controlling for other known risk factors for smoking among women in the region, cumulative exposure to multiple forms of gender-based violence is an independent risk factor for smoking among women in Ohio Appalachia. There was a significant difference in any intimate partner and/or sexual gender-based violence lifetime exposure, and for each abuse type (demeaning emotional abuse, fear invoking control, isolation, physical assault, medical restriction, and reproductive coercion by an intimate partner in addition to coerced and forced sexual abuse by an intimate partner or other), across smoking status, with prevalence increasing in each case when moving from never smokers, to former smokers, to current smokers. Among current smokers, 77.5% reported sexual and/or intimate partner violence lifetime exposure, compared to 69.6% among former smokers and 43.8% among never smokers. The categorical distribution of the GBV Exposure Index score, a composite score representing cumulative exposure to eight abuse types, was also significantly different across smoking status, with increasing prevalence of exposure to multiple

gender-based violence abuse types moving from never, to former, to current smokers. Based on these findings, anyone seeking to encourage or assist women in Appalachia with tobacco cessation must acknowledge that gender-based violence exposure, and its sequale, are likely impacting women's smoking behavior and ability to engage in successful cessation.[104,105]

3. ***Due to safety concerns among gender-based violence survivors, and the correlation noted between violence exposure and contextual variables, the social context of a gender-based violence survivor's smoking behaviors and cessation attempts should be considered.*** Graded, cumulative gender-based violence was associated with intrapersonal and contextual factors which could be influencing both current smoking and gender-based survivors' attempts to quit. Significant differences existed between current and past smokers with gender-based violence exposure histories regarding: perceived stress, exposure to fear invoking control (a type of intimate partner violence), perception of social status, discrimination, adult socioeconomic position, perception of number of smokers in the social environment, and home smoking restrictions. Due to the unique safety concerns for this population, the social context of a gender-based violence survivor's smoking behaviors and cessation attempts must be considered when adapting cessation programs to this population. Findings from this study suggest that it may be factors within a survivor's environment causing stress—a culture tolerant of gender-based

violence, discrimination, social economic standing, and smoking bans within the home—which must be addressed in concert with intrapersonal factors, like self-control and affect regulation, to help this vulnerable population succeed in smoking cessation.

4. ***In the Appalachian region, where abuse exposure is high and where access to health services are scare, assessment for eight types of gender-based violence may open opportunities for more targeted intervention and referral.*** Findings from this study determined the validity of using a more mechanistic modeling of intimate partner and gender-based violence for use in research and practice including the eight constructs: demeaning emotional abuse, fear invoking control, isolation, physical assault, medical restriction, and reproductive coercion by an intimate partner in addition to coerced and forced sexual abuse by an intimate partner or other. The assessment of eight forms of gender-based violence, as opposed to a three factor modeling predominate in public health, better represents the exposure to gender-based violence experienced by women in Ohio Appalachia. In addition, the Gender-based Violence Exposure Index (GBV Exposure Index), proved to be a powerful explanatory variable representing the influence of cumulative exposure to these eight forms of abuse.

Limitations

There are limitations impacting analysis and study findings. First, cross-sectional data cannot be used to determine temporality—limiting interpretations regarding the relationship between cumulative exposures to multiple forms of gender-based violence, intrapersonal and contextual variables, and smoking status of women in Appalachia. Further modeling and longitudinal investigations are warranted to determine the cluster of factors which might be best to consider when tailoring a smoking cessation intervention to meet the needs of gender-based violence survivors. Second, survey research is liable to coverage bias through underrepresentation of smokers and of women exposed to sexual and intimate partner violence.[97] Indeed, only 20% of the sample reported current smoking, when the population estimate for women in the region is 32%.[53,54] Given this, and the high correlation between current smoking and gender-based violence exposure in the sample, intimate partner and sexual violence gender-based violence estimates produced for this region, in this analysis, are probably conservative, and underrepresent the true population parameter. In addition, those women who did respond may be different than women sampled but not consented on key factors impacting smoking and cessation. These results should be considered a first attempt at understanding the context of smoking behaviors for women who have ever smoked who also report gender-based violence exposure. Finally, a limitation of this study and critical element missing from the interpretation of the data, in particular, is

the perspective of women smokers who have also experienced gender-based violence. Survivors of gender-based violence, both those within currently abusive relationships, along with those with past abuse, need to be asked directly about their primary concerns, and what they see as the primary barriers to quitting smoking or any other recommended behavioral change intervention. It is possible that factors not identified through survey research might surface as critical elements for this vulnerable population. Further qualitative investigation is necessary to tease out other mediating mechanisms, not identified here, that might need to be directly addressed concurrently with tobacco cessation in order for this population to fully engage with behavioral intervention and succeed at cessation.

Despite these limitations, this is the first known study: 1) to report intimate partner and sexual violence gender-based violence estimates for a full range of abuse types among women in Ohio Appalachia; 2) to find cumulative gender-based violence exposure a risk factor for smoking in the region; 3) to quantify social and contextual factors that may impact the high rate of smoking among women exposed to gender-based violence; and 4) test a mechanistic eight factorial model representing types of intimate partner and sexual violence exposure against the predominant three construct model typically used in public health research. These contributions are valuable to our collective understanding of the potential influence of gender-based violence on health disparities experienced by women in Ohio Appalachia.

Considerations for Future Research

Given study findings, and in consideration of study limitations, the following avenues might be considered, both by researchers interested in reducing health disparities among women in Ohio Appalachia, and by those interested in reducing health disparities among women exposed to intimate partner and sexual violence at some point during the life course:

1. ***In order to reduce smoking prevalence among populations disproportionally exposed to gender-based violence we need to more fully understand the mediating intrapersonal and social-contextual pathways between abuse exposure and smoking. In addition, for a population in which safety is of central concern, the moderating role of social context on a survivor's ability to engage in the cessation process should also be considered***. Given study findings and the current state of the literature, it is plausible to hypothesize that the cumulative stress that women exposed to increasing types of intimate partner and sexual violence experience is leading to a coping response in which alexithymia is blunted, impulsivity increases, and depression takes hold; where the perceived rewards and satisfaction from smoking are increased along with the regulation of affect, in particular positive affect, especially among those with depression; and where the proclivity to relapse is heightened in the face of changed self-control pathways and continued stress. Further investigation into the relationship

between stress regulation, impulsivity, alexithymia, perception of stress, depression, positive affect regulation, learning to manage fear invoking control as part of the abuse process, and smoking among women exposed to a range of sexual and/or intimate partner violence is warranted to more fully understand this relationship and its potential impact on the smoking cessation process for women with gender-based violence exposure histories. Taking into account the strong association between social contextual factors and smoking among women exposed to gender based violence, it's also important to understand how intrapersonal regulation is influenced by the social context in which women exposed to gender-based violence live. In **Appendix C**, a conceptual model has been proposed for the way in which social contextual factors may be influencing smoking behaviors for women exposed to intimate partner and sexual gender-based violence; in addition hypothesized mediating and moderating mechanisms have been proposed as possible pathways to consider when tailoring a smoking cessation intervention to meet the needs of women exposed to gender-based violence. Further investigation is needed to understand if these mechanisms, indeed, could assist survivors of gender-based violence find success in smoking cessation intervention. (See **Appendix C**: The social context of smoking behaviors among women exposed to intimate partner and sexual gender-based violence and hypothesized mediating mechanisms and modifying factors to address in a tailored smoking cessation intervention).

2. ***Given the pervasive prevalence of intimate partner and sexual gender-based violence in Ohio Appalachia, it is plausible that gender-based violence may be associated with other detrimental health behaviors, or preventative health promotion behaviors, among women in the region***. Researchers interested in reducing health disparities among women in the Appalachian region might consider the way in which specific types of gender-based violence, and cumulative exposure to multiple forms of gender-based violence, may be influencing: 1) other addictive behaviors, including prescription drug misuse,[232] 2) family planning,[121,233] 3) sexually transmitted infection and other infectious disease prevention even among partnered women,[234] 4) maternal and child health, including prematurity and infant mortality,[235] 5) preventative screening behaviors, including Pap screening,[236] and 6) mental health.[71]

3. ***These study findings offer promising directions in assessment and intervention for researchers and practitioners interested in reducing health disparities among women exposed to gender-based violence***. For instance, isolating mechanistic types of abuse represented in the multi-factorial modeling of gender-based sexual and intimate partner violence data (for instance, gender-based isolation, medical restriction, or sexual coercion by an intimate) offer promising opportunities for health disparity researchers. Future areas of investigation may include isolating types of abuse that may require specialized, contextual interventions in health care settings for those experiencing these types of abuses. In addition, survivors of gender-based violence in this study reported living within a stress invoking context—this environment, and possible intrapersonal

changes that may have taken place due to traumatic exposure, should be considered in health behavior interventions designed for this population. Tailored intervention, taking into account the contextual needs of survivors of gender-based violence, and those in currently abusive situations, might allow survivors greater access and benefit from health care services offered, including adhering more fully to prescribed courses of treatment or behavioral modification goals.[105]

In conclusion

Health disparate outcomes among women exposed to gender-based violence are not inevitable and can be greatly reduced if health professionals seek to understand how to meet the needs of survivors within the course of behavioral treatments. A key aspect of this tailoring process must include widening the focus of intervention to not just the individual, but to the survivor's environment, where more may be out of their control than within it. In the book *Counseling to End Violence Against Women,* Whalen proposes that the process of helping survivors of gender-based violence heal must include not only individual counseling, but counseling that connects survivors to the larger social justice work of ending violence against women, including addressing social context which condones and even promotes such violence.[218] Findings from this study suggest, in fact, that it may be factors within a survivor's environment causing stress—a culture tolerant of gender-based violence, discrimination, social economic standing, and smoking bans within the home—which must be addressed in concert with intrapersonal

factors, like self-control and affect regulation, to help this vulnerable population succeed in smoking cessation and other health promotion activities.

Smoking, the leading cause of preventable mortality and morbidity, is particularly high among survivors of intimate partner and sexual violence. And current women smokers, in Ohio Appalachia in particular, are also overwhelmingly survivors of intimate partner and/or sexual violence. The inquiry in to how best help women smokers exposed to gender-based violence move through successful cessation is nothing short of health justice work,[72] and will take the collective attention and commitment of both those within the health professions with knowledge of nicotine addiction and cessation alongside community-based advocacy organizations that have been working with survivors of gender-based violence for decades.

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Appendix A:

CARE II Project 2 Research Interview and Distress Protocol

Appendix A: CARE II Project 2

Research Interview and Distress Protocol

The following protocol outlines the action of the Interviewer if, during the course of the interview, a participant exhibits acute distress or safety.

Indications of Distress During Interview	Follow-Up Questions	Participant Behaviors/ Responses	Actual Emotional Distress/ Safety Concern? (Y or N)	Imminent Danger? (Y or N)
I. If the study participant indicates she is experiencing a high level of stress or emotional distress **OR** exhibit behaviors suggestive that the interview is too stressful such as uncontrollable crying, incoherent speech, indications of flashbacks, etc.	Then the interviewer should: 1. Stop the interview. 2. Offer support (ie. **I can see this is very difficult for you**) and allow the participant time to regroup. 3. Assess person's current state: a. Tell me what thoughts you are having. b. Tell me what you are feeling right now. c. Do you feel safe? (If NO, ask questions pertaining to danger.) d. Do you feel that you are able to proceed with this interview? It's okay if you can't. You'll still receive compensation for your time today. 4. Determine if the person is experiencing **acute emotional distress beyond what would be normally expected in an interview about a sensitive topic**.			
II. If study participant indicates she is in any danger if anyone else found out about her participation in the study	1. Stop the interview. 2. Assess danger from the participant: • How might you be in danger? • How might the other person find out you were participating? • What do you think the other person would do if they found out you were participating in the study? 3. Determine if the person is experiencing **a safety concern**.			

This protocol is modeled after the "Research Interview and Distress Protocol" suggested in [137] .

Actions for Interviewer:

1. If a **participant's distress reflects an emotional response reflective of what would be expected in an interview about a sensitive topic**, offer support and extend the opportunity to: (a) stop the interview; (b) regroup; (c) continue with interview.

2. If a participant's distress reflects **acute emotional distress or a safety concern** beyond what would be expected in an interview about a sensitive topic, **but NOT imminent danger**, take the following actions:
    a. Stop the Interview.
    b. If she has one, encourage the participant to contact her mental health provider.
    c. Provide the participant with the local county contact sheet (including hotline, mental health providers, and local domestic violence or sexual violence response services) and encourage the participant to call one of the resources if she experiences increased distress in the hours/days following the interview.
    d. Ask:
        - **Would you like for one of our staff members, who has medical training, to contact you in the next few days to check in on you?**
        - **Can she call you at the same phone number that I called when I set up this interview?**
    e. If participant desires a follow-up phone call, notify Dr. Mary Ellen Wewers. Dr. Wewers will follow up with the participant.
    f. Notify Dr. Mary Ellen Wewers, Dr. Tiffany Thompson, and Julianna Nemeth of actions taken.
3. If a participant's distress reflects **imminent danger**, take the following actions:
    a. Stop the Interview.
    b. Contact local hotline number and/or police unless arrangements can be made for the participant to be transported to the emergency room by a family member.
    c. While waiting for family member or police to arrive, provide the participant with the local county contact sheet (including hotline, police, mental health providers, and local domestic violence or sexual violence response services).
    d. Ask:
        - **Would you like for one of our staff members, who has medical training, to contact you in the next few days to check in on you?**
        - **Can she call you at the same phone number that I called when I set up this interview?**
    e. If participant desires a follow-up phone call, notify Dr. Mary Ellen Wewers. Dr. Wewers will follow up with the participant.
    f. Immediately notify Dr. Mary Ellen Wewers, Dr. Tiffany Thompson, and Julianna Nemeth of actions taken.

The following training would be provided to all interviewers on this project:

1. Signs of and brief interventions with people who may be at risk for suicide/self-harm.
2. Signs of and brief interventions with people who may have experienced trauma.
3. Orientation to local mental health, alcohol and drug services, hospital, and sexual and domestic violence advocacy services.
4. Training on implementing "Project 2: Research Interview and Distress Protocol."

Reference: Draucker, C. B., Martsolf, D. S., & Poole, C. (2009). Developing distress protocols for research on sensitive topics. Arch Psychiatr Nurs, 23(5), 343-350. doi: 10.1016/j.apnu.2008.10.008

Appendix B:

Tobacco Control Variables

Appendix B: Tobacco Control Variables

	Construct	Composite Score	Subscales, if any	Section in CARE II Project 2 Survey	Questions from Section	Citation to Measures Used
Intrapersonal Factors	Current smoking status & history of smoking	Categorical (never, former, current)		SMKSTAT	Q. 1-7.	NHIS (Q.1,2 & 4-7)[1] & Care 1 (Q. 3)
	Nicotine dependence	A six item summary score (range 0-10)		SMKSTAT	Q. Combination of 4-7 & 17-21. A six item summary score (range 0-10) comprise the Faerstrom Test of Nicotine Dependence (FTND).[2] Questions with points assigned to each response option are as follows: 1. "How soon after you awake to you smoke your first cigarette?": Within 5 minutes (3 pts), 6-30 minutes (2 pts), 31-60 minutes (1 pt), after 30 minutes (0 pts). 2. "Do you find it difficult to refrain from smoking in places where it is forbidden?": Yes (1 pt)/No(0 pt). 3. Which cigarette would you hate to most give up?": The first one in the morning (1 pt)/All others (0 pts). 4. "How many cigarettes/day to you smoke?": 10 or less (0 pts), 11-20 (1 pt), 21-30 (2 pts), 31 or more (3 pts).	Fagerstrom Test for Nicotine Dependence (Heatherton et al.)[2]
	Quit Attempt History (Stages of Change)			SMKSTAT	Q. 9-13, 15-16, 29-33	
Interpersonal Factors	Household composition & Household (HH) smoking status	Combination of the three subscales: Household smoking status	Smoking status of household members less than 14 years old	HCOMP	Q.2-5	CARE I & Wewers
			Smoking status of household members 14-18 yrs. old		Q.6-9	
			Smoking status of household members less than 18+ yrs. old		Q.10-13	
	Social influences on smoking cessation	No composite-only 6 subscales	**Explicit Verbal Norm** <verbal stimulation to quit smoking>[3]	SMKSTAT	Q. 27 "During the last 3 months, have people in your environment said that you should quit smoking?" 5-point response option (Never, Rarely, Sometimes, Often, Very Often).[3]	Social Influences Scale (van den Putte et al., 2005)[3]

			Descriptive Smoking Norm <perception of how many other people smoke>[3]		Q. 38-42workplac Asked if "partner/spouse" and "best friend" smoke (Yes/no, to each). Asked how many children smoke (#). Asked how many friends and acquaintances, relatives, and direct colleagues smoke, with response options on a 4-point scale (None, some most all). Putte formed composite variable of these items as an indicator of the number of smokers in a respondent's social environment. If referent non-existent they were coded as if didn't smoke. Composite variable coded so larger values indicated that less people in the respondents social environment smoke.[3]	
			Descriptive Quitting Norm <perception of how many other people quit smoking>[3]		Q. 43 "How many of the smokers who you regularly see have tried to quit smoking in that last 3 months?" 4-point response option (None, Some, Most, All)[3]	
			Injunctive Norm <perception of acceptability of smoking in society>[3]		Q. 59-62 Four of eight items used by van den Putte. "How acceptable is it if someone smokes in the following locations: 1) bar, 2) presence of children, 3) public spaces such as shopping malls, and 4) at work in the presence of non-smoking co-workers." Four questions added to form a scale. 5-point scale, very unacceptable to very acceptable. In analysis, coding is reversed. (alpha=0.81 for 8 item scale)[3]	
			Subjective Norm <perception of whether other people think that the respondent should quit smoking>		Q. 14 "If you decided to quit smoking within the next three months, how would the people who are important to you fell?" 5-point scale, strongly disapprove to strongly approve.[3]	
Organizational Factors	HH smoking rules (home smoking restrictions)			SMKSTAT	Q. 34	Current Population Survey (tobacco supplement)[4]
	Work & Workplace smoking restrictions			DEMO	Q. 5-11	Current Population Survey (tobacco supplement)[4]

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4. National Cancer Institute-sponsored Tobacco Use Supplement to the Current Population Survey (2010-11): http://appliedresearch.cancer.gov/studies/tus-cps/. US Department of Commerce, Census Bureau, 2012. (Accessed at Technical documentation: http://www.census.gov/cps/methodology/techdocs.html.)

Appendix C:

The social context of smoking behaviors among women exposed to intimate partner and sexual gender-based violence and hypothesized mediating mechanism and modifying factors to address in a tailored smoking cessation intervention

Appendix C. The social context of smoking behaviors among women exposed to intimate partner and sexual gender-based violence and hypothesized mediating mechanisms and modifying factors to address in a tailored smoking cessation intervention