

Perceived risk of infection and smoking behavior change during COVID-19 in Ohio

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Abstract

Objective: The recent COVID-19 pandemic may catalyze smoking behavior modification. The purpose of the study was to examine factors associated with reducing smoking exposure during the COVID-19 outbreak.

Design: Cross-sectional design using the Health Belief Model to develop an online survey distributed throughout Ohio early during the outbreak.

Sample: 810 adults in Ohio (77.9% non-smokers, 22.1% current smokers).

Measurements: Sociodemographic factors, smoking and behavior changes since the COVID-19 outbreak, and perceived risk of infection were collected. Logistic regression analyses were conducted to determine factors associated with indoor smoking bans and factors associated with desire to quit smoking since the outbreak.

Results: For the overall sample, the odds of indoor smoking bans were significantly associated with never smoked, college education, single-family residence, not living with smokers, and perceived importance of avoiding public places. For smokers, the desire to quit smoking since the COVID-19 outbreak was associated with diabetes and perceived risk of severe infection.

Conclusions: Identified factors inform residential smoking exposure reduction through indoor smoking bans. Having an increased perceived risk of severe infection among smokers may motivate cessation. Public health nurses can provide accurate and accessible resources for smoking cessation during the COVID-19 pandemic to promote healthy lifestyle modification.

KEYWORDS

epidemic, pandemic, smoking

1 | INTRODUCTION

The infectious pandemic outbreak of the novel Coronavirus Disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Clinical manifestations include a range of symptoms, from more common symptoms of tiredness, fever, and cough to less common symptoms of conjunctivitis and discoloration of digits, with respiratory symptoms being the most serious

and associated with complications, increasing the risk for morbidity and mortality. COVID-19 has impacted communities and individuals globally as the infection has been quickly spreading. The virus is primarily transmitted among humans through droplet infection, by inhaling or ingesting respiratory droplets of an infected person who has coughed or sneezed (Adhikari et al., 2020). The virus is also transmitted through contact infection, by touching a contaminated surface and then transferring the virus to mouth, nose, or eyes, wherein

the virus can enter the body. Asymptomatic viral transmission has been noted which increases the risk of unknowingly spreading the virus. Additionally, susceptible populations have been identified as those who have preexisting conditions including immunosuppression, respiratory problems, cardiovascular disease, older adults, and health workers (Driggin et al., 2020; Rothan & Byrareddy, 2020).

By minimizing close human contact as through “social distancing” (also known as “social isolation” and “physical distancing”) along with other measures such as handwashing, cleaning surfaces, and wearing personal protective equipment, viral transmission may be minimized. On community levels, the most common strategy for containment has been quarantine and isolation, with countries recommending and enforcing containment and mitigation strategies in different ways. While recommendations such as the extent of quarantine and wearing masks on community levels vary, individuals maintain their own beliefs and practices regarding prevention of infection. Smoking is a modifiable behavior that has been associated with poor respiratory outcomes and higher risk of severe influenza (Vardavas & Nikitara, 2020). To date, there have been limited large population-based research studies published since the outbreak regarding the association of smoking on the infection risk and severity of COVID-19. A meta-analysis of 19 studies with a pooled total of 11,590 COVID-19 infected patients, found a significantly higher risk of disease progression among smokers compared to never smokers (Patanavanich & Glantz, 2020). Considering the upregulation of angiotensin-converting enzyme-2 (ACE2) receptors with smoking and the role that ACE2 plays in severe respiratory syndromes, researchers have recently suggested that smoking potentially increases the risk of developing severe COVID-19 (Brake et al., 2020; Leung et al., 2020). As such, the increased risk of COVID-19 infection and severe infection among people with risk factors, may motivate smoking cessation among those who smoke. Additionally, households where indoor smoking bans were previously lacking may adopt such restrictions during the global outbreak of COVID-19 as reduction of secondhand smoke exposure through the restriction of indoor smoking has been found to decrease breathing problems (Young et al., 2016).

The Health Belief Model explains health behavior change such as smoking modification in relation to the perceived susceptibility, benefits, barriers, and self-efficacy of health behavior modification, along with personal modifying factors (Rosenstock et al., 1988). In the current context, the pandemic outbreak of COVID-19 and recommendations of social isolation can serve as cues to action to engage in positive behavior modification along with the global transformation in routine daily activities and socialization such as home quarantine and modified, and for many curtailed, employment. In England, concern was expressed that a consequence of social isolation and possible stress is increased smoking among smokers and relapsed smoking among former smokers (Patwardhan, 2020). To date, limited research has been published describing the changes in health behaviors during the COVID-19 pandemic outbreak in the United States.

The aim of the study was to examine factors associated with reducing smoking exposure during the COVID-19 pandemic using the Health Belief Model. The findings can be used to inform public health

TABLE 1 Questions on perceived risk of COVID-19 infection

Using the scale of 1 = none and 10 = extremely high, rate your perception of risks associated with COVID-19...

How much do you think that you are personally at risk of getting infected?

How much do you think that you are personally at risk of severe infection?

How much do you think that members of your home are at risk of getting infected?

How serious is the overall risk in your community of the spread of infection?

How serious is the overall risk in your country of the spread of infection?

How easily does coronavirus spread?

How important is it for you to avoid crowds or groups of people?

How important is it for you to avoid public places?

nurses and other members of the health care team in promoting health behavior modification during the outbreak. At the time of the study being launched in early April 2020, there were over 1.2 million confirmed COVID-19 cases and 72,000 deaths worldwide (World Health Organization, 2020), over 380,000 cases and 12,000 deaths in the United States (Johns Hopkins University & Medicine, 2020), and the daily fatality rate in the state of Ohio reached its highest increase to that date (Hlavaty, 2020).

2 | METHODS

2.1 | Study design

A cross-sectional study was conducted using an anonymous online survey. The survey was developed using the Health Belief Model as the theoretical framework (Rosenstock et al., 1988). A set of eight questions were developed based on the model's constructs about perceived risk of COVID-19 infection (measured on a scale of 1 = lowest and 10 = highest) (Table 1), for which an overall Cronbach's alpha was calculated. The outbreak of COVID-19 and recommendations of social isolation to reduce the risk of infection can serve as an external cue, prompting behavior modification, specifically reducing smoking exposure in the home in general, and smoking cessation among smokers. Following survey development, the online survey was piloted to obtain feedback from 10 colleagues (whose data were excluded from the survey results), after which minor adjustments were made. Institutional review board approval was granted by the author's academic institution prior to initiation of the study.

2.2 | Sample population

Adult residents of Ohio who were at least 18 years of age were eligible to participate in the online survey. The survey was distributed

through listservs and social media outlets with specific boosts targeting adults residing in the state of Ohio. Social media outlets have been found to be an effective method of recruitment (Khatri et al., 2015), especially during the pandemic outbreak and the need to maintain social distancing. Upon reading the online informed consent, the participant could decide whether to proceed with the survey. At the time of the initiation of the survey on April 7, 2020, there were 4,782 confirmed cases in the state and 167 fatalities (Hlavaty, 2020). The governor of Ohio signed an Executive Order Declaring a State of Emergency on March 9, 2020 after three adults in the state tested positive for COVID-19 (DeWine, 2020), making Ohio one of the early states to actively join the global effort in mitigating the outbreak.

2.3 | Data analysis

The primary independent variable of interest was cigarette smoking status with options of currently smokes, formerly smoked, and never smoked. The primary dependent variable of indoor smoking ban was dichotomized: not permitted to smoke in the house (which included permitted to smoke on the porch/outside and no smoking in the house), and permitted to smoke in the house (permitted to smoke anywhere in the house, permitted to smoke in specific rooms, and permitted to smoke in only one specific room). Participants were also asked to report on changes in health behaviors since COVID-19 (increased, remained the same, or decreased). The other health behaviors were exercise (none, up to 30 min per week, 30–90 min per week, 90–150 min per week, and over 150 min per week) and diet (eat set meals daily, limit sweet and salty snacks, limit sweetened drinks, eat at least five fruits or vegetables per day). Additional data collected included sociodemographic factors of age (continuous variable), sex (male or female), marital status (married/living with partner or single/not living with partner), highest education level (high school, undergraduate degree, graduate degree), employment status (no change, reduced or unemployed), health status (heart disease yes/no, respiratory problems yes/no, asthma yes/no, high blood pressure yes/no, diabetes yes/no, COVID-19 infection yes/no), and current household members (children under 18 years of age yes/no, members at-risk for infection who are elderly or have health problems yes/no). For those who reported cigarette smoking, frequency and urgency of smoking, desire to quit, and quit attempts were assessed. There was a question about type of smoking, defined as cigarettes only, e-cigarettes only, or both cigarettes and e-cigarettes. Considering that e-cigarettes are commonly used as a supposed method of smoking cessation (Hajek et al., 2019), those who answered e-cigarettes only were not classified as cigarette smokers; for purposes of analysis, the classification of cigarette smokers was comprised of cigarettes only and both cigarettes and e-cigarettes. There were also two dichotomous questions regarding the perceived association of smoking and COVID-19 infection.

Frequencies and proportions were used to describe participant characteristics. Chi-square tests were used to examine the

proportional differences of characteristics and health behaviors between current smokers and non-smokers with Friedman's exact tests used when the sample was small for a given category. Independent sample *t* tests were used to calculate the mean differences in the continuous variable of age between smokers and non-smokers. To examine differences based on smoking status in perceived risk of COVID-19 infection scale questions, nonparametric Mann-Whitney *U* tests were conducted. Significance was set at $p \leq .05$. Significant variables from the bivariate analyses were used in logistic regression models to calculate adjusted odds ratios (aOR) and 95% confidence intervals (CI) to determine factors associated with indoor smoking bans since COVID-19 among all participants, and to identify factors associated with desire to quit among current smokers and those who quit since the outbreak. Data analyses were conducted using SPSS 25 (NY, IBM Corporation) and post hoc power analysis was conducted using G*Power 3 (Faul et al., 2007).

3 | RESULTS

Within 2 weeks, 1,156 adults at least 18 years of age completed the anonymous survey. After excluding responses where the question regarding the primary independent variable of interest, cigarette smoking status, was not answered and none of the behavior change questions were answered, there were 1,087 respondents. For purposes of the current study, only Ohio residents were selected, bringing the final number to 810 participants. The post hoc power analysis showed that the observed power regarding indoor smoking bans for the total sample of 810 participants was 0.81 with a small effect size of 0.10 and alpha of 0.05. The overall Cronbach's alpha of the eight perceived risk questions was 0.793, considered adequate internal consistency.

Among the total sample, 50.4% had a high school education and the remaining were college educated, a majority were women (72.5%, $n = 587$, compared to 223 men (27.5%)), and 22.1% ($n = 179$) reported that they currently smoked cigarettes. Nearly one-third of participants (31.1%) experienced a negative change in their employment, and for those continuing to work, 66.9% ($n = 351$) were working from home. The average age of survey participants was 33.5 (standard deviation 14.6) years, with non-smokers being significantly younger than smokers (32.4 vs. 37.3, respectively, 95% CI 2.50, 7.34). Since the outbreak, the proportion of people with an indoor smoking ban was significantly higher among non-smokers (91.8%, $n = 579$) compared to current smokers (70.4%, $n = 126$; $p < .001$). Additional differences in characteristics and health factors were noted based on current cigarette smoking status (Table 2).

Most of the participants (75.4%, $n = 611$) thought that smoking increased the risk of COVID-19 infection and an overwhelming majority (93.0%, $n = 753$) thought that smoking increased the severity of the infection. When examining the differences based on current smoking status, a significantly higher proportion of non-smokers compared to smokers thought that smoking increased the risk of infection (77.2% vs. 69.3%, $p = .030$) and increased the risk

TABLE 2 Characteristics and health factors of survey participants ($n = 810$) and differences between current smokers and those who quit since the outbreak ($n = 179$) and nonsmokers ($n = 631$)

Characteristics	Overall % (n)	Nonsmoker % (n)	Smoker % (n)	p
Sex				.098
Male	27.5 (223)	26.1 (165)	32.4 (58)	
Female	72.5 (587)	73.9 (466)	67.6 (121)	
Age categories				<.001***
18–25 years	46.8 (375)	50.2 (314)	34.9 (61)	
26–45 years	28.7 (230)	28.1 (176)	30.9 (54)	
46 years and older	24.5 (196)	21.7 (136)	34.3 (60)	
Education level				<.001***
High school	50.4 (408)	46.9 (296)	62.6 (112)	
Undergraduate degree	27.5 (223)	27.7 (175)	26.8 (48)	
Graduate degree	22.1 (179)	25.4 (160)	10.6 (19)	
Marital status				.586
Married/living with partner	54.1 (438)	53.6 (338)	55.9 (100)	
Single/not living with partner	45.9 (372)	46.4 (293)	44.1 (79)	
Since COVID-19: employment status				.128
No change	68.9 (558)	70.2 (443)	64.2 (115)	
Reduced or unemployed	31.1 (252)	29.8 (188)	35.8 (64)	
Residence				.640
Apartment, condominium, or shared home	18.5 (150)	18.9 (119)	17.3 (31)	
Single-family home or townhouse	81.5 (660)	81.1 (512)	82.7 (148)	
Other household members who smoke				<.001***
Yes	25.6 (207)	20.3 (128)	44.1 (79)	
No	74.4 (603)	79.7 (503)	55.9 (100)	
Children (<18) currently living at home				.239
Yes	34.4 (277)	35.5 (222)	30.7 (55)	
No	65.5 (528)	64.5 (404)	69.3 (124)	
At-risk people currently living at home				.715
Yes	42.8 (346)	43.1 (272)	41.6 (74)	
No	57.2 (463)	56.9 (359)	58.4 (104)	
Health problems				
Heart disease	2.9 (23)	2.3 (14)	5.1 (9)	.048*
Respiratory problems	7.8 (62)	5.5 (34)	15.8 (28)	<.001***
Asthma	16.5 (132)	16.9 (105)	15.2 (27)	.576
High blood pressure	12.0 (96)	10.0 (62)	19.3 (34)	.001***
Diabetes	4.9 (39)	3.7 (23)	9.1 (16)	.003**
COVID-19 infection	1.1 (9)	1.1 (7)	1.1 (2)	1.000
Before COVID-19: exercise	83.6 (670)	85.6 (536)	76.6 (134)	.004**
Since COVID-19: change in exercise time per week				<.001***
Increased	28.6 (229)	29.9 (187)	24.0 (42)	
Remained the same	27.2 (218)	23.8 (149)	39.4 (69)	
Decreased	44.2 (354)	46.3 (290)	36.6 (64)	
Before COVID-19: eat set meals daily	60.0 (480)	62.8 (393)	50.0 (87)	.002**
Since COVID-19: eat set meals daily				.545

(Continues)

TABLE 2 (Continued)

Characteristics	Overall % <i>(n)</i>	Nonsmoker % <i>(n)</i>	Smoker % <i>(n)</i>	<i>p</i>
Worsened	27.3 (216)	27.9 (173)	25.1 (43)	
Remained the same	53.8 (426)	53.9 (335)	53.2 (91)	
Improved	18.9 (150)	18.2 (113)	21.6 (37)	
Before COVID-19: limit sweet/salty snacks	52.8 (421)	55.0 (343)	44.8 (78)	.018*
Since COVID-19: limit sweet/salty snacks				.007**
Worsened	37.0 (294)	39.5 (246)	27.9 (48)	
No change	50.6 (402)	47.7 (297)	61.0 (105)	
Improved	12.3 (98)	12.7 (79)	11.0 (19)	
Before COVID-19: limit sweetened drinks	71.1 (567)	74.7 (466)	58.4 (101)	<.001***
Since COVID-19: limit sweetened drinks				.198
Worsened	20.2 (160)	20.9 (130)	17.4 (30)	
No change	65.2 (517)	65.5 (407)	64.0 (110)	
Improved	14.6 (116)	13.5 (84)	18.6 (32)	
Before COVID-19: eat ≥5 fruits/vegetables daily	44.6 (356)	45.0 (281)	43.1 (75)	.663
Since COVID-19: eat ≥5 fruits/vegetables daily				.426
Worsened	19.0 (151)	19.8 (123)	16.2 (28)	
No change	59.4 (472)	59.4 (369)	59.5 (103)	
Improved	21.5 (171)	20.8 (129)	24.3 (42)	
Before COVID-19: indoor smoking ban	85.8 (695)	90.3 (570)	69.8 (125)	<.001***
Since COVID-19: indoor smoking ban	87.0 (705)	91.8 (579)	70.4 (126)	<.001***

p* ≤ .05,*p* ≤ .01,****p* ≤ .001.

of severe infection (95.1% vs. 85.5%, *p* < .001). When asked about their perceived risk of infection using the scale, results of the Mann-Whitney tests and median scores were significantly different on perceived risk of severe infection (non-smokers' median of 3 compared to smokers' median of 5, *z* = -4.43, *p* < .001) and perceived risk of infection in the community (non-smokers' median of 6 compared to smokers' median of 5, *z* = -2.88, *p* = .004).

There were reported smoking behavior changes among current smokers and those who quit since COVID-19 (Table 3), with 36.7% (*n* = 66) having attempted to quit since the outbreak. Among those who attempted to quit, six used a quit-line or application, eight received support from a health care provider, 12 used prescription medication, 10 used over the counter medication, and 12 used other resources. There were significant differences in perceived risk between people who reported no desire to quit smoking and those who reported a desire to quit smoking among current smokers and those who quit since COVID-19, notably that those who desired to quit perceived a higher risk of infection (Table 4).

In the final logistic regression model of having indoor smoking bans (*n* = 810, $\chi^2 = 164.49$, *p* < .001), the statistically significant variables were never smoked (aOR 4.714, 95% CI 2.687, 8.269), having higher education (aOR 2.077, 95% CI 1.244, 3.466), single-family home residence (aOR 2.088, 95% CI 1.185, 3.677), not living with other smokers (aOR 6.591, 95% CI 4.071, 10.673), and perceived

importance of avoiding public places (aOR 1.107, 95% CI 1.007, 1.217) (Table 5).

In the final logistic regression model of having a desire to quit smoking since COVID-19 (*n* = 200, $\chi^2 = 22.88$, *p* < .001), the statistically significant variables included those having diabetes (aOR 6.984, 95% CI 1.781, 27.387) and perceived risk of severe infection (aOR 1.185, 95% CI 1.114, 1.376) among current smokers and those who quit since the outbreak (Table 6).

4 | DISCUSSION

Considering the rapid development of the COVID-19 outbreak and the subsequent adjustments to daily routines, results of the on-line survey demonstrate that residents of Ohio have recently experienced changes in their lives and in health behaviors. Reported changes included employment status, working from home, smoking, diet, and exercise. Among people who reported that they were currently smoking or quit smoking since COVID-19, approximately one-third attempted to quit, while over half reported a desire to quit smoking. As research studies on COVID-19 infection have been developing and proliferating, information on the associated risk factors are becoming more available. For example, a recent study found that a higher proportion of men were affected by COVID-19 compared

TABLE 3 Smoking behaviors before and since COVID-19 among current smokers and those who quit since the outbreak ($n = 204$, except where indicated)

Smoking behavior	%(n)
Type of smoking ($n = 183$)	
Cigarettes only	62.8 (115)
Both cigarettes and e-cigarettes	37.2 (68)
Before COVID-19: time of smoking upon waking ($n = 177$)	
Within 5 min	31.1 (55)
6–30 min	24.3 (43)
31–60 min	15.8 (28)
More than 1 hr	28.8 (51)
Since COVID-19: change in smoking ($n = 180$)	
Increased	18.3 (33)
Remained the same	43.3 (78)
Decreased	38.3 (69)
Since COVID-19: change in frequency of smoking ($n = 178$)	
Increased	35.4 (63)
Remained the same	43.3 (77)
Decreased	21.3 (38)
Since COVID-19: change in desire to quit smoking ($n = 180$)	
Increased	51.7 (93)
Remained the same	36.1 (65)
Decreased	12.2 (22)
Since COVID-19: change in urgency to smoke ($n = 180$)	
Increased	38.3 (69)
Remained the same	38.9 (70)
Decreased	22.8 (41)
Since COVID-19: change in feeling able to quit smoking ($n = 180$)	
Increased	38.3 (69)
Remained the same	47.8 (86)
Decreased	13.9 (25)
Since COVID-19: attempted to quit smoking ($n = 180$)	
Yes	36.7 (66)
No	63.3 (114)

Note: Not all participants answered all the questions, as indicated.

to women, which may be associated with higher rates of smoking among men (Cai, 2020). A systematic review of five studies conducted in China and published in English on COVID-19 and smoking found that smoking was likely associated with adverse outcomes of the infection (Vardavas & Nikitara, 2020).

We expected that perceived risk of COVID-19 would influence indoor smoking bans, based on the Health Belief Model. We found that among the total sample, only perceived importance of avoiding public places was significantly associated with having indoor bans, along with personal and household characteristics of never smoking, higher level of education, single-family home, and not living with smokers. In our study, the overall rate of indoor smoking bans was 87.0%, higher than the national average rate of 79% in

the United States (United States Department of Health & Human Services, 2014) and only minimally changed from before COVID-19 to following the outbreak. It is noteworthy that 49.6% of the study participants had a bachelor's degree or higher which is greater than the state average of 27.8% and the national average of 31.5% (American Community Survey, 2018) indicating a relatively highly educated sample which may be a contributing factor to the high rates of smoking bans among the participants. Higher education is also associated with increased likelihood of owning a home, which may explain the higher smoking bans among adults living in single-family homes (Malito, 2017). People living in multifamily buildings may experience a lack of compliance with and enforcement of smoke-free policies among residents (Rokicki et al., 2016) which may increase their risk of second-hand smoke exposure. Among study participants, current smokers and those who quit since the outbreak had a significantly lower rate of indoor smoking bans than nonsmokers. It is possible that there is a lack of awareness of the detrimental effects of secondhand smoke among adults who smoke thereby contributing to the lower rate of indoor smoking bans among smokers, as was found in a national survey study (Kruger et al., 2016). This finding is further supported by the lower proportion of current smokers compared to nonsmokers who responded that smoking influenced COVID-19 infection or severity of the infection.

Consistent with the Health Belief Model, among smokers, perceived susceptibility to severe COVID-19 infection risk along with having diabetes, a personal factor that impacts health and lifestyle, was a significant predictor of having the desire to quit smoking. The desire to quit smoking in light of perceived infection risk, may serve as a motivator for positive health behavior modification. Research pointing to increased risk of poor glycemic profiles among smokers (Kar et al., 2016) warrants the focus on adults who smoke and have diabetes, as they may be inclined to quit smoking in response to their perceived threat of infection. It is noteworthy that the reported use of smoking cessation resources among those who quit smoking since COVID-19 was low which suggests the need to avail and promote resources that are Internet-based and phone accessible. This is timely as the COVID-19 outbreak could be a motivator for smoking cessation with the perceived increased risk of and susceptibility to severe COVID-19 infection.

Limitations of the study include the possible selection bias as people who are interested in the topic of smoking and COVID-19 may have more readily volunteered to participate in the online survey, potentially limiting generalizability. Additionally, people who smoke and are concerned about the negative social desirability of smoking may have refrained from full participation, although by using an online anonymous survey, there is minimal risk of response bias and social desirability bias. As an anonymous online survey, there is a risk of respondents misrepresenting themselves and not meeting eligibility criteria, although the risk was limited as one of the first screening questions verified that they were at least 18 years of age; the survey ended for those who answered that they were not yet 18. Due to the nature of the cross-sectional design, it is not possible to determine causation, although administration of the survey

Statement of risk perception	No desire	Desire	z	p
Perceived risk of personally getting infection	5	6	-3.38	.001***
Perceived risk of personally getting severe infection	3	5	-3.51	<.001***
Perceived risk of household members getting infection	4	5	-2.69	.007**
Perceived risk of infection spread in own community	5	5	-0.96	.337
Perceived risk of infection spread in own country	8	8	-0.27	.786
Perceived risk of ease of COVID-19 spread	8	8	-1.45	.148
Importance of personally avoiding crowds or groups of people	10	10	-2.77	.006**
Importance of personally avoiding public places	8	10	-2.68	.007**

** $p \leq .01$,

*** $p \leq .001$.

Variable	aOR	p	95% CI
Never smoked (ref: smoker)	4.714	<.001	2.687, 8.269***
Education level: college (ref: less than college)	2.077	.005	1.244, 3.466**
Single-family residence (ref: multifamily)	2.088	.011	1.185, 3.677*
Not living with smokers (ref: living with smokers)	6.591	<.001	4.071, 10.673***
Perceived importance of avoiding public places	1.107	.035	1.007, 1.217*

Note: Adjusted for all variables listed in the model.

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$.

TABLE 6 Logistic regression model with adjusted odds ratios (aOR) of desire to quit smoking since COVID-19 among current smokers and those who quit since the outbreak ($n = 200$)

Variable	aOR	p	CI
Diabetes (ref: no diabetes)	6.984	.005	1.781, 27.387**
Perceived risk of severe COVID-19 infection	1.185	<.001	1.114, 1.376***

Note: Adjusted for all variables listed in the model, with exclusion of cases with missing data relevant to the model variables.

** $p \leq .01$,

*** $p \leq .001$.

was relatively quick within 1 month following the announcement in Ohio of a State of Emergency when statewide outbreak mitigation efforts were initiated.

4.1 | Implications for practice

Public health nurses are positioned at the forefront of community care during the current pandemic outbreak. It is critical for public health nurses to educate the public about COVID-19 and to support

TABLE 4 Differences in medians of perceived risk of infection (scale of 1 = lowest and 10 = highest) between people who report no desire to quit smoking ($n = 111$) and those who desire to quit smoking ($n = 93$) among current smokers and those who quit since COVID-19

TABLE 5 Logistic regression model with adjusted odds ratios (aOR) of indoor smoking ban among overall survey participants ($n = 810$)

communities and populations in need during this time (Edmonds et al., 2020). In promoting public health, nurses should provide guidance in health promotion and risk reduction. Considering the goal of Healthy People 2020 to increase smoke-free homes to 87.0% (United States Department of Health & Human Services, 2014), public health nurses should capitalize on the opportune timing to promote this positive lifestyle change for all households, thereby decreasing smoking exposure for smokers and non-smokers.

Furthermore, considering the increased risk of severe COVID-19 among smokers (Patanavanich & Glantz, 2020) public health nurses should educate and motivate current smokers to quit smoking. It is important to consider the potential for increased stress with social distancing and precarious employment, which can consequently negatively impact smokers and former smokers, raising concern regarding an increased risk for smoking and smoking relapse (Patwardhan, 2020). As such, increased efforts should be made to support current and former smokers to promote smoking cessation among other health promotional lifestyle modifications. With the practice of social distancing and burgeoning Internet-based communication during this time period (Schaumacher & Kent, 2020), means of effective online communication, message targeting, and healthy lifestyle modification support are necessary. Moreover, based on prevalent misconceptions and misinformation about COVID-19

(Geldsetzer, 2020), public health nurses and other members of the health care team are critical in providing accurate and accessible information such as through phone and Internet-based resources, thereby facilitating smoking exposure reduction through online communication and resources.

5 | CONCLUSIONS

The recent outbreak of COVID-19 has led to changes in people's typical routines, social contexts, and health behaviors. Using the Health Belief Model, the current study found that perceived risks of infection were associated with desire to quit smoking among current smokers and those who quit since the outbreak in Ohio. Public health nurses should utilize Internet-based resources to distribute accurate messages and facilitate access to resources to promote healthy lifestyle modification including smoking cessation and smoking exposure reduction during the current pandemic outbreak.

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