A path model of smoking cessation in women smokers of low socio-economic status

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Abstract

The goals of this study were to (i) determine how factors commonly implicated in smoking cessation processes influenced smoking cessation in low socio-economic status (SES) women and (ii) elucidate the pathways through which these factors may lead to quitting smoking. Secondary analysis was conducted on data from 644 women smokers aged 18–45 years who had participated in an earlier experimental evaluation of a smoking cessation program, were still smokers at the 2-month post-intervention survey and completed an interview 6 months later. Path analysis (LISREL 8) was used to test a conceptual model in which (i) factors considered as precursors to quitting (motivation, self-efficacy, confidence, action and intention to quit) directly predicted subsequent quitting and (ii) health concerns, social pressure to quit and daily stress influenced quitting indirectly through their effects on the precursor factors and (iii) mediated the effects of background characteristics (race, education, single motherhood, pregnancy and exposure to the earlier smoking cessation intervention) on quitting. Overall, results supported this conceptual model and its applicability to low-SES women smokers and indicated significant pathways among specific factors. In particular, (i) only plans to quit, confidence and social pressure to quit directly predicted quitting; (ii) both health concerns and social pressure increased motivation to quit and (iii) the negative effect of daily stress on quitting was mediated through decreased self-efficacy.

Introduction

Reduction of the currently high smoking prevalence among women of low socio-economic status (SES) is an important public health goal [1, 2]. Achieving this goal will require more knowledge about what might influence these smokers to successfully quit.

This paper presents findings about factors associated with quitting smoking among low-income women smokers of reproductive age. Specifically, we report findings from path analyses conducted to explore relationships among (i) factors that are assumed to mediate the negative effect of low SES on smoking behavior (i.e. perceived daily stress, weak social norms favoring quitting and limited relevance of health concerns), (ii) factors that are generally considered as precursors to quitting (i.e. confidence, self-efficacy, motivation, recent actions toward quitting and intention to quit) and (iii) subsequent quitting.

Conceptual model

Precursors of smoking cessation

Long-standing theories of health behavior, including health beliefs, reasoned action and social
learning theories, indicate five elements that are likely to be precursors of smoking cessation. These elements are motivation to quit smoking, situational self-efficacy, confidence in one’s ability to quit, recent actions taken toward quitting and plans to quit [1, 3, 4].

‘Motivation’ reflects the desire and determination to change and is assumed to be essential for movement forward in the change process [5–7]. ‘Situational self-efficacy’ reflects a smoker’s awareness of specific situations that trigger her smoking and her perceived ability to abstain from smoking in such situations. ‘Confidence’ reflects a more general self-assessment of readiness to quit and having sufficient skills to make quitting a realistic goal [8, 9]. ‘Action’ toward quitting may involve setting and achieving small goals, such as cutting down one’s daily cigarette consumption or being able to abstain in given situations [10–12]. For some smokers, engaging in these intermediary actions may be due to reasons unrelated to any thoughts about quitting smoking (e.g. cut down daily consumption because of financial cost). Regardless of their reasons, these intermediate actions may have an important function in building the skills and confidence necessary to eventually quit. ‘Plans to quit smoking’ are whether a smoker seriously plans to quit and how soon.

Note that recent action and plans to change are the two variables commonly combined to operationalize the transtheoretical theory’s concept of stage of readiness [12]. We chose to treat actions and plans as separate factors because these two variables may result from different influences and have different impact on quitting smoking.

Factors mediating the negative impact of low SES on smoking cessation

The social context in which low-SES smokers are situated can also influence the quitting process. Three main factors through which low-SES contexts are assumed to influence smoking behavior are (i) limited relevance of concerns about the health risks of smoking, (ii) weak social norms favoring quitting and (iii) high daily stress.

Health concerns

In the original health belief model, the motivational force that impels engaging in health preventive behavior is generated by the perceived threat associated with health risks [13]. Low-SES women tend to be less knowledgeable or less concerned about the specific health risks of smoking (i.e. cancer, heart disease) than higher SES women, but are as likely to have generalized concerns about the effects of smoking on health maintenance and wellbeing [14]. However, their concern about the health risks of smoking may compete with concerns about more immediate threats to their physical and financial security [15].

Social norms favoring smoking cessation

In reasoned action theory, motivation to change is also fueled by the inclination to comply with social norms, especially as expressed by what significant others want one to do [8, 16]. If smoking is prevalent and a valued part of lifestyle among low-SES groups, social norms for quitting may be weaker and competing with group-specific norms and lifestyle interactions that favor and reinforce smoking behavior [17].

Stress

Psychological theories assume two modes of response to stress: controlling the sources of stress or, when that is not feasible, controlling the negative emotions associated with stress [18]. Compared with more socio-economically advantaged individuals, those of low SES tend to experience daily stressors more frequently and have fewer material resources and less social power to control the sources of stress [19–22]. Thus, they may resort to the emotion control-coping mechanism more often. Cigarette smoking is then used to help gain emotion control [1, 23]. Recent studies have begun to question the physiological evidence for smoking as a stress reduction mechanism [24, 25]. However, regardless of objective physiological evidence, many low-SES smokers perceive smoking as essential to their ability to deal with daily stressors and mention such perceived utility as a serious barrier to quitting [14, 20, 25].
Other background factors

Within low-SES groups, background variables such as race, marital status, children, pregnancy, presence of other smokers in the home, smoking addiction and habituation and exposure to smoking cessation interventions may also influence smoking cessation processes, although their effects are not always clear.

Among low-SES race groups, African–American women are less likely than White women to be former smokers even after controlling for their lower initiation rates [1, 26]. However, some smoking cessation trials have obtained as good or better smoking cessation outcomes with African American as with White women [27–30]. Like other smokers, the majority of African–American women who smoke would like to quit, plan to quit eventually and has tried to quit in the past [14, 26, 28].

Being employed, being a single parent, presence of other smokers in the home and physiological addiction are all generally associated with greater difficulty in quitting smoking [2, 31–33]. However, marriage in combination with financial or family problems may prevent smoking cessation [34]. Quitting smoking is less likely for women who are routinely housebound and alone with children and who lack resources for occasional relief [35, 36].

Pregnancy generally promotes at least temporary abstinence from smoking [37] and is likely to increase health concerns, social pressure and motivation to quit. Pregnancy could also increase stress for poor or unmarried women, thus raising the utility of smoking as a stress-coping mechanism.

In summary, low SES is assumed to be associated with higher perceived daily stress. A high stress level and limited resources to address the sources of stress may provoke smoking, decrease self-efficacy to abstain under stress and hinder cessation. The high prevalence of smoking among low-SES groups may increase the likelihood of having friends and relatives who also smoke and decrease social pressure to quit from significant others. As a result, low-SES individuals are likely to have lower motivation to quit and less confidence in one's ability to quit. Poor motivation, self-efficacy and confidence may prevent taking intermediate actions toward quitting as well as preventing quitting. Despite these presumed barriers, many low-SES women want to quit smoking and respond positively to smoking cessation interventions, and some do quit smoking. As is the case for other smokers, intention to quit smoking among low-SES smokers should be associated with higher motivation, self-efficacy and confidence. Recent actions toward quitting should be associated with these factors, but can also be affected by other factors unrelated to a reasoned decision or motivation to quit. Actions and intention to quit should be associated, and both should predict quitting.

The theoretical model shown in Fig. 1 summarizes these expected relationships. The model includes exposure to the earlier smoking cessation program as an exogenous variable to control for the known positive effects of such exposure on the precursors of quitting and on quitting [27, 38].

Study methods

Study sample

The data for this study came from an earlier experimental study conducted by three of the authors to evaluate a smoking cessation program in 12 public health clinics (ten in Chicago and two in suburbs). The clinics served mostly poor or low-income women. Smokers in six experimental clinics had received a minimal cessation intervention. Smokers in the six control clinics received usual and customary clinic services. Smokers were identified by research staff by screening all women in the clinic waiting rooms. Telephone interviews were attempted with all consenting smokers at ~2 and 6 months post-intervention. Interviews were conducted by the Survey Research Laboratory at the University of Illinois. Details of the methods for accruing study participants and intervention components are reported elsewhere [27, 38]. All methods for the original study and the present study were approved by the Office for Human Subject Protection at the University of Illinois at Chicago. Participants for the present study are 644 women aged 18–45.
years who were still smokers at the time of the 2-month post-intervention interviews, who completed both the 2- and 6-month interviews and who were either White or African–American race.

**Study variables**

**Background variables**

These included race, age, education, employment (full-, part-time, not employed), married or living with a partner, number of children, presence of other smokers in the household, years smoked, number of cigarettes smoked daily and exposure to the earlier program. Marital status, number of children and being a single mother were highly correlated; therefore, only ‘single mother’ was kept in the model. Years smoked was also dropped due to its high correlation with age. Preliminary results showed that employment, presence of other smokers in the household, age and number of cigarettes smoked were not associated with any endogenous variables in the model. Thus, the final model reported in this study included only five background variables: ‘race’ (African American, White), ‘education’ (less than high school, high school, more than high school), ‘single parenthood’ (yes, no), ‘pregnancy’ at the 2-month measurement (yes, no) and ‘exposure to the earlier intervention’, coded ‘yes’ if women had been in the intervention condition of the earlier clinic study and ‘no’ if they had been in the control condition.

**Mediating factors**

‘Health concerns’ was constructed from responses to two four-point scales about how much a woman was concerned about the health risk of smoking on (i) her own health and (ii) the health of close others. Due to the highly skewed distribution of responses, ‘health concerns’ was coded 1 if women reported being very concerned about both risks and 0 otherwise. ‘Social pressure to quit’ was measured with a four-point question: ‘How much people close to you want you to quit smoking?’ (1 = not at all, 4 = very much). ‘Perceived stress’ was measured with two items from the four-item version of the Perceived Stress Scale [39]. The scale constructed with these two items (confidence in being able to handle personal problems and feeling that ‘things are going my way’ in previous 30 days) had the highest reliability (0.60) in the study population.

**Smoking precursors**

‘Motivation’ to quit smoking was a sum of three four-point items reflecting desire and determination to cut down and desire to quit smoking (range
‘Situational self-efficacy’ was a four-point scale constructed from the mean of four questions that measured how confident respondents were in being able to not smoke: when upset, when angry, when having an argument and under pressure (each answered from 1, not at all confident, to 4, very confident). The scale has alpha reliability of 0.87. ‘Confidence’ was a seven-point scale constructed from the sum of two questions assessing the woman’s confidence in her ability to (i) cut down and (ii) abstain from smoking (range 2–8). ‘Action’ was a four-point scale created as the sum of four actions taken or not taken in the past 2 months (intentionally cut down on smoking, reduced the number of daily cigarettes, tried to quit and quit for at least 24 hours). These three scales were developed for use with low-SES women, have adequate reliability [11, 40, 41] and were useful in assessing change following different smoking cessation interventions [27, 38, 42, 43]. ‘Plans to quit’ was a response to two questions about whether a woman planned to quit smoking and, if so, how soon. Plans to quit was coded 0 = no plans to quit, 1 = plans to quit but not within 6 months, 2 = plans to quit within 6 months but not sooner and 3 = plans to quit within 3 months.

‘Smoking abstinence’ was whether a woman reported being abstinent (no cigarettes in the prior 7 days) at the 6-month interview. Table I shows the sample distribution on the above variables.

### Data analysis

Using LISREL 8, we tested a recursive model (see Fig. 1) in which direct pathways go from background (exogenous) variables to mediating factors (perceived stress, social norm and health concerns), to motivation, self-efficacy, confidence, recent action and plans to quit, to quitting 6 months later. Since the model includes categorical and ordinal variables, we used the weighted least squares method [44] with asymptotic covariance matrix to adjust non-normal distribution of the variables and to obtain less biased estimates [45]. To evaluate the model, we used several model fit statistics: chi-square test, adjusted goodness-of-fit index (AGFI), normed fit index (NFI) and root mean squared error of approximation (RMSEA). The ratio of chi-square to the degrees of freedom less than three generally indicates a good model fit [46, 47] and the model with ratio less than five is considered acceptable [48]. AGFI >0.90, RMSEA <0.05 and NFI >0.90 are considered to indicate ‘good fit’ [49, 50]. Given their complementary features, we used all four indexes to evaluate the model.

### Results

The model that emerged as having the best fit is shown in Fig. 2. Only the path coefficients significant at $P < 0.05$ level are included in the final model. The overall model fit statistics were found to be all favorable. The chi-square (=216.24)
divided by degrees of freedom (=59) is 3.66, and NFI, AGFI and RMSEA are 0.92, 0.92, and 0.007, respectively.

Pathways through mediating and precursor factors

We consider first the pathways through which mediating and precursor factors lead to quitting. One pathway involved perceived stress, situational self-efficacy and confidence in one’s ability to quit. Higher perceived stress decreased the likelihood of quitting smoking by reducing self-efficacy ($\beta = -0.29$). Self-efficacy enhanced quitting indirectly by increasing immediacy of plans to quit ($\beta = 0.07$) and confidence in one’s ability to quit ($\beta = 0.49$). Confidence was not associated with plans to quit, but directly predicted quitting 6 months later ($\beta = 0.22$).

A second set of pathways involved motivation and action to quit. Motivation was positively affected by both social pressure to quit ($\beta = 0.17$) and health concerns ($\beta = 0.58$). Stronger motivation to quit ($\beta = 0.23$) and health concerns ($\beta = 0.26$) were associated with more actions toward quitting. Motivation and recent actions fostered quitting indirectly by increasing immediacy of plans to quit ($\beta = 0.58$ and $\beta = 0.21$, respectively). Plans to quit then directly affected quitting ($\beta = 0.23$). Social pressure to quit had also a direct impact on quitting ($\beta = 0.32$) that was not mediated by motivation or recent action.

In summary, plans to quit mediated much of the effects of self-efficacy, motivation and recent action on quitting. Confidence in one’s ability to quit and social pressure to quit had additional direct effects on quitting that were not mediated through other factors.

Pathways through which background factors influenced quitting smoking

Being African American increased the likelihood of quitting smoking by increasing health concerns ($\beta = 0.18$), which in turn increased motivation. A higher education reduced perceived stress ($\beta = -0.18$). Education ($\beta = 0.28$) and single mother ($\beta = 0.18$) increased social pressure to quit. Social pressure to quit increased health concerns ($\beta = 0.15$). Health concerns increased motivation ($\beta = 0.58$), and motivation increased plans to quit ($\beta = 0.23$). Plans to quit increased immediacy of plans to quit ($\beta = 0.58$ and $\beta = 0.21$, respectively). Plans to quit then directly affected quitting ($\beta = 0.23$). Social pressure to quit had also a direct impact on quitting ($\beta = 0.32$) that was not mediated by motivation or recent action.

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**Fig. 2.** A path model of smoking cessation: standardized coefficients. Coefficients are all statistically significant at $P=0.05$ level. $n=644$, $\chi^2=216.24$, df = 59, NFI = 0.92, AGFI = 0.92, RMSEA = 0.007.
—0.18), which increased self-efficacy. Single parenthood had a negative impact on quitting indirectly by increasing stress ($\beta = 0.12$) and decreasing motivation to quit ($\beta = -0.11$). Pregnancy had a positive impact on quitting by increasing actions toward quitting ($\beta = 0.25$) and a negative impact by decreasing confidence in one’s ability to quit ($\beta = -0.13$). Finally, exposure to the earlier interventions enhanced the likelihood of quitting by increasing health concerns ($\beta = 0.28$), which in turn increased motivation and action.

**Discussion**

In testing the conceptual model depicted in Fig. 1, our aim was to assess how five factors that are commonly considered precursors of smoking cessation (motivation, action, self-efficacy, confidence and plans to quit) were associated with each other and predicted quitting smoking at a later point in time. We found that all five precursors factors affected the likelihood of quitting smoking, but only two factors, immediacy of plans to quit and confidence in one’s ability to quit, did so directly. Three additional observations about these five precursors of smoking cessation emerged from the study findings.

First, the pathways connecting self-efficacy and confidence to plans to quit were separate from and unrelated to those connecting motivation and action with plans to quit, suggesting two independent mechanisms. Contrary to our expectations, more actions toward quitting did not lead to increased confidence or self-efficacy, nor did the latter lead to greater motivation to quit.

Second, situational self-efficacy increased confidence. Smokers may have to learn to restrain from smoking in specific negative affect situations in order to build a more generalized confidence in being able to quit successfully. Greater confidence did not affect plans to quit, but directly increased the likelihood of later quitting.

Third, action toward quitting and plans to quit involved different pathways to quitting smoking. Plans to quit mediated the effects of the other precursors and directly predicted quitting, whereas action mediated the effects of health concerns, motivation and pregnancy on plans to quit but did not predict quitting directly. As mentioned earlier, past action and future plans are the operationalized components of the stage of readiness variable [12].

However, for purposes of understanding change toward smoking cessation, it may be useful to focus on past actions and plans to quit separately.

Our second study aim was to assess how the above precursors of quitting smoking were explained by health concerns, social pressure to quit smoking and perceived daily stress, and how these factors in turn mediated the effects of background variables. Consistent with long-standing health behavior theories [13, 16], we found that social pressure to quit and health concerns were strong determinants of motivation to quit. Motivation then mediated the association of social pressure and health concerns with other precursors of quitting and quitting. Social pressure to quit also influenced smoking cessation indirectly by increasing motivation. However, social pressure also had a direct impact on quitting that was not mediated through any of the precursor factors considered in our model. Social pressure to quit was not affected by any of the background variables, but race and exposure to the earlier interventions attenuated the negative effects of low SES by increasing health concerns.

As predicted, perceived daily stress was a barrier to quitting smoking among these low-SES women. Perceived stress partially mediated the negative associations between low education and being a single mother and quitting smoking. The negative impact of stress occurred indirectly by decreasing situational self-efficacy. The higher the perceived stress, the lower the perceived ability to abstain from smoking in situations associated with negative emotions. Low situational self-efficacy in turn decreased both immediacy of plans to quit smoking and confidence in being able to quit.

Contrary to our expectations, the association of pregnancy with quitting smoking was not mediated by any increase in stress, social pressure to quit, health concerns or motivation to quit smoking. Pregnancy influenced quitting positively by increasing the likelihood of recent actions, and
negatively by decreasing confidence in one’s ability to quit. These findings must be considered in light of the fact that many of the women who were pregnant at the 2-month interview (when the predictor variables were measured) were no longer pregnant when smoking abstinence was assessed 6 months later. The known high rate of relapse following delivery [37] may thus have prevented clearer pathways between pregnancy and quitting.

The third aim of this study was to assess whether factors that are often associated with smoking cessation or its precursors in general populations also explained smoking abstinence in low-SES women. Four of the variables initially included in our study were not found to be significant. These were employment, presence of other smokers in the home, age and number of daily cigarettes. The lack of a beneficial effect of employment may be explained by the predominance of African–American women in the sample, since a recent study found that employment predicted cessation only in White women [31]. The lack of a negative effect of presence of other smokers is inconsistent with other studies [33] and could be explained by the prevalence of single mother in our sample. Presence of other smokers may have also meant presence of other adults in the home, which in turn could buffer the negative effects of being a single parent.

All the remaining variables in our model were significant in this sample of low-SES women. We found that health concerns and social pressure to quit smoking were fairly prevalent (see Table I) and both these variables were strongly associated with motivation to quit. Daily stress was a major barrier to achieving self-efficacy and confidence, and daily stress increased with more disadvantaged conditions such as single parenthood and low education.

Note, however, that a similar importance of health concerns, social pressure and stress constructs across populations should not mask differences in the substantive contents or contexts of these constructs. For example, previous research we conducted with low-SES women indicated that they would have liked to quit smoking because of strong generalized concerns about staying healthy and strong, whereas they had little knowledge or interest in disease-specific risk or susceptibility [15]. Similarly, comparable ratings of perceived stress may have different meanings depending on the severity and degree of controllability of stressors in one’s environment.

In summary, results from this study support the conceptual model proposed in Fig. 1 and its application to low-SES women. These findings support the benefits of continued exposure to offer smoking cessation interventions that address the model’s components. More knowledge may be needed, however, on the substantive elements that account for health concerns, social pressure or stress and how to develop strategies to address them effectively.

Study limitations
Our study sample included only low-SES women, thus it did not allow inferences about effects due specifically to low SES, or generalization of our findings to other populations. The smokers in this study may also differ from other low-SES female smokers in two ways. First, half of them had been exposed to the experimental intervention 2 months prior to the measurement of the variables discussed here. We controlled for this factor by including exposure as a background variable, but it is possible that findings would differ in a sample of smokers all without such exposure. Second, women who had quit smoking at the 2-month post-intervention measurement were excluded. This was necessary because of the study focus on smokers and for methodological reasons (i.e. otherwise overlapping definitions in some study variables). The exclusion may have biased the sample by removing from it those smokers most ready to quit. Future studies may need to determine whether the study model also applies to long-term maintenance of abstinence.

Conclusion
The mediating variables (health concerns, social pressure and daily stress) and precursor variables (motivation, action, self-efficacy and confidence)
Path model of smoking cessation in low-SES women smokers

in this study have long been implicated in smoking cessation behavior. Our study findings add to this theoretical basis in important ways. First, the findings show that these variables and their associations are not limited to cross-sectional relationships but predict future smoking abstinence. Second, they explicate how health concerns, social pressure and daily stress influence future quitting through their effects on the precursor dimensions of cessation. Few studies have assessed how well these factors predict—rather than just being correlated with—quitting smoking or have explored the pathways explaining their impact on quitting [1, 4]. Finally, the study focused on these processes among low-SES and predominantly African–American women, an understudied population.

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Conflict of interest statement

None declared.

References


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