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Intention to Quit Smoking and Concerns about Household Environmental Risks: Findings from the Health in Common Study in Low-Income Housing

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Abstract

Purpose—To assess the association between intention to quit smoking and perceptions of household environmental risks among racially/ethnically diverse residents of low-income housing.

Methods—Baseline data were collected from 2007 to 2009 for the Health in Common Study, which assessed social and physical determinants of cancer risk-related behaviors among residents of 20 low-income housing developments in the Greater Boston metropolitan area. Participants were surveyed about their tobacco use and concerns about household exposures. Household environmental inspections were also conducted to identify conditions associated with increased risk of exposure to indoor environmental agents, including pesticides, mold and cleaning products.

Results—Intention to quit smoking was associated with a greater degree of concern about exposures in the home, yet not with the actual presence of household hazards, as identified by home inspections and survey findings.

Conclusions—An ecological approach targeting multiple levels of influence may help to highlight the importance of both quitting tobacco and reducing potential household environmental exposures as part of comprehensive efforts to promote individual and household health.

Keywords

Smoking; tobacco use; household hazards; environmental toxins; low-income

Introduction

Persistent disparities in tobacco use prevalence by socio-economic status (SES) point to an ongoing need to identify factors associated with the high rates of smoking among low income and less formally educated populations [1–7]. Tobacco use has also been found to be particularly prevalent in lower SES neighborhoods [8, 9], suggesting the potential roles of excess social (e.g., stress) and physical (e.g., environmental) risks, which are concentrated among socially disadvantaged groups [10, 11]. Hazardous physical environments, likely to be more prominent in low-income neighborhoods than in higher SES communities, may also be associated with health behaviors, motivations to change these behaviors, and the efficacy of interventions [12–15]. The risk communication literature indicates that people perceive

risks as more threatening when they are viewed as involuntary, undetectable, beyond personal control, and unfair [16–18] - characteristics typical of environmental exposures. Thus, the presence of environmental hazards may increase perceptions of vulnerability [19], thereby heightening motivations to make changes in risk-related behaviors, such as quitting smoking. Alternatively, perceived environmental hazards may diminish motivation to change health behaviors (e.g., quit smoking), if a sense of fatalism or inevitability of diminished health is expected as a result of such exposures. It is also possible that those who are highly sensitive to or aware of health risks from individual behaviors or environmental sources may experience a heightened sense of urgency to diminish all risks. In any case, an ecological health approach that addresses multiple levels of influence, including individual health behaviors as well as environmental hazards, may provide a greater intervention impact—either by attending to individuals’ concerns about externally induced environmental hazards or by stimulating a heightened sense of urgency and enhancing receptivity to messages about health behaviors [20].

This paper examines the relationship between intentions to quit smoking and perceptions of household environmental risks among residents of low-income housing. The important role of the housing environment has been well-documented across a range of public health outcomes [12, 21]. Within low-income housing in particular, indoor environments have been shown to include elevated exposures to agents with known or suspected health effects, including pesticides [22, 23], pest allergens [24, 25], combustion by-products [26] and other chemical exposures. It has been suggested that risk reduction efforts should attend to these exposures, singly or jointly, and the housing conditions which drive them, as part of efforts to minimize health risks.

We have conceptualized intentions to quit smoking following the Transtheoretical Stages of Change Model, which posits that health behavior changes such as quitting smoking progress through a set of stages of change [27]. These stages include pre-contemplation (no intention to change in the foreseeable future, with little awareness of a problem); contemplation (no commitment to action has been made, although the awareness of a problem exists); preparation (intending to take action in the next month); action (overt changes are underway), and maintenance (working to prevent relapse) [28]. At each stage, varied mechanisms might facilitate or hinder advancement or regression to another stage. For example, at the pre-contemplation stage, increasing awareness of risks through educational efforts might help to motivate an individual to seek more information about strategies to diminish risk or change behaviors. Overall, there is strong evidence supporting the application of the Transtheoretical Model to tobacco use [29].

The Health in Common study presents an important opportunity to explore these relationships among residents of low-income housing. A random sample of residents of 20 low-income housing developments was surveyed, and in addition, an environmental inspection of potential household hazards was conducted in each participating household. The purpose of this paper is to explore the associations of intention to quit smoking to household hazards and concern about those hazards. We hypothesize that compared to smokers in the pre-contemplation and contemplation stages of change, those in the preparation or action stages will have (1) higher household hazards, based on combined data from the survey and inspection, and (2) greater concern about those risks.

Methods

The Health in Common Study assessed social and physical determinants of cancer risk-related behaviors among residents of 20 publicly and privately managed low-income housing developments across three cities in the Boston metropolitan area (Cambridge,

Somerville and Chelsea). Housing developments were eligible for inclusion if they were considered low-income housing based on Department of Housing and Urban Development (HUD) guidelines, and had mostly family units, with a minimum of 40 households within the development. Eligible residents were over 18 years of age and spoke English, Haitian Creole, or Spanish. Using multi-stage cluster sampling of households within each housing development, households and residents were randomly selected from recruited housing developments and surveyed. In the smaller housing sites, we attempted to invite one member of every household to participate in the survey. In the larger housing sites, we randomly selected households and again, residents within households, to attain a similar number of participating households at each site.

Data collection

This paper is based on results of this cross-sectional survey of 828 low-income housing residents. Trained bilingual survey assistants conducted the 45–60 minute survey in residents' households between February 2007 and June 2009 in English (53.7%), Spanish (23.7%), and Haitian-Creole (19.6%). The survey response rate averaged 49% across the 20 sites. In addition, trained study staff conducted a brief household environmental inspection to identify conditions associated with increased risk of exposure to indoor environmental agents, such as mold growth and pest infestation.

Measures

Tobacco use was measured by self-report using standard measures [30, 31] that divided individuals into two categories: current users, who reported currently smoking cigarettes, cigars, or pipes, and non-users/former users. This paper focuses on these current users (n=177). *Intention to quit using tobacco* was a dichotomous measure among current tobacco users, who were asked if they were currently trying to quit or planned to quit within the next 30 days (classified as in the “action/preparation” group). Those who reported thinking about quitting within the next 6 months or not thinking about quitting were classified as being in the “contemplation/pre-contemplation” group.

Using data from both the survey of residents and household inspections, we created five indices reflecting household conditions or behaviors. For the *mold index*, residents were classified as being exposed if (a) mold was reported to be treated or seen by resident or if (b) mold was seen during a visual inspection in the unit at the time of the survey. For the *combustion by-products index*, residents were determined to be exposed if (a) the unit had a gas stove and there was no mechanical exhaust to the exterior (i.e., no kitchen fan or the kitchen fan did not work or if the kitchen fan was re-circulating) or (b) the gas stove was used to heat the apartment. For the *chemical exposure index*, respondents were defined as exposed if the use of pesticides (spray, powders, foggers) or the use of spray air fresheners is greater than a few times a month. For the *pest index*, respondents were classified as being exposed if (a) they reported to have seen cockroaches or ants or mice a few times a month or more often or if (b) they reported to have seen rats or bedbugs a few times a year or more. Using observational data for the *inadequate ventilation index*, residents were classified as being exposed if no bathroom fan or vent was present, the kitchen fan was not working or absent or re-circulating, or the bathroom fan suction was inadequate. We summed scores across these five individual indices to create a summary *household hazards score*. Scores ranged from 0 to 5, with higher scores indicating greater exposures. In this sample, the mean was 3.2 (std=1.2); high exposure was defined as 4 or 5.

We additionally assessed concerns about household hazards. We asked residents about their level of concern, using a four-point scale from “not at all concerned” (1 point) to “very concerned” (4 points), about *air quality, pests in the home and pesticides*. We created a

summary score for overall *concerns about exposures in the home* by summing responses. The summary exposure measure ranged from 3–12 with a mean of 7.7 (std=3.2), where higher scores indicated more concern.

We also measured *socio-demographic characteristics*, including age, race/ethnicity, gender, and education, using standard measures.

Statistical Analyses

To assess the bivariate associations between intention to quit and independent variables, we used a Chi-Square test for categorical variables and t-tests for continuous variables. The effect of overall household exposures was assessed with a multivariable logistic regression model, which controlled for demographic characteristics and the household hazards score derived from site inspection.

Results

Sample characteristics

Among the 828 respondents, 177 (21%) were current smokers. Of those, 108 (61%) were determined to be in the preparation or action stages of readiness to quit. Characteristics of the sample are presented in Table 1. In addition, we examined the association between the household hazards score (dichotomous) and concern about exposures (continuous) using a t-test. As expected, respondents with a high household hazard score were more concerned about home exposures (mean=8.44; std=2.95) compared to those with low household hazards scores (mean=7.19; std=3.18. $p<.0001$).

Bivariate results (Table 2)

Intention to quit was significantly higher among those reporting elevated concerns about air quality, pests in home, pesticides in home, and the summary score for concerns about exposures in the home. Intention to quit was also higher among women. Neither the household hazards score nor any of its components was associated with intention to quit.

Multivariable results (Table 3)

After controlling for the household hazards score, age, gender, education, and race, concerns about exposures in the home was significantly associated with intention to quit using tobacco; those in action/preparation stages were more concerned about exposures in the home, compared to those in pre-contemplation/contemplation stages.

Discussion

Among this sample of smokers living in low-income housing, we found that intention to quit smoking was significantly associated with concerns about exposures in the home, even when controlling for the actual presence of household hazards. Nevertheless, our measure of actual household hazard, measured based on both resident reports and inspection, was not associated with intention to quit.

Others have noted that perceived risk and concern or worry about that risk are distinct constructs and not strongly related [32]. As seen in our findings, actual and perceived household exposures were highly related, although they did not share the same relationships with intention to quit smoking. Concern about exposure, rather than actual exposure, was associated with motivation to quit. Prior studies have demonstrated that perceived vulnerability to environmental toxins may lead to heightened anxiety about these exposures [33, 34].

Our measures of actual household exposures were created to capture major household risks based on objective audits and survey data, and developed from existing scientific evidence. As a practical matter, these measures were also derived from items which could be easily assessed via inspection or participant self-report of conditions or behaviors. Some of these indices are readily identifiable by participants as health risks or issues which affect quality of life (e.g., mold, pests), while others may represent unknown risk (e.g., inadequate ventilation, combustion by-products). It is notable that intention to quit was not associated with objective risks, regardless of their presumed visibility for participants.

The potential impact of household exposures on respiratory risks may be of particular concern to smokers. Dampness and mold may contribute to increased risk of asthma and other respiratory conditions [12, 35, 36]. Damp dwellings also provide a favorable environment for pests, such as cockroaches, which may increase exposure to allergens associated with asthma and related conditions [37, 38]. Concerns about dampness, mold and pests are wide-spread, although these exposures are generally concentrated in lower income housing [12, 37].

Concern about environmental hazards may be particularly powerful in relation to the home environment. Research on the meaning of “home” has shown that in addition to providing shelter, housing can provide refuge in the social and psychological sense, conferring a sense of privacy, safety, and security [21, 39]. Threats to the sense of control over one’s home environment may be an especially salient basis for increased perceptions of vulnerability. Others have observed that the ability to control one’s home environment may function as a resource in mitigating the impact of negative environments [33, 40]. Thus, concerns about potential environmental exposures in the home and the related lack of control over those exposures may be strong motivators to change individual health behaviors, over which one does have personal control.

This study used a cross-sectional design, and it is therefore not possible to infer causality. We have purposefully focused on the association between intention to quit and concern about environmental hazards, regardless of causality, rather than on one factor predicting the other, which is appropriate given the cross-sectional nature of this study. In light of the goal of reducing the overall burden of risk from either tobacco use or environmental exposures, there are important implications for interventions regardless of causality. Interventions aimed at reducing household hazards and enhancing the physical environments of low-income housing may also highlight the importance of quitting tobacco as part of comprehensive efforts to promote individual and household health. In addition, interventions aimed at smoking cessation may also address the significance of reducing environmental risks by addressing household hazards to promote individual and household health. Future research is needed to examine these associations prospectively to assess causality and the direction, if any, and to explore possible independent or synergistic relationships.

Several additional limitations warrant discussion, including the possibility of differential misclassification or confounding, particularly related to a clustering of perceptions of risks. While concern about household hazards may contribute to increased intentions to quit smoking, it is also possible that persons planning to quit may be generally more attuned to risks to their health, including environmental hazards. If this were the case, then measures of both variables (intention to quit and concern about household exposures) may be falsely elevated, creating a spuriously high association. Nonetheless, a comprehensive intervention addressing both sources of risk would likely contribute to enhanced effectiveness by addressing this clustering of risk perceptions. An additional limitation is that the magnitude of this association is relatively modest, suggesting that other attitudes and beliefs also play a role in these risk perceptions. Accordingly, it would be important for intervention designs to

take into consideration other participant characteristics, attitudes and beliefs in addition to intention to quit and concern about household exposures. Also, although residents were selected within housing developments, it was not possible to control for clustering of individuals within housing site due to the small sample size. Finally, the response rate is less than optimal, though consistent with several recent studies conducted in public housing [41–43]; our results must be interpreted with caution as they may be generalizable only to residents who might be similarly likely to participate in a survey.

Despite these limitations, this study reinforces the importance of taking an ecological approach in risk reduction efforts to improve health. Not only are individual health behaviors of concern, but other sources and levels of exposures, such as in the housing setting, must be considered in a comprehensive intervention approach. The potential for exposure to household hazards is not equally distributed in the population, but is more likely within low-income settings [12, 37]. It is possible that concern about household environmental hazards may contribute to an increased sense of vulnerability and lack of control over one's home environment, thereby increasing awareness of the need to reduce personal risks (smoking). The reverse may also be true, with those concerned about their own health habits finding reasons to be concerned about their environments as well. Nevertheless, incorporating both individual and environmental sources of risk into messages about smoking cessation may heighten the impact of these messages and further support motivations to quit smoking. Also, multi-level interventions aimed at improving the physical environments of low-income housing may additionally underscore the importance of quitting tobacco as part of comprehensive efforts to support individual and household health.

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Table 1

Sample characteristics of current tobacco users

Independent Variables	Current tobacco users N=177
Age	
18–29 yrs	42 (23.7%)
30–39 yrs	29 (16.4%)
40–49 yrs	40 (22.6%)
50–59 yrs	43 (24.3%)
60–70+ yrs	23 (13.0%)
Gender	
Men	46 (26.0%)
Women	131 (74.0%)
Education	
Grade school	19 (11.9%)
Some high school (HS)	36 (22.5%)
HS graduate	44 (27.5%)
>HS	61 (38.1%)
Race/ethnicity	
Hispanic	64 (36.6%)
White	48 (27.4%)
Black	44 (25.1%)
Other	19 (10.9%)
Chemical exposure index (% exposed)	147 (84.5%)
Mold index (% exposed)	75 (42.4%)
Pest index (% exposed)	94 (53.1%)
Combustion by-products index (% exposed)	90 (53.3%)
Ventilation index (% exposed)	152 (87.9%)
Household hazards score (high exp 4–5)	69 (41.6%)
Concern about air quality in home (mean score)	2.40 ± 1.22
Concern about pests in home (mean score)	2.63 ± 1.40
Concern about pesticides in home (mean score)	2.60 ± 1.35
Concerns about home exposures (mean score)	7.64 ± 3.17

* Frequencies (%) presented for categorical measures and means ± std presented for continuous measures.

Table 2

Intention to quit tobacco use: Bivariate results

Independent variables	Intention to quit tobacco use Pre-contemplation/contemplation (n=62)	Intention to quit tobacco use Preparation/action (n=108)	p-value
Chemical exposure index	85.2% (52/61)	84.0% (89/106)	0.83
Mold index	38.7% (24/62)	44.4% (48/108)	0.47
Pest index	51.6% (32/62)	51.9% (56/108)	0.98
Combustion by-products index	50.9% (29/57)	53.8% (57/106)	0.72
Ventilation index	91.7% (55/60)	85.8% (91/106)	0.27
Household hazards score (high exposure)	35.7% (20/56)	44.2% (46/104)	0.30
Concern about air quality	2.1±1.2 (1.0–4.0)	2.6±1.2 (1.0–4.0)	0.02
Concern about pests in home	2.3±1.4 (1.0–4.0)	2.8±1.4 (1.0–4.0)	0.02
Concern about pesticides in home	2.3±1.3 (1.0–4.0)	2.8±1.4 (1.0–4.0)	0.05
Concerns about exposures in the home score	6.7±2.8 (3.0–12.0)	8.1±3.2 (3.0–12.0)	0.003
Gender			
Men	33.9% (21/62)	19.4% (21/108)	0.04
Women	66.1% (41/62)	80.6% (87/108)	
Education			
Grade school	12.5% (7/56)	12.4% (12/97)	0.88
Some HS	19.6% (11/56)	24.7% (24/97)	
HS grad	30.4% (17/56)	25.8% (25/97)	
>HS	37.5% (21/56)	37.1% (36/97)	
Race/ethnicity			
Hispanic	36.1% (22/61)	37.4% (40/107)	0.99
Non-Hispanic White	27.9% (17/61)	29.0% (31/107)	
African American	24.6% (15/61)	23.4% (25/107)	
Other	11.5% (7/61)	10.3% (11/107)	
Age			
18–29	29.0% (18/62)	20.4% (22/108)	0.51
30–39	17.7% (11/62)	16.7% (18/108)	
40–49	22.6% (14/62)	20.4% (22/108)	
50–59	17.7% (11/62)	28.7% (31/108)	
60–70+	12.9% (8/62)	13.9% (15/108)	

* Frequencies (%) presented for categorical measures and means ± std presented for continuous measures. Chi-square p-values testing for differences between intention to quit categories.

Table 3

Intention to quit tobacco: Multivariate model

Predictors	Intention to quit Tobacco ^I	
	Pre-contemp/contemp (n=62)	Prep/action (n=108)
Predictors	OR (95% CI)	p
Household hazards score	0.72 (0.30–1.72)	0.46
Concerns about exposures in the home score	1.19 (1.04–1.37)	0.01
Age (ref: 60–70+)		
18–29	0.60 (0.15–2.47)	0.41
30–39	0.93 (0.20–4.29)	
40–49	0.83 (0.22–3.21)	
50–59	1.90 (0.48–7.47)	
Gender (ref: women)		
Men	0.38 (0.15–0.97)	0.04
Education (ref: >HS)		
Grade school	1.10 (0.29–4.21)	0.94
Some HS	1.34 (0.47–3.79)	
HS	0.96 (0.37–2.53)	
Race (ref: Non-Hispanic White)	1.14 (0.41–3.20)	0.76
Hispanic	0.73 (0.24–2.19)	
African American	1.44 (0.32–6.43)	
Other		

^ILogistic regression a logit link for concerns about exposures adjusted for demographics and household hazards