A cross-sectional study of the relationship of proximal smoking environments and cessation history, plans, and self-efficacy among low-income smokers

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Abstract

Introduction.—Proximal environments could facilitate smoking cessation among low-income smokers by making cessation appealing to strive for and tenable.

Aims.—We sought to examine how home smoking rules and proximal environmental factors such as other household members’ and peers’ smoking behaviors and attitudes related to low-income smokers’ past quit attempts, readiness, and self-efficacy to quit.

Methods.—This analysis used data from Offering Proactive Treatment Intervention (OPT-IN) (randomized control trial of proactive tobacco cessation outreach) baseline survey, which was completed by 2,406 participants in 2011/12. We tested the associations between predictors (home smoking rules and proximal environmental factors) and outcomes (past-year quit attempts, readiness to quit, and quitting self-efficacy).

Results.—Smokers who lived in homes with more restrictive household smoking rules, and/or reported having ‘important others’ who would be supportive of their quitting, were more likely to report having made a quit attempt in the past year, had greater readiness to quit, and greater self-efficacy related to quitting.

Conclusions.—Adjustments to proximal environments, including strengthening household smoking rules, might encourage cessation even if other household members are smokers.

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Ethical standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. The study was approved by the Institutional Review Boards at the University of Minnesota and the Minnesota Department of Human Services (DHS).

Conflict of interest. None
Keywords

home smoking policy; low-income smokers; smoking norms; social environment

Introduction

A variety of features in smokers’ proximal environments, which include their homes, families, and social groups, may influence attitudes and actions toward quitting smoking. Homes, even those that include current smokers, have varying rules about smoking on the premises. Some smokers primarily spend their time in the company of other smokers while others have few smokers in their social and familial circles. Smokers’ perceptions of how people that surround them feel about their smoking or how supportive these peers would be in a quit attempt may influence quit motivations (Westmaas, Bontemps-Jones, & Bauer, 2010). Further, when smokers observe smoking cues in their proximal environments, these can trigger cravings that could impede smoking abstinence (Conklin et al., 2018). Knowledge about if and how these proximal environments may correspond to pre-cessation attitudes and actions could offer guidance to smokers who are interested in quitting and want to set themselves up for cessation success.

Home smoking rules

There are many benefits to smokefree homes including decreasing secondhand smoke exposure for all household members, modeling smokefree norms for children, and fostering an environment that encourages smokers to reduce their cigarette consumption or even quit. Home smoking bans (or rules that there is to be no smoking within a home) are increasingly common with nearly 85% of US homes reporting a smoking ban by 2010/11 (Zhang, Martinez-Donate, Kuo, & Piper, 2016), up from 58% in 1995 (Zhang, Martinez-Donate, Kuo, Jones, & Palmersheim, 2012). There are a variety of factors that may have been driving this change, including the strengthening of large-scale tobacco control policies (Cheng, Glantz, & Lightwood, 2011; Ferketich, Wee, Shultz, & Wewers, 2007). But despite this progress, low-income smokers are less likely to have a smoking ban in their household (Parks, Kingsbury, Boyle, & Evered, 2018; Zhang et al., 2012).

Previous work has shown that home smoking bans are associated with cessation-related attitudes and behaviors. Cross-sectionally, home smoking bans have been associated with a greater likelihood of current and former smokers reporting periods of intentional smoking abstinence in the previous year (Farkas, Gilpin, Distefan, & Pierce, 1999; Messer, Trinidad, Al-Delaimy, & Pierce, 2008; Vijayaraghavan, Messer, White, & Pierce, 2013). Household smoking bans are also associated with fewer cigarettes smoked per day by household members (Rees et al., 2014; Wamboldt et al., 2008). The associations may be explained by lower nicotine dependency (and fewer cigarettes smoked per day) increasing openness to a household smoking ban, perhaps because it is less of an inconvenience for the light smoker. Alternatively, the home smoking ban might cause someone to reduce their cigarette consumption because smoking becomes less convenient and subsequently nicotine dependency lessens. There is evidence supporting the causality flowing in both directions. An example suggesting that home smoking rules may lessen smoking can be found in a
study of Philadelphia households which concluded that home smoking restrictions (or rules that limit smoking) reduced smoking in the home but that the level of smoking in the home did not predict the household’s smoking policy (Hennessy, Bleakley, Mallya, & Romer, 2014). Further, other clinical trial data have also shown that home smoking bans are associated with greater future success at quitting (Japuntich et al., 2011). There are also studies that suggest smoking habits can determine home smoking rules. In the International Tobacco Control Four Country Survey both quitting activity and intentions to quit predicted future home smoking bans (Borland et al., 2006). However, the presence of a ban at an earlier wave predicted greater quit attempts and successes, depicting a mutually reinforcing relationship between these rules and habits (Borland et al., 2006). Weaker pro-cessation attitudes can lead to weaker home smoking rules. For instance, in a cessation trial with African American light smokers, those who saw a reduction in their confidence to quit over time were less likely to have a partial or complete restriction on smoking in their homes at follow-up (Warren, Okuyemi, Guo, Thomas, & Ahluwalia, 2010).

Smoking among friends and family

Having a larger number of smokers in one’s social network is associated with smoking (Hoffman, Sussman, Unger, & Valente, 2006; Rostila, Almquist, Östberg, Edling, & Rydgren, 2013) for reasons likely related to both selection (smokers socialize with other smokers) and influence (being friends with smokers encourages initiation and discourages cessation) (Engels, Knibbe, Drop, & de Haan, 1997; Ennett & Bauman, 1994; Hoffman, Monge, Chou, & Valente, 2007). Both types of norms can influence smoking behavior (Phua, 2013). For instance, among low-income pregnant women, having a greater proportion of friends who smoked or a partner who smoked was associated with continuing smoking through the first trimester (Homish, Eiden, Leonard, & Kozlowski, 2012). In one cessation trial, the proportion of smokers in the social network was associated with a greater chance of returning to smoking after initial success and the number of supportive individuals in the network was associated with a lesser chance of lapse (Japuntich et al., 2011).

Beyond the influence of social modeling on smoking behaviors, the opinions of others in one’s social circle could motivate behavior change. Previous research has shown that believing that important people in your life want you to quit smoking increases quit attempts (Rennen et al., 2014). Among smokers who used cessation services in France, abstinence rates were highest among smokers who indicated that achieving a smoke-free social network or being pressured by others in their lives motivated them (Baha & Le Faou, 2010). However, there is some evidence that even peers who are smokers can also be supportive of quitting (Koshy, Mackenzie, Tappin, & Bauld, 2010). This may be because of people’s feelings about what ought to be, or injunctive norms, are not always congruent with their perceptions of what people in their community actually do (descriptive norms) (Phua, 2013). Unfortunately, despite the influence that social norms appear to have on behavior, a systematic review of intervention trials aimed to enhance partner support for cessation failed to increased quit rates for those who received partner support interventions (Park, Tudiver, & Campbell, 2012).
Though previous research, as described above, suggests that there are possibly multiple aspects of proximal environments that are associated with tobacco use cessation motivation and success, more information on which particular aspects might be most helpful, especially for disadvantaged smokers, would be helpful for intervention prioritization. The present study aimed to examine how home smoking rules (or the common principles that govern smoking in a household) and smoking norms might relate to past year quitting intentions and actions among low-income smokers. The goal of this investigation was to illuminate possible targets for intervention that might make the environments and contexts of low-income smokers more conducive to quitting.

Methods

Overview

The present analysis uses data from the Offering Proactive Treatment Intervention (OPT-IN) baseline survey. The OPT-IN study was designed to test if a proactive cessation intervention can increase tobacco abstinence and evidence-based cessation treatment utilization in low-income smokers (Fu et al., 2014). English speaking adults (age 18–64) who reported using cigarettes in the past 30 days (which is how OPT-IN defined being a smoker) were recruited from the state-subsidized insurance program for low-income Minnesotans, the Minnesota Health Care Programs (MHCP), a population that could be accessed due to our partnership with Minnesota Department of Human Services. Of the 21,181 individuals who were initially mailed surveys, 2,406 individuals returned baseline surveys in 2011/12 and were randomized to either the intervention or usual care (21,181 mailed surveys – 11,819 who did not return surveys – 6,826 who did not meet screening criteria – 130 who expressed they did not want to participate = 2,406 – for a detailed flow chart see Fu et al., 2016). The study was approved by the Institutional Review Boards at the University of Minnesota and the Minnesota Department of Human Services.

Measures

Outcomes—The outcomes in this analysis were three cessation-related attitudes or actions – readiness to quit, global self-efficacy for quitting, and past year quit attempts. Since all participants were current smokers at baseline, any reported past year quit attempt was, by definition, an unsuccessful one. To determine ‘readiness to quit,’ participants were presented a 10-rung ladder (adapted from Abrams et al. (Abrams et al., 2003; Biener and Abrams, 1991)) and were instructed, ‘Each rung on this ladder represents where various smokers are in their thinking about quitting. On this ladder from 0–10 where 1 is ‘no thought of quitting’ and 10 is ‘taking action to quit,’ write the number where you are now.’ Though this measure is commonly referred to as ‘readiness to quit,’ and that is how we refer to it here, Biener & Abrams have written that a more accurate description of what it actually measures is ‘readiness to consider quitting. (Biener & Abrams, 1991)’ Global self-efficacy for quitting was measured with the item, ‘On a scale from 0–10 where 0 is not at all confident and 10 is extremely confident, how confident are you that you can quit smoking now?’ (Baldwin et al., 2006). Past year quit attempts was captured in a yes/no question that asked, ‘During the past 12 months, have you stopped smoking for one day or longer because you were trying to quit?’ (Al-Delaimy, et al., 2010).
Predictors—We were interested in how home and social environments might relate to the aforementioned cessation-related attitudes and behaviors. Home smoking rules were assessed with the question (Al-Delaimy, et al., 2010), ‘Which of the following best describes the rules about smoking in your home?’ (1) smoking is not allowed anywhere inside my home, (2) smoking is allowed in some places or at some times, (3) smoking is allowed everywhere inside my home. For social environment, we measured both descriptive and injunctive norms. Descriptive norms were assessed by two items, the first was ‘Thinking of your close friends and family, about how many smoke cigarettes?’ (1) Almost all, (2) More than half, (3) About half, (4) Less than half, (5) Very few, (6) None. The second social environment question asked, ‘Who else in your household smokes’ and instructed the respondent to ‘check all that apply’ from a list of types of household members. For the purpose of this analysis, we dichotomized these responses as ‘one or more’ if at least one household member smoked, or ‘none’ if they did not indicate that any other household member smoked. Finally, to assess injunctive norms, participants were asked to indicate how strongly they agreed with the following three statements, People important to me: (1) ‘Want me to quit smoking,’ (2) ‘Don’t care if I smoke,’ (3) ‘Would be supportive of me if I wanted to quit smoking.’ The response options for these three items were, ‘strongly agree, somewhat agree, neither agree or disagree, somewhat disagree,’ ‘strongly disagree.’

Covariates—We considered demographic covariates, which included race/ethnicity, education, income, age and gender, and children under the age of 18 living in the home, all of which were recorded from survey questions. The race/ethnicity question enabled participants to check all races/ethnicities that applied to them. We created dichotomous variables (yes/no) for each of the following race categories: white, black, American Indian or Alaska Native, and ‘other’ (indicating they selected Pacific Islander, Asian, Hispanic or other from the list of choices), allowing respondents to be assigned to multiple categories if that was how they had described themselves in the questionnaire. Additionally, time to the first cigarette and the average number of cigarettes smoked per day were also included in some (see ‘fully adjusted’ in Table 2) models as potential confounding covariates. We have presented both minimally and fully adjusted models as these additional potential confounders may actually be on the causal pathway between exposures and outcomes, in which case the minimally adjusted models are more appropriate. Since the study design does not allow us to test if these variables are on the causal pathway, we present both models for the reader to assess.

Analysis—We first described the sample’s demographics, cessation-related attitudes and behaviors, and household and social environments. Next, we tested cross-sectional associations between the predictors and the continuous outcomes (readiness to quit and self-efficacy for quitting) using multivariable linear regression and tested associations between predictors and the dichotomous outcome (past year quit attempt) with multivariable logistic regression. Minimally adjusted models included race/ethnicity, education, income, children under 18 living in the household, age, and gender; more fully adjusted models also included time to first cigarette and cigarettes per day. Both minimally and more fully adjusted models used the full sample. We presented two models due to concern that nicotine dependency may be on the causal pathway between predictors and the outcomes and would thus represent an
over-adjustment. We calculated 95% confidence intervals for all adjusted means and odds ratios. All models were run using SAS 9.2 (SAS Institute Inc., Cary, NC).

**Results**

Table 1 shows that the OPT-IN sample was predominantly women (70.5%), white (84.0%) and had a median age of 33.0. Very few OPT-IN participants had graduated from college (11.6%) or had a household income greater than $40,000 per year (9.9%). Approximately half of respondents reported they had a household smoking ban in their homes, 67.8% reported that approximately half or more of their friends and family members smoked, and 52.5% reported that at least one other person in their household smoked. Most participants indicated that they perceived that people in their lives were supportive of them being smokefree. For instance, approximately 80% strongly agreed or agreed that important people in their lives wanted them to quit and just over 50% strongly disagreed or disagreed with the statement that important others did not care if they smoked. Slightly greater than half of respondents reported a past-year quit attempt (54.3%), median global self-efficacy for quitting was 5.0 and median readiness to quit level was 7.0. Slightly more than a quarter of the sample reported having their first cigarettes within 5 minutes of waking (26.0%) and median number of cigarettes smoked per day was 10, or half of a pack.

Tables 2–4 show that living in a household where smoking is not allowed was associated with an increased readiness to quit, increased global self-efficacy for quitting, and greater odds of a past year quit attempt. For instance, those who reported that smoking was not allowed anywhere in the home had a 33% greater odds of reporting a past year quit (aOR = 1.33 [1.03, 1.72]) (Table 4). Agreeing with ‘important others want me to quit’ and disagreeing with ‘important others don’t care if I smoke’ was associated with endorsing a higher readiness to quit. For example, those who strongly agreed with important others wanting them to quit were at 7.02 [6.87, 7.18] on the readiness to quit ladder versus a mean of 4.24 [3.48, 5.00] among those who strongly disagreed (Table 2). While these two ‘important others’ predictors were also associated with greater global self-efficacy scores, the differences were more modest than those seen with the readiness to quit ladder. Those who strongly agreed with important others wanting them to quit gave a mean 5.20 [5.04, 5.35] rating for their self-efficacy for quitting versus a mean of 4.72 [3.95, 5.49] among those who strongly disagreed (Table 3). Indicating that important people did not care if they smoked was associated with a lesser odds of having a past year quit attempt (aOR = 0.54 [0.38, 0.78]) (Table 4). Having more friends, family and/or other household member who smoke did not result in substantial differences in the readiness to quit ladder, global self-efficacy for quitting or past year quit attempts.

Home smoking rules and norms and the other outcomes were correlated. Smokers with a complete home smoking ban had fewer smokers in their peer groups (family and friends), were less likely to be living with another smoker, and reported more social support for quitting than smokers less restrictive home smoking policies (data not shown).
Discussion

We found that having stronger smokefree rules in one’s household was associated with a greater likelihood of having tried to quit recently as well as feeling ready and able to quit smoking in all models. Fewer smokers in the participants’ household and among their friends and family, a measure of participants’ descriptive norms, was not meaningfully associated with readiness to quit, global self-efficacy or past quit attempts. It is noteworthy that the most (68%) participants reported that half or more of their friends and family smoke. Conversely, one measure of injunctive norms, feeling that other important people in one’s life did care if he or she smoked, was associated with taking action to stop smoking in all models. And those who agreed that ‘others don’t care if I smoke’ had nearly 50% lesser odds of reporting they had recently tried to quit. Some associations were attenuated after adjustment for measures of dependency (time to first cigarette and number of cigarettes smoked per day) in the fully adjusted models. Dependency may partially confound these relationships as it relates to quitting attitudes and actions as well some of the norms and environments (for instance a highly nicotine dependent person might be less likely to choose to socialize with non-smokers).

Our findings reinforce earlier work that demonstrated associations between smokefree home rules and quitting attitudes and actions. Previous research has shown that stricter home smoking rules connect to greater quitting behaviors and intentions (Farkas et al., 1999; Messer et al., 2008), even in low-income populations (Vijayaraghavan et al., 2013). Due to this study’s design, we were not able to examine if the rules preceded or followed the cessation-related outcomes of interest. However, given the evidence that home rule adjustments and tobacco-free behavior changes are both favorable and mutually reinforcing, our study serves to underline that promoting one could have the beneficial follow-on effect of enhancing the other, a possibility which has also been supported by previous work (Borland et al., 2006; Hennessy, Bleakley, Mallya, & Romer, 2014). When considering home smoking rules, and their benefits, it is important to note that only a rule that bars all smoking from the home will protect inhabitants from exposure to secondhand smoke, as smoke will migrate even to parts of a home that are distal to the smoker (Van Deusen et al., 2009). There are approaches such as the brief intervention ‘Smoke-Free Homes: Some Things are Better Outside’ that have been tested in multiple populations including low-income populations, that have been shown to be both efficacious (Kegler et al., 2015), effective (Mullen et al., 2016; Williams et al., 2016), and disseminatable (Bundy et al., 2018).

It is important to note that many low-income people might not have authority to totally define their household smoking policy as low-income people are more likely to be renters and/or live in multi-unit buildings (Gentzke, Hyland, Kiviniemi, & Travers, 2018). For instance, a building owner might have a policy that prohibits smoking in their building’s units. Alternately, a household in a multi-unit building might have exposure to smoker from neighboring units, even if that household’s members have a smokefree rule for their apartment.
When considering an individual’s likelihood of quitting or how a person could be best positioned for cessation success, at first glance it could appear that having a great number of people in their household and friend groups who smoke might be a significant barrier. Indeed previous research has shown that these descriptive norms do predict smoking continuation (Homish et al., 2012) and in our study, perceiving that more friends or household members were smokers, was associated with lower self-efficacy for quitting. There was, however, no association between descriptive norms and quitting action, measured by having had a past-year quit attempt. Injunctive norms were associated with quitting action, specifically reporting that ‘important others don’t care if I smoke’ was associated with halved odds of having a past-year quit attempt. The reason for this is not clear but other recent studies have documented a link between injunctive norms and quitting behaviors (Benson, Nagelhout, Nierkens, Willemsen, & Stronks, 2016; Schoenaker, Brennan, Wakefield, & Durkin, 2018) and it is an area for further exploration with qualitative methods. This may be an important target for intervention. A person who is trying to quit may not be able to get those around him or her to not smoke during the quit attempt. But it could be possible to encourage people in the smoker’s social circle to alter their attitudes or how they are expressed to the smoker who wants to quit. This, in turn, could bolster the chances that it would be a successful quit attempt.

This study focused on an important population – a low-income group, which currently experience disproportionately higher tobacco use prevalence and poorer quitting success rates compared to the general US population. This analysis is limited by its cross-sectional nature and it would certainly be an interesting next step to conduct a study that followed participants forward in time to determine how household environments might longitudinally relate to cessation. An additional limitation is that we had no objective measures of participants’ social and household environments or quit attempts; all of the contextual and environmental information for this study was gathered by participant self-report. However, this methodological factor is not as important as it may first appear as we intended to measure norms, both descriptive and injunctive, which are defined for each individual by their perception of what others are doing rather than the objective fact of others’ actions and beliefs. Finally, since this sample was entirely composed of smokers, we are not able to examine what contexts are associated with actual quitting success since all quit attempts in this group, by definition, had resulted in lapses, at least at the point in time that participants were surveyed.

Certainly there are many factors that influence tobacco use cessation. Across studies, nicotine dependence appears to be the most consistent predictor of cessation success after a quit attempt has been made (Vangeli, Stapleton, Smit, Borland, & West, 2011). But cessation attitudes and actions are important as they are predictive of quit attempts (Vangeli et al., 2011; Zhou et al., 2009). Further, a number of previous quit attempts predicted future quit attempts and that both motivation and self-efficacy predicted 24-hour abstinence (Jardin & Carpenter, 2012).

In conclusion, this study further supports, that household contexts in which low-income smokers live can influence their cessation attitudes and actions and our work points to specific aspects of proximal environments that might be most useful to address. Specifically,
living in homes with more restrictive smoking rules and having important people in one’s life that are supportive of the smoker becoming smoke-free (injunctive norms) were related to various quitting attitudes and behaviors. Given the associations seen here, cessation intervention effects might be boosted if they more formally emphasized certain aspects of participants’ proximal environments. Often we think of environmental and contextual issues as being immutable and thus not something to directly focus cessation intervention upon. However, tobacco-free rules and injunctive norms do not require that all members of a social circle be tobacco-free, which potentially removes a barrier to modifying these features. Since low-income smokers face multiple barriers to quitting, interventions that can optimize smokers’ environment to be more pro-cessation, could, in turn, enhance opportunities for a tobacco-free lifestyle.

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References

Abrams DB, Niaura R, Brown RA, Emmons KM, Goldstein MG, & Monti PM (2003). The tobacco dependence treatment handbook: A guide to best practices (Vol. xviii). New York, NY, US: Guilford Press.

Al-Delaimy WK, Mills AL, Pierce JP, Emory K, Boman M, Smith J et al. (2010). Final summary report of: Two decades of the California tobacco control program:California tobacco survey, 1990–2008. La Jolla, San Diego, CA: University of California.

Baha M, & Le Faou A-L (2010). Smokers' reasons for quitting in an anti-smoking social context. Public Health, 124(4), 225–231. 10.1016/j.puhe.2010.02.011 [PubMed: 20371089]

Baldwin AS, Rothman AJ, Hertel AW, Linde JA, Jeffery RW, Finch EA et al. (2006). Specifying the determinants of the initiation and maintenance of behavior change: An examination of self-efficacy, satisfaction, and smoking cessation. Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association, 25 (5), 626–634. 10.1037/0278-6133.25.5.626

Benson FE, Nagelhout GE, Nierkens V, Willemsen MC, & Stronks K (2016). Inequalities in the impact of national reimbursement of smoking cessation pharmacotherapy and the influence of injunctive norms: An explorative study. Substance Abuse: Research and Treatment, 10, 45–53. 10.4137/SART.S32225

Biener L, & Abrams DB (1991). The contemplation ladder: Validation of a measure of readiness to consider smoking cessation. Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association, 10(5), 360–365.

Borland R, Yong H-H, Cummings KM, Hyland A, Anderson S, & Fong GT (2006). Determinants and consequences of smoke-free homes: Findings from the international tobacco control (ITC) four country survey. Tobacco Control, 15 Suppl 3, iii42–50. 10.1136/tc.2005.012492 [PubMed: 16754946]

Bundy LT, Haardörfer R, Kegler MC, Owolabi S, Berg CJ, Escoffery C et al. (2018). Disseminating a smoke free homes program to low SES households in the US through 2–1-1: Results of a national impact evaluation. Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco. 10.1093/ntt/nty256

Cheng K-W, Glantz SA, & Lightwood JM (2011). Association between smokefree laws and voluntary smokefree-home rules. American Journal of Preventive Medicine, 41(6), 566–572. 10.1016/j.amepre.2011.08.014 [PubMed: 22099232]
Conklin CA, McClernon FJ, Vella EJ, Joyce CJ, Salkeld RP, Parzynski CS et al. (2018). Combined smoking cues enhance reactivity and predict immediate subsequent smoking. Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco. 10.1093/ntr/nty009

Engels RC, Knibbe RA, Drop MJ, & de Haan YT (1997). Homogeneity of cigarette smoking within peer groups: Influence or selection? Health Education & Behavior: The Official Publication of the Society for Public Health Education, 24(6), 801–811. [PubMed: 9408792]

Emnett ST, & Bauman KE (1994). The contribution of influence and selection to adolescent peer group homogeneity: The case of adolescent cigarette smoking. Journal of Personality and Social Psychology, 67(4), 653–663. [PubMed: 7965611]

Farkas AJ, Gilpin EA, Distefan JM, & Pierce JP (1999). The effects of household and workplace smoking restrictions on quitting behaviours. Tobacco Control, 8(3), 261–265. [PubMed: 10599569]

Ferketich AK, Wee AG, Shultz J, & Wewers ME (2007). A measure of nicotine dependence for smokeless tobacco users. Addictive Behaviors, 32(9), 1970–1975. 10.1016/j.addbeh.2007.01.005 [PubMed: 17287090]

Fu SS, van Ryn M, Burgess DJ, Nelson D, Clothier B, Thomas JL et al. (2014). Proactive tobacco treatment for low income smokers: Study protocol of a randomized controlled trial. BMC Public Health, 14, 337. 10.1186/1471-2458-14-337 [PubMed: 24716466]

Fu SS, van Ryn M, Nelson D, Burgess DJ, Thomas JL, Saul J et al. (2016). Proactive tobacco treatment offering free nicotine replacement therapy and telephone counselling for socioeconomically disadvantaged smokers: A randomised clinical trial. Thorax, 71(5), 446–453. 10.1136/thoraxjnl-2015-207904 [PubMed: 26931362]

Gentzke AS, Hyland A, Kiviniemi M, & Travers MJ (2018). Attitudes and experiences with secondhand smoke and smoke-free policies among subsidised and market-rate multiunit housing residents living in six diverse communities in the USA. Tobacco Control, 27(2), 194–202. 10.1136/tobaccocontrol-2016-053374 [PubMed: 28302920]

Hennessy M, Bleakley A, Mallya G, & Romer D (2014). The effect of household smoking bans on household smoking. American Journal of Public Health, 104(4), 721–727. 10.2105/AJPH.2013.301634 [PubMed: 24524533]

Hoffman BR, Monge PR, Chou C-P, & Valente TW (2007). Perceived peer influence and peer selection on adolescent smoking. Addictive Behaviors, 32(8), 1546–1554. 10.1016/j.addbeh.2006.11.016 [PubMed: 17188818]

Hoffman BR, Sussman S, Unger JB, & Valente TW (2006). Peer influences on adolescent cigarette smoking: A theoretical review of the literature. Substance Use & Misuse, 41(1), 103–155. 10.1080/10826080500368892 [PubMed: 16393739]

Homish GG, Eiden RD, Leonard KE, & Kozlowski LT (2012). Social-environmental factors related to prenatal smoking. Addictive Behaviors, 37(1), 73–77. 10.1016/j.addbeh.2011.09.001 [PubMed: 21945011]

Japuntich SJ, Leventhal AM, Piper ME, Bolt DM, Roberts LJ, Fiore MC et al. (2011). Smoker characteristics and smoking-cessation milestones. American Journal of Preventive Medicine, 40(3), 286–294. 10.1016/j.amepre.2010.11.016 [PubMed: 21335259]

Jardin BF, & Carpenter MJ (2012). Predictors of quit attempts and abstinence among smokers not currently interested in quitting. Nicotine & Tobacco Research, 14(10), 1197–1204. 10.1093/ntr/nts015 [PubMed: 22387995]

Kegler MC, Bundy L, Haardörfer R, Escoffery C, Berg C, Yembra D et al. (2015). A minimal intervention to promote smoke-free homes among 2–1-1 callers: A randomized controlled trial. American Journal of Public Health, 105(3), 530–537. 10.2105/AJPH.2014.302260 [PubMed: 25602863]

Koshy P, Mackenzie M, Tappin D, & Bauld L (2010). Smoking cessation during pregnancy: The influence of partners, family and friends on quitters and non-quitters. Health and Social Care in the Community, 18(5),500–510. 10.1111/j.1365-2524.2010.00926.x [PubMed: 20561076]

J Smok Cessat. Author manuscript; available in PMC 2021 March 26.
Messer K, Trinidad DR, Al-Delaimy WK, & Pierce JP (2008). Smoking cessation rates in the United States: A comparison of young adult and older smokers. American Journal of Public Health, 98(2), 317–322. 10.2105/AJPH.2007.112060 [PubMed: 18172143]

Mullen PD, Savas LS, Bundy LT, Haardörf er R, Hovell M, Fernández ME et al. (2016). Minimal intervention delivered by 2–1-1 information and referral specialists promotes smoke-free homes among 2–1-1 callers: a Texas generalisation trial. Tobacco Control, 25(Suppl 1), i10–i18. 10.1136/ tobaccocontrol-2016-053045 [PubMed: 27697943]

Park EW, Tudier FG, & Campbell T (2012). Enhancing partner support to improve smoking cessation. The Cochrane Database of Systematic Reviews, 7, CD002928. 10.1002/14651858.CD002928.pub3

Parks MJ, Kingsbury JH, Boyle RG, & Evered S (2018). Smoke-Free rules in homes and cars Among smokers and nonsmokers in Minnesota. Preventing Chronic Disease, 15, E32. 10.5888/ pcd15.170355

Phua JJ (2013). The reference group perspective for smoking cessation: An examination of the influence of social norms and social identification with reference groups on smoking cessation self-efficacy. Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors, 27(1), 102–112. 10.1037/a0029130 [PubMed: 22730253]

Rees VW, Keske RR, Blaine K, Aronstein D, Gandelman E, Lora V et al. (2014). Factors influencing adoption of and adherence to indoor smoking bans among health disparity communities. American Journal of Public Health, 104(10), 1928–1934. 10.2105/AJPH.2013.301735 [PubMed: 25208003]

Rennen E, Nagelhout GE, van den Putte B, Janssen E, Mons U, Guignard R et al. (2014). Associations between tobacco control policy awareness, social acceptability of smoking and smoking cessation. Findings from the International Tobacco Control (ITC) Europe Surveys. Health Education Research, 29(1), 72–82. 10.1093/her/cyt073 [PubMed: 23861478]

Rostila M, Almqquist YB, Östberg V, Edling C, & Rydgren J (2013). Social network characteristics and daily smoking among young adults in Sweden. International Journal of Environmental Research and Public Health, 10(12), 6517–6533. 10.3390/ijerph10126517 [PubMed: 24351786]

Schoenaker DAJM, Brennan E, Wakefield MA, & Durkin SJ (2018). Anti-smoking social norms are associated with increased cessation behaviours among lower and higher socioeconomic status smokers: A population-based cohort study. PloS One, 13(12), e0208950. 10.1371/ journal.pone.0208950

Van Deusen A, Hyland A, Travers MJ, Wang C, Higbee C, King BA et al. (2009). Secondhand smoke and particulate matter exposure in the home. Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco, 11(6), 635–641. 10.1093/ntt/ntp018 [PubMed: 19351784]

Vangelis E, Stapleton J, Smit ES, Borland R, & West R (2011). Predictors of attempts to stop smoking and their success in adult general population samples: A systematic review. Addiction, 106(12), 2110–2121. 10.1111/j.1360-0443.2011.03565.x [PubMed: 21752135]

Vijayaraghavan M, Messer K, White MM, & Pierce JP (2013). The effectiveness of cigarette price and smoke-free homes on low-income smokers in the United States. American Journal of Public Health, 103(12), 2276–2283. 10.2105/AJPH.2013.301300 [PubMed: 24134354]

Wamboldt FS, Balkissoon RC, Rankin AE, Szefler SJ, Hammond SK, Glasgow RE et al. (2008). Correlates of household smoking bans in low-income families of children with and without asthma. Family Process, 47(1), 81–94. [PubMed: 18411831]

Warren JR, Okuyemi KS, Guo H, Thomas JL, & Ahluwalia JS (2010). Predicting home smoking restrictions among African American light smokers. American Journal of Health Behavior, 34(1), 110–118. [PubMed: 19663758]

Westmaas JL, Bontemps-Jones J, & Bauer JE (2010). Social support in smoking cessation: Reconciling theory and evidence. Nicotine & Tobacco Research, 12(7), 695–707. 10.1093/ntt/ ntt077 [PubMed: 20513695]

Williams RS, Stollings JH, Bundy L, Haardörf er R, Kreuter MW, Mullen PD et al. (2016). A minimal intervention to promote smoke-free homes among 2–1-1 callers: North Carolina randomized effectiveness trial. PloS One, 11(11), e0165086. 10.1371/journal.pone.0165086
Zhang X, Martinez-Donate AP, Kuo D, Jones NR, & Palmersheim KA (2012). Trends in home smoking bans in the USA, 1995–2007: Prevalence, discrepancies and disparities. Tobacco Control, 21(3), 330–336. 10.1136/tc.2011.043802 [PubMed: 21813487]

Zhang X, Martinez-Donate AP, Kuo D, & Piper M (2016). Beyond cigarette smoking: Smoke-free home rules and use of alternative tobacco products. Perspectives in Public Health, 136(1), 30–33. 10.1177/1757913915600194 [PubMed: 26275410]

Zhou X, Nonnemaker J, Sherrill B, Gilsenan AW, Coste F, & West R (2009). Attempts to quit smoking and relapse: Factors associated with success or failure from the ATTEMPT cohort study. Addictive Behaviors, 34(4), 365–373. 10.1016/j.addbeh.2008.11.013 [PubMed: 19097706]
Table 1
Characteristics of OPT-IN sample at baseline for key variables. $n = 2,406$

|                              | n  | % or median (IQR) |
|------------------------------|----|-------------------|
| Gender                       |    |                   |
| Male                         | 694| 29.5              |
| Female                       | 1659| 70.5             |
| Race/ethnicity               |    |                   |
| Am In/AL Nat                 | 183| 7.8               |
| Asian                        | 53 | 2.2               |
| Black                        | 246| 10.4              |
| Pacific Islander             | 6  | 0.3               |
| White                        | 1,985| 84              |
| Other                        | 12 | 0.5               |
| Education                    |    |                   |
| None                         | 27 | 1.2               |
| 1st–11th grade               | 295| 12.5              |
| High school/General Education Development | 781| 33.2            |
| Some college                 | 977| 41.5              |
| College grad                 | 163| 6.9               |
| Graduate degree              | 111| 4.7               |
| Income                       |    |                   |
| <$10 K                       | 857| 37.3              |
| $10 K–$20 K                  | 720| 31.4              |
| $20 K–$40 K                  | 492| 21.4              |
| $40 K–$60 K                  | 157| 6.8               |
| $60 K–$80 K                  | 48 | 2.1               |
| >$80 K                       | 23 | 1.0               |
| Age                          | 2,356| 33 (26–48)      |
| Home smoking rules           |    |                   |
| Smoking allowed nowhere      | 1,206| 50.5            |
| Smoking allowed some places  | 627 | 26.2              |
| Smoking allowed everywhere   | 557| 23.3              |
| How many friends and family members smoke? |    |                   |
| Almost all                   | 488| 20.4              |
| >half                        | 513| 21.5              |
| About half                   | 618| 25.9              |
| <half                        | 367| 15.4              |
| Very few                     | 355| 14.9              |
| None                         | 47 | 2.0               |
|                                | n  | % or median (IQR) |
|--------------------------------|----|-------------------|
| **Other household smokers**    |    |                   |
| None                           | 1,134 | 47.6            |
| One or more                    | 1,251 | 52.5            |
| **Important others want me to quit** |    |                   |
| Strongly agree                 | 1,314 | 56.4            |
| Somewhat agree                 | 552  | 23.7            |
| Neither agree or disagree      | 360  | 15.5            |
| Somewhat disagree              | 42   | 1.8             |
| Strongly disagree              | 61   | 2.6             |
| **Important others don’t care if I smoke** |    |                   |
| Strongly agree                 | 192  | 8.5             |
| Somewhat agree                 | 393  | 17.3            |
| Neither agree or disagree      | 504  | 22.2            |
| Somewhat disagree              | 425  | 18.7            |
| Strongly disagree              | 755  | 33.3            |
| **Important others would be supportive of quitting** |    |                   |
| Strongly agree                 | 1,627 | 70.3            |
| Somewhat agree                 | 441  | 19.1            |
| Neither agree or disagree      | 161  | 7.0             |
| Somewhat disagree              | 38   | 1.6             |
| Strongly disagree              | 46   | 2.0             |
| **Quit for ≥1 day in past year?** |    |                   |
| Yes                            | 1,287 | 54.3            |
| No                             | 1,082 | 45.7            |
| **Global self-efficacy for quitting**<sup>a</sup> | 2,375 | 5 (3–8)         |
| **Readiness to quit ladder**<sup>b</sup> | 2,282 | 7 (5–8)         |
| **Cigarettes per day**         | 2,356 | 10 (7–20)       |
| **Time to 1st cigarette**      |    |                   |
| <5 min                         | 617  | 26.0            |
| 6–15 min                       | 689  | 29.0            |
| 16–30 min                      | 356  | 15.0            |
| 31–60 min                      | 285  | 12.0            |
| >60 min                        | 430  | 18.1            |
| **Children under 18 in home?** |    |                   |
| Yes                            | 1,316 | 55.9            |
| No                             | 1,040 | 44.1            |

<sup>a</sup> Due to missing items, n totals vary.
a. Global self-efficacy for quitting ranges from 0 to 10 with 0 = ‘Not at all confident that you could quit smoking now’ to 10 = ‘Extremely confident that you could quit smoking now’.

b. Readiness to quit ladder ranges from 0 to 10 with 0 = ‘No thought of quitting’ and 10 = ‘Taking action to quit’.
Table 2.
Adjusted mean values on the readiness to quit ladder (range 1–10) by household and social context. (OPT-IN, n = 2,406)

|                                     | Minimally adjusted<sup>a</sup> | Fully adjusted<sup>b</sup> |
|-------------------------------------|--------------------------------|-----------------------------|
|                                     | Mean 95% CI                     | Mean 95% CI                 |
| **Home smoking rules**              |                                |                             |
| Smoking allowed nowhere             | 6.70 6.52 6.88                 | 6.58 6.39 6.76              |
| Smoking allowed some places          | 6.35 6.12 6.59                 | 6.38 6.15 6.62              |
| Smoking allowed everywhere          | 5.66 5.39 5.92                 | 5.84 5.56 6.11              |
| **How many friends and family members smoke?** |                                |                             |
| Almost all                          | 6.03 5.76 6.31                 | 6.06 5.78 6.34              |
| > half                              | 6.28 6.02 6.54                 | 6.29 6.03 6.55              |
| About half                          | 6.41 6.17 6.65                 | 6.41 6.17 6.64              |
| < half                              | 6.45 6.14 6.77                 | 6.37 6.06 6.69              |
| Very few                            | 6.78 6.46 7.10                 | 6.72 6.39 7.04              |
| None                                | 5.92 4.98 6.86                 | 6.16 5.20 7.11              |
| **Other household smokers**         |                                |                             |
| None                                | 6.45 6.27 6.63                 | 6.42 6.25 6.60              |
| One or more                         | 6.27 6.07 6.44                 | 6.27 6.11 6.44              |
| **Important others want me to quit** |                                |                             |
| Strongly agree                      | 7.02 6.87 7.18                 | 7.02 6.87 7.18              |
| Somewhat agree                      | 5.87 5.63 6.11                 | 5.86 5.62 6.10              |
| Neither agree or disagree           | 5.29 4.99 5.59                 | 5.21 4.91 5.51              |
| Somewhat disagree                   | 4.03 3.14 4.93                 | 4.01 3.12 4.90              |
| Strongly disagree                   | 4.11 3.35 4.87                 | 4.24 3.48 5.00              |
| **Important others don’t care if I smoke** |                                |                             |
| Strongly agree                      | 5.31 4.89 5.74                 | 5.27 4.85 5.69              |
| Somewhat agree                      | 5.78 5.49 6.07                 | 5.74 5.46 6.03              |
| Neither agree or disagree           | 5.90 5.65 6.15                 | 5.91 5.65 6.16              |
| Somewhat disagree                   | 6.50 6.22 6.78                 | 6.50 6.23 6.78              |
| Response                          | Minimally adjusted<sup>a</sup> | Fully adjusted<sup>b</sup> |
|----------------------------------|---------------------------------|-----------------------------|
|                                  | Mean 95% CI                      | Mean 95% CI                 |
| Strongly disagree                | 7.14  6.93  7.35                | 7.14  6.93  7.35            |
| Important others would be supportive of quitting |                                  |                             |
| Strongly agree                   | 6.57  6.43  6.72                | 6.56  5.11  6.04            |
| Somewhat agree                   | 6.00  5.73  6.28                | 5.99  5.72  6.27            |
| Neither agree or disagree        | 5.53  5.07  5.99                | 5.58  5.11  6.04            |
| Somewhat disagree                | 5.62  4.65  6.59                | 5.64  4.68  6.60            |
| Strongly disagree                | 6.17  5.22  7.13                | 6.18  5.18  7.17            |

<sup>a</sup> Adjusted for race (white, black, Asian, American Indian, Pacific Islander, other), education, income, age, gender, children under 18 in home.

<sup>b</sup> Adjusted for above AND time to first cigarette and cigarettes per day.
Table 3.

Adjusted mean values for global self-efficacy for quitting (range 0–10) by household and social context. (OPT-IN, $n = 2,406$)

|                              | Minimally adjusted<sup>a</sup> | Fully adjusted<sup>b</sup> |
|------------------------------|-------------------------------|-----------------------------|
|                              | Mean  | 95% CI  | Mean  | 95% CI  |
| Home smoking rules           |       |         |       |         |
| Smoking allowed nowhere      | 5.48  | 5.29 5.66 | 5.10  | 4.93 5.28 |
| Smoking allowed some places  | 4.91  | 4.66 5.15 | 5.09  | 4.85 5.32 |
| Smoking allowed everywhere   | 4.17  | 3.89 4.45 | 4.63  | 4.36 4.90 |
| How many friends and family members smoke? |       |         |       |         |
| Almost all                   | 4.75  | 4.47 5.04 | 4.90  | 4.63 5.17 |
| > half                       | 4.76  | 4.48 5.03 | 4.80  | 4.55 5.06 |
| About half                   | 5.07  | 4.82 5.31 | 5.05  | 4.82 5.28 |
| < half                       | 5.26  | 4.93 5.58 | 5.09  | 4.78 5.39 |
| Very few                     | 5.54  | 5.20 5.87 | 5.28  | 4.96 5.14 |
| None                         | 4.31  | 3.35 5.26 | 4.21  | 3.29 5.14 |
| Other household smokers      |       |         |       |         |
| None                         | 4.99  | 4.81 5.18 | 4.91  | 4.74 5.08 |
| One or more                  | 5.02  | 4.84 5.20 | 5.05  | 4.88 5.21 |
| Important others want me to quit |       |         |       |         |
| Strongly agree               | 5.18  | 5.02 5.48 | 5.20  | 5.04 5.35 |
| Somewhat agree               | 4.61  | 4.35 4.88 | 4.64  | 4.39 4.88 |
| Neither agree or disagree    | 5.15  | 4.82 5.48 | 4.91  | 4.60 5.21 |
| Somewhat disagree            | 4.40  | 3.46 5.35 | 4.25  | 3.37 5.13 |
| Strongly disagree            | 4.79  | 3.98 5.61 | 4.72  | 3.95 5.49 |
| Important others don’t care if I smoke |       |         |       |         |
| Strongly agree               | 4.92  | 4.67 5.37 | 4.83  | 4.41 5.25 |
| Somewhat agree               | 4.82  | 4.52 5.13 | 4.78  | 4.49 5.06 |
| Neither agree or disagree    | 4.86  | 4.58 5.13 | 4.86  | 4.60 5.11 |
| Somewhat disagree            | 4.89  | 4.60 5.19 | 4.91  | 4.64 5.19 |
|                                                  | Minimally adjusted<sup>a</sup> | Fully adjusted<sup>b</sup> |
|-------------------------------------------------|--------------------------------|---------------------------|
|                                                  | Mean  | 95% CI | Mean  | 95% CI |
| Strongly disagree                                | 5.36  | 5.13   | 5.31  | 5.10   | 5.52   |
| Important others would be supportive of quitting |       |        |       |        |
| Strongly agree                                  | 5.25  | 5.09   | 5.19  | 5.05   | 5.33   |
| Somewhat agree                                  | 4.53  | 4.24   | 4.57  | 4.30   | 4.84   |
| Neither agree or disagree                        | 4.60  | 4.11   | 4.61  | 4.15   | 5.07   |
| Somewhat disagree                                | 3.48  | 2.48   | 3.55  | 2.62   | 4.47   |
| Strongly disagree                                | 5.82  | 4.80   | 5.84  | 4.87   | 6.80   |

<sup>a</sup> Adjusted for race (white, black, Asian, American Indian, Pacific Islander, other), education, income, age, gender, children under 18 in home.

<sup>b</sup> Adjusted for above AND time to first cigarette and cigarettes per day.
### Table 4

Adjusted associations between household and social contexts and past year quit attempts. (OPT-IN, n = 2,406)

|                          | Minimally adjusted<sup>a</sup> | Fully adjusted<sup>b</sup> |
|--------------------------|-------------------------------|----------------------------|
|                          | aOR   | 95% CI | aOR   | 95% CI |
| **Home smoking rules**   |       |        |       |        |
| Smoking allowed nowhere  | 1.67  | 1.31   | 2.12  | 1.03   | 1.72 |
| Smoking allowed some places | 1.29  | 1.00   | 1.67  | 1.21   | 1.57 |
| Smoking allowed everywhere | 1.00  | 1.00   |       |        |      |
| **How many friends and family members smoke?** |       |        |       |        |
| Almost all               | 0.85  | 0.43   | 1.69  | 0.75   | 1.36 |
| > half                   | 0.92  | 0.46   | 1.84  | 0.80   | 1.66 |
| About half               | 0.91  | 0.46   | 1.80  | 0.75   | 1.36 |
| < half                   | 0.95  | 0.47   | 1.90  | 0.77   | 1.66 |
| Very few                | 1.15  | 0.58   | 2.31  | 0.95   | 2.00 |
| None                    | ref   | ref    |       |        |      |
| **Other household smokers** |       |        |       |        |
| None                     | 1.05  | 0.88   | 1.26  | 1.00   | 1.20 |
| One or more             | 1.00  | 1.00   |       |        |      |
| **Important others want me to quit** |       |        |       |        |
| Strongly agree          | 1.86  | 1.04   | 3.32  | 1.78   | 3.28 |
| Somewhat agree          | 0.98  | 0.54   | 1.78  | 0.92   | 1.72 |
| Neither agree or disagree | 0.78  | 0.42   | 1.44  | 0.66   | 1.25 |
| Somewhat disagree       | 0.86  | 0.35   | 2.08  | 0.77   | 1.95 |
| Strongly disagree       | 1.00  | 1.00   |       |        |      |
| **Important others don’t care if I smoke** |       |        |       |        |
| Strongly agree          | 0.55  | 0.39   | 0.78  | 0.54   | 0.38  | 0.78 |
| Somewhat agree          | 0.50  | 0.38   | 0.65  | 0.48   | 0.36  | 0.63 |
| Neither agree or disagree | 0.54  | 0.42   | 0.69  | 0.51   | 0.40  | 0.66 |
| Somewhat disagree       | 0.62  | 0.48   | 0.80  | 0.61   | 0.47  | 0.80 |
| Important others would be supportive of quitting | Minimally adjusted<sup>a</sup> | Fully adjusted<sup>b</sup> |
|-----------------------------------------------|-----------------------------|-----------------------------|
| Strongly disagree                             | 1.00                        | 1.00                        |
| Strongly agree                                | 0.77 0.38 1.56              | 0.76 0.36 1.62              |
| Somewhat agree                                | 0.58 0.28 1.21              | 0.60 0.27 1.30              |
| Neither agree or disagree                      | 0.51 0.23 1.10              | 0.49 0.21 1.12              |
| Somewhat disagree                             | 0.49 0.19 1.32              | 0.49 0.18 1.37              |
| Strongly disagree                             | 1.00                        | 1.00                        |

<sup>a</sup> Adjusted for race (white, black, Asian, American Indian, Pacific Islander, other), education, income, age, gender, children under 18 in home.

<sup>b</sup> Adjusted for above AND time to first cigarette and cigarettes per day.