

Smoking Restrictions Among Households of Childhood and Young Adult Cancer Survivors: Implications for Tobacco Control Efforts

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Purpose: This study assessed the prevalence of smoking restrictions among households of survivors of childhood and young adult cancer who smoke. It also examined the relationship between home smoking restrictions and motivation to quit smoking, as well as other smoking, psychosocial, and environmental factors.

Methods: Participants included 374 smokers who were childhood or young adult cancer survivors (between the ages of 18 and 55 years) recruited from five cancer centers to participate in a randomized smoking cessation trial. Survivors completed baseline measures about the smoking restrictions in their households, their smoking behavior, and related psychological and environmental factors, which are the focus of the current manuscript.

Results: Almost 54% of survivors reported that smoking was prohibited in their households. Living with a nonsmoking partner, having a strict smoking policy at work, and not being nicotine dependent all increased the likelihood of having a total home smoking ban. Participants who were older, smoked more cigarettes per day over the prior week, and received prior chemotherapy were less likely to reside in households that adopted total bans.

Conclusion: Findings suggest that socio-environmental factors and current smoking behaviors are associated with complete smoking restrictions in the homes of survivors. These factors should be considered when communicating with survivors about the importance of establishing strict smoking policies in their private residences.

Keywords: survivors, smoking, restrictions, tobacco

SMOKING AMONG CHILDHOOD AND YOUNG ADULT CANCER survivors may magnify the late effects of their cancer treatment and risk for smoking-related illnesses, as well as increase their risk for developing second malignancies.¹⁻⁶ Data from the Childhood Cancer Survivor Study (CCSS) found that approximately 17% of survivors are active smokers.⁷ As smoking rates among survivors are generally similar to those of the general population,⁷⁻⁹ it is important to examine socio-environmental influences that have had an effect on smoking behaviors in the general population, such as home smoking policies, and determine if they operate similarly in the survivor population.¹⁰ Prior studies have reported differences in the correlates of smoking behaviors among childhood cancer survivors and the general population,^{7,11}

but the role of smoke-free policies has not been adequately explored. This information may assist in the management of survivors' smoking behaviors and potentially influence their decisions to quit.

The percentage of the U.S. population that reports having a smoke-free home has increased in recent years, due in part to broader adoption of smoke-free policies in workplaces and public settings. Recent reports estimate that close to three-quarters of all households in the United States restrict smoking in the home, with rates notably lower in households where a smoker resides.¹² Home smoking restrictions (defined as "limiting or banning cigarette smoking in the home")¹⁰ have been shown to reduce exposure of nonsmokers and children to secondhand smoke¹³ and its associated adverse health

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effects.^{13–15} Restricting smoking in the home has also been associated with a number of smoking-related outcomes among adult smokers, including decreased daily cigarette consumption,^{10,16} greater interest in quitting and increased quit attempts,^{16–20} successful cessation,^{18–20} and relapse prevention.¹⁰ Additionally, home bans are associated with less smoking uptake among children of smokers.^{21,22} If the adoption of home smoking restrictions can similarly influence the smoking behaviors of cancer survivors and/or reduce the exposure of others in the survivor's environment to tobacco smoke, then home smoking policies could serve as a useful adjunct to other tobacco control efforts in this vulnerable population.

The establishment of smoking restrictions in the home is influenced by a number of individual as well as social and environmental factors. Sociodemographic disparities have been found to exist with respect to the prevalence of home smoking restrictions, with rural and low income households less likely to report strict bans.^{10,16,23–25} However, smoke-free policies are more prevalent among households with younger residents¹⁰ and those that include a nonsmoking adult.^{10,24–28} Smokers whose families preferred they did not smoke were also more likely to have smoking restrictions at home.^{10,29} In fact, previous research suggests that the factors most likely to influence the probability of restricted smoking among households with smoking residents include concern for the health of a nonsmoker and interest by another family member in the smoker's quitting,¹⁰ rather than the smoker's desire to have a more successful quit attempt. Environmentally, exposure to worksite smoking restrictions has been associated with reductions in smoking and cessation among employees,³⁰ and smoke-free policies in the workplace may encourage adoption of smoking restrictions in the home.³¹ Whether similar factors operate in households of cancer survivors has not been studied.

This is the first study to assess the prevalence of smoking restrictions in the households of childhood and young adult cancer survivors who smoke. In order to understand better the potential of promoting smoke-free homes as a means of controlling smoking and facilitating quitting behavior among survivors who smoke, the relationship between home smoking restrictions and smoking behaviors (i.e., level of smoking, nicotine dependence) as well as readiness to quit were examined. In addition, we identified individual, social, and environmental factors associated with the presence of home smoking bans. This information is important for designing interventions to restrict home smoking in this population.

Methods

Participants

Participants included 374 smokers who were childhood or young adult cancer survivors. To be eligible, participants had to be current smokers (defined as having smoked at least 1 puff in the last 30 days), between the ages of 18 and 55 years, diagnosed with cancer before age 35 but off cancer treatment for at least 2 years, and able to provide informed consent. The definition of a current smoker employed in this study was intended to capture even occasional smokers³² because young cancer survivors tend to be lighter smokers, and any level of smoking can be harmful to the survivor's health.^{7,11} Eligible

survivors were invited to participate in a randomized controlled trial evaluating the effectiveness of PFH-2, an internet-based version of the Partnership for Health (PFH) study, a survivor-focused smoking cessation intervention.^{33,34} This paper presents baseline data from survivors who agreed to participate in the trial; study design is provided in detail elsewhere.³⁴

Eligible survivors were recruited from five cancer centers in the United States and Canada (Dana-Farber Cancer Institute (DFCI)/Partners, Memorial Sloan Kettering Cancer Center, Princess Margaret Hospital, St. Jude Children's Research Hospital, and The Hospital for Sick Children) with Institutional Review Board (IRB) approval received at all sites. A preliminary screen for eligibility was performed at each site. Due to variability in institutional implementation of patient privacy and IRB requirements, the recruitment procedures somewhat varied across institutions. After consent was obtained, contact information was forwarded to the study survey team, who verified eligibility and administered the baseline survey. Participants also included respondents to advertisements on websites designed for and about childhood and young adult cancer survivors who provided verbal consent for the same smoking cessation study described above.

Measures

Sociodemographic characteristics and medical history. Information about age, gender, race, ethnicity, marital status, education, employment status, type of cancer, and cancer treatment history was collected.

Household and workplace smoking policy. *Household smoking rules* were assessed using the following question: "What are the rules, if any, about smoking in your home?" The response options included: (1) no smoking is permitted in the home (complete/total ban); (2) smoking is limited to certain rooms in the home (partial ban); and (3) there are no rules about smoking in the home (no ban). Household smoking restrictions have been similarly assessed in other studies.^{19,20} Additionally, participants who were employed in the past year were asked to report on the rules about smoking in the workplace using the same response options.

Smoking behavior. *Smoking rate* was assessed by the number of cigarettes participants smoked per day. *Nicotine dependence* was assessed based on the number of minutes after waking that participants reported smoking their first cigarette;³⁵ responses were dichotomized as less than 30 minutes (more nicotine dependent) and greater than or equal to 30 minutes (less nicotine dependent). *Quit attempts* were assessed by the number of quit attempts in the previous 12 months with at least 24 hours abstinence.

Motivational variables. The *Stages of Change Scale* was used to assess the participants' motivation to quit smoking³⁶ according to the following categories: (1) *precontemplation*: not seriously thinking about quitting smoking in the next 6 months; (2) *contemplation*: seriously thinking about quitting smoking in the next 6 months; or (3) *preparation*: intending to quit smoking in the next month or tried to quit in the past year. *Self-efficacy* was assessed with a question about the participants' level of confidence that they could quit smoking in 1 month.¹¹

TABLE 1. BIVARIATE RELATIONSHIPS WITH HOME SMOKING RESTRICTIONS

	p-value	No home ban ^a		Total home ban		Total sample	
		n	%	n	%	N	%
<i>Demographics</i>							
Gender	ns						
Male		95	55	97	48	192	51
Female		78	45	104	52	182	49
Race	0.0639						
White		154	89	166	83	320	86
Non-white		19	11	35	17	54	14
Education	0.0145						
Did not complete HS or GED		21	12	11	5	32	9
Completed HS or GED		56	32	47	23	103	27
Some college or training after college		61	35	67	33	128	34
College graduate		35	20	76	38	111	30
Marital status	0.0096						
Married		42	24	75	38	117	31
Living with a partner		27	16	32	16	59	16
Never been married and not living with a partner		79	46	83	42	162	44
Divorced or no longer living with partner		25	14	10	5	35	9
Did you work in past year, including work done at home?	0.0094						
Yes		126	73	171	85	297	79
No		47	27	30	15	77	21
		<i>Mean</i>	<i>Std</i>	<i>Mean</i>	<i>Std</i>	<i>Mean</i>	<i>Std</i>
Age	<0.0001	34	8.4	31	7.4	32	7.9
<i>Social environment</i>							
Does your partner smoke cigarettes? ^b	0.0002						
Yes		50	71	40	37	90	51
No		20	23	67	63	87	49
What are the rules about smoking in your workplace? ^c	0.0005						
There are no rules		29	17	23	12	52	14
People can only smoke in certain rooms		16	10	9	5	25	7
People cannot smoke inside		74	45	136	69	210	58
Did not work in past year		47	28	30	15	77	21
Encouragement to quit by friends	0.0434						
Yes		90	52	124	62	214	57
No		83	48	77	38	160	43
Family encouragement to quit	ns						
Yes		125	72	147	73	272	73
No		48	28	54	27	102	27
Provider encouragement to quit	ns						
Yes		68	39	68	34	136	36
No		105	61	133	66	238	64
<i>Smoking behavior</i>							
Quit attempts in the past year	ns						
None		80	47	82	43	162	45
1-3 times		62	36	69	36	131	36
4+ times		29	17	39	21	68	19
Number of minutes after waking until first cigarette	<0.0001						
<30 minutes		81	47	45	23	126	34
30+ minutes		90	53	152	77	242	66
Smoking rate	<0.0001						
< ¼ pack		37	21	92	46	129	34
¼ pack-½ pack		39	23	51	25	90	24
> ½ pack		97	56	58	29	155	42
		<i>Mean</i>	<i>Std</i>	<i>Mean</i>	<i>Std</i>	<i>Mean</i>	<i>Std</i>
Average number of cigarettes smoked	<0.0001	15	10.1	9	9.3	12	9.7
<i>Motivation/psychosocial factors</i>							
Chance of serious health problems in the future/perceived vulnerability	ns						
No chance/very unlikely/unlikely		28	16	50	25	78	21
Moderate chance		56	33	57	29	113	31
Likely		45	26	56	28	101	27
Very likely/certain to happen		42	25	35	18	77	21

(continued)

TABLE 1. (CONTINUED)

	p-value	No home ban ^a		Total home ban		Total sample	
		n	%	n	%	N	%
Self-efficacy to quit smoking in 1 month	ns						
Not at all		43	25	42	21	85	23
A little/somewhat		85	49	84	42	169	45
Very-extremely		44	26	75	37	119	32
Stage of change	ns						
Precontemplation		24	14	32	16	56	15
Contemplation		36	21	46	23	82	22
Preparation		110	65	120	61	230	63
<i>Medical and treatment history</i>							
Cancer diagnosis	ns						
Leukemia/lymphoma		93	54	90	45	183	49
Solid tumor		64	37	92	46	156	42
CNS disease		16	9	19	9	35	9
Prior chemotherapy	ns						
Yes		139	82	146	73	285	77
No		31	18	53	27	84	23
Prior radiation therapy	ns						
Yes		113	66	114	58	227	61
No		59	34	84	42	143	39
Prior surgery	ns						
Yes		122	72	143	73	265	73
No		47	28	53	27	100	27

Notes: Separate bivariate analyses were performed for the above-listed variables for only employed participants ($n=297$). Variables significant at $p<0.20$ were entered into a multivariate model (see Table 2); these included age, race, education, marital status, smoking status of the spouse/partner, encouragement to quit smoking by friends, smoking policy at work, nicotine dependence, number of cigarettes smoked per day, perceived vulnerability, prior chemotherapy, and radiation therapy. Variables that remained significant at $p<0.15$ were retained in the model.

^aHouseholds with no restrictions and partial restrictions were combined.

^bBased on only those who have a partner ($n=177$).

^cThe workplace can include the home setting.

CNS, central nervous system; GED, General Educational Development test; HS, high school; ns, not significant; Std, standard deviation.

Social environment. *Social support for smoking cessation* was assessed with a series of questions about whether participants' family, friends, and healthcare providers encouraged them to quit smoking. We also asked whether participants' spouses or partners smoked.³³

Psychological variables. *Perceived vulnerability* was assessed with a question about perceived risk of any serious future health problems.

Data analyses

Descriptive statistics were calculated for the entire study sample and according to level of smoking restrictions in the home. Logistic regression models were created to assess the impact of predictor variables on the primary outcome—household smoking restrictions (total ban vs. no ban). In all analyses, we combined the “no restrictions” and “partial restrictions” categories because our interest was in the relationship between total home smoking bans on smoking-related outcomes, as these provide the best public health protection.^{20,25} Also, in preliminary analyses, the pattern of association between “partial restrictions” and the outcomes under study were similar to that of “no restrictions.” A stepwise selection approach was used to enter variables into the model. Separate bivariate analyses were conducted for the entire sample and for a restricted sample of employed par-

ticipants. Variables significant at $p\leq 0.20$ in the bivariate analyses for the employed participants were entered into a multivariate logistic model. Variables that remained significant at $p<0.15$ were retained in the model. The following predictors were examined: age, gender, race, education, marital status, cancer diagnosis and type of treatment, smoking policy at work, stage of change, self-efficacy, social support for cessation, perceived vulnerability, smoking status of the spouse/partner, confidence in the ability to quit smoking in the next month, past quit attempts, number of cigarettes smoked per day, and nicotine dependence. Study site was controlled for in all analyses. All analyses were conducted in SAS Version 9.2.

Results

Participant characteristics

Descriptive demographic statistics for the sample by household smoking restrictions are presented in Table 1.

Prevalence of household smoking restrictions and smoking-related variables

Total home smoking bans were in effect in 201 (53.7%) of participants' households; 56 (15%) reported partial smoking restrictions (smoking permitted in certain rooms or areas), and 117 (31.3%) had no smoking restrictions in the home

(smoking permitted everywhere). The homes with partial restrictions and no restrictions were combined (173 households, 46.3%; henceforth referred to as “no ban”) for all analyses.

Demographics. Age (younger), education (college graduate), being married, and being employed were associated with having a total household smoking ban (Table 1).

Social environment. Of the 177 participants in the sample who lived with a spouse or partner, almost half of the spouses/partners smoked. However, significantly more participants who resided in households with no smoking bans had a smoking spouse or partner compared to those who lived in households with a total smoking ban (71% vs. 37%, $p < 0.0002$). There were no significant differences in likelihood of a home smoking ban between participants living with a spouse or partner and those without. Having a total smoking ban at work and encouragement to quit smoking by one’s friends were also associated with a total home smoking ban. Encouragement from family and healthcare providers to quit was not associated with household smoking policy (Table 1).

Smoking behaviors. Approximately twice as many participants living in households that had total smoking bans were very light smokers compared with those living in households with no ban ($p < 0.0001$). Nicotine dependence was significantly more prevalent among participants from

homes with no ban compared with those from homes with total smoking bans (47.4% vs. 23%, $p < 0.0001$). There was no significant relationship between household smoking policy and quit attempts during the past year.

Motivational and psychosocial factors. Perceived vulnerability and self-efficacy were not significantly associated with household smoking policy. Having a household smoking ban was also not associated with readiness to quit. Across all participants, there were high intentions to quit. More than 60% of participants (61% and 65% from homes with a total smoking ban and no smoking ban, respectively) reported intentions to quit in the next month (i.e., preparation stage).

Multivariate analysis

The final regression model predicting household smoking restrictions among employed participants is shown in Table 2. The multivariate model was based on employed participants so that we could examine the contribution of workplace smoking restrictions in the model. Participants who were older and who had received prior chemotherapy were less likely to reside in households with total smoking restrictions. Increased smoking rate also decreased the odds of having a total household smoking ban (odds ratio [OR]=0.93; 95% confidence interval [CI]: 0.90–0.97). Compared to employed participants who worked at sites that had no rules about smoking, those who were exposed to strict smoking policies at work had significantly higher odds of having a total smoking ban at home (OR=2.32; 95% CI: 1.20–4.48). Being less nicotine dependent was significantly associated with having a total home ban (OR=2.22; 95% CI: 1.15–4.22).

Discussion

This study was the first to provide an estimate of the prevalence of smoking restrictions in the homes of childhood and young adult cancer survivors who smoke. Despite being current smokers, almost 54% of survivors in our sample reported that smoking was completely banned inside their homes. This percentage slightly exceeds the prevalence of reported home smoking bans among U.S. households with at least one smoker, which has been estimated to range from 30% nationally^{12,37} to 49% in California’s smoking households.³⁸ When compared to survivors living in households with a spouse or partner who smoked, survivors residing with a nonsmoking spouse or partner were more likely to live in a home that banned smoking. Therefore, the establishment of smoking restrictions in the homes of survivors may be driven, in part, by a proximal social network that does not tolerate indoor smoking and is consistent with previous research that suggests that a nonsmoking resident/partner in the home increases the odds of having a ban on home smoking.^{10,27,39}

Survivors exposed to more stringent smoke-free policies in the workplace were also more likely to live in homes with smoke-free rules, as is the case in the general population.^{30,31} It should be noted, however, that questions about workplace smoking policies employed in this study did not allow for clear determination of whether the participant’s home also functioned as their workplace. For survivors who work outside the home, comprehensive worksite policies may clearly define what constitutes a total ban on smoking and restricted smoking during the day at the worksite may facilitate greater

TABLE 2. MULTIVARIABLE MODEL PREDICTING HOME SMOKING RESTRICTIONS^{a,b}

	p-value	OR (95% CI)
<i>Demographics</i>		
Age	0.03	0.96 (0.92–1.00)
<i>Medical</i>		
Prior chemotherapy		
Yes	0.00 ^c	0.29 (0.12–0.67)
No	REF	1.00
<i>Social environment</i>		
Partner smokes cigarettes		
Yes	REF	1.00
No	0.00 ^c	7.01 (2.94–16.71)
Not living with a partner	0.73	0.89 (0.44–1.78)
Workplace smoking restrictions		
No/partial restrictions	REF	1.00
Smoking prohibited	0.01	2.32 (1.20–4.48)
<i>Smoking behavior</i>		
Smoke within 30 minutes of waking		
Yes	REF	1.00
No	0.02	2.22 (1.15–4.22)
Average number of cigarettes smoked	0.00 ^b	0.93 (0.90–0.97)

Note: Analyses control for study site.

^aComparison of total home smoking restrictions vs. partial/no home smoking restrictions.

^bBased on only employed participants ($n = 297$).

^c p -value < 0.001.

CI, confidence interval; OR, odds ratio; REF, reference.

acceptance of similar bans in the household. Exposure to tobacco control efforts in the workplace may also increase smokers' awareness of the dangers of their smoking to others, resulting in the adoption of personal home smoking restrictions. These findings suggest consideration of the importance of environmental factors and public tobacco control programs in establishing home smoking policies.^{19,31,40}

Our findings are similar to other research suggesting that cigarette consumption^{10,16} and nicotine dependence⁴¹ are important factors associated with home smoking restrictions. Survivors who smoked fewer cigarettes per day and were less nicotine dependent were more likely to reside in homes with smoking restrictions. From this cross-sectional data, we cannot determine whether lighter or less addicted smokers more readily accept smoke-free homes or whether smoke-free homes lead to lighter smoking and lower nicotine dependence. Additionally, smokers residing in homes with bans may underreport their cigarette consumption because they feel guilty about smoking.²²

In this study, we did not observe an association between household smoking restrictions and motivation to quit (i.e., interest in quitting, quit attempts). These findings are in contrast to previous studies that document a significant relationship between home smoking restrictions and previous quit attempts,^{16,17,19} as well as interest in quitting.¹⁹ However, it was encouraging to note that more than 60% of participants, regardless of home smoking restrictions, were interested in quitting in the next 30 days (i.e., preparation stage). This rate is considerably higher than the proportion of U.S. adult daily smokers interested in quitting reported in national studies.^{42,43} However, because the sample was comprised of highly motivated survivors who were willing to participate in a smoking cessation intervention, this potential selection bias may have limited our ability to detect a significant association between motivation to quit and household smoking policies. Inclusion of highly motivated survivors may also account for increased prevalence of reported home smoking bans as compared to other survivors who smoke.

Demographically, home smoking restrictions were observed less among older survivors, which has been demonstrated in prior studies.^{10,39} When considering medical factors, the odds of having home smoking restrictions were lower among survivors who received prior chemotherapy compared to those who did not. To our knowledge, no other studies have examined the relationship between home smoking restrictions and treatment history among individuals treated for a chronic illness. However, it is likely that this relationship was accounted for by some shared relationship with other variables examined in the present study (e.g., diagnosis) or some other aspect of their clinical experience.

The major strength of this study is its population-based approach to recruiting smokers from several survivor programs in the United States and Canada, which contributed to the external validity of the findings. However, the results from this study are subject to a number of limitations. First, estimates for homes with smoke-free rules were based on self-report and not validated by an objective measure. However, a number of studies have supported the validity of such self-reported data in population surveys.^{44,45} Second, relevant information regarding household composition (such as the number of children, total number of smokers, and nonsmoking

residents), a consistent predictor of household smoking restrictions, was not obtained. Lastly, the duration and degree of ban enforcement within the home and the reasons for establishing smoke-free rules were not assessed but may be pertinent to one's motivation to quit and to future cessation efforts.

Conclusion

The consistency of our study findings with those from the general population should be considered in the context of the increased health risks of the survivor population for whom more aggressive tobacco efforts are warranted. Healthcare providers should routinely advise cancer survivors and their families to establish home smoking bans⁴⁶ and to stop smoking. Providers should capitalize on survivors' awareness that smoking is prohibited in the hospital environment and encourage them to impose these same restrictions in the home as an important extension of survivorship care and an important component of smoking cessation efforts. Smokers should be informed that smoke-free homes may facilitate reduced smoking such that they may be able to quit successfully in the future, as well as protect others in the household from secondhand smoke.⁴⁷ Partners and others in the survivor's proximal social group should be encouraged to help establish smoke-free rules that require compliance from the smoker. Programs designed to promote smoke-free homes and cessation among survivors that are delivered in the survivorship treatment setting have the potential to shape smoking behaviors in this highly vulnerable population.

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No competing financial interests exist.

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