Published in final edited form as:

Am J Addict. 2012 ; 21(4): 302–312. doi:10.1111/j.1521-0391.2012.00237.x.

Psychosocial Predictors of Nicotine Dependence Among Women During Their Mid-Sixties

Judith S. Brook, Ed.D., Chenshu Zhang, Ph.D., David W. Brook, M.D., Jonathan Koppel, M.A., and Martin Whiteman, Ph.D.

Department of Psychiatry New York University School of Medicine

Abstract

Although there is considerable research demonstrating the prospective association between earlier maladaptive personal attributes and later nicotine dependence, there is less work on the psychosocial mediators of this relationship. Maladaptive personal attributes appear in the form of depression, anxiety, and interpersonal sensitivity. The current study was designed to assess the prospective relationship between earlier maladaptive personal attributes (mean age = 40) and later nicotine dependence ($\bar{X}$ age=65.2) within an understudied female community sample. The participants were given self-administered questionnaires. The results supported a model by which earlier maladaptive personal attributes predicted later nicotine dependence through several indirect pathways. In addition to cigarette smoking, several domains mediated the relation of earlier maladaptive personal attributes and later nicotine dependence. These domains included: internal factors (i.e., later maladaptive personal attributes), interpersonal factors (i.e., marital/partner conflict), later contextual factors (i.e., family financial difficulty). Our multidimensional longitudinal findings have important implications for the prevention and treatment of nicotine dependence. The results identify earlier and later significant psychosocial risk factors to be targeted, and suggest the timing of interventions to reduce or eliminate nicotine dependence.

INTRODUCTION

Cigarette smoking is a major leading preventable cause of morbidity and mortality in the U.S., according to the Centers for Disease Control and Prevention.¹ Related to this, there is an association between cigarette smoking and a number of types of cancers, coronary conditions, and chronic obstructive pulmonary disease (COPD).²⁻⁴ There is a literature demonstrating that earlier maladaptive personal attributes, such as anxiety, depression, and interpersonal sensitivity, are related to cigarette smoking in young adulthood.⁵⁻⁷ However, there is a need to study longitudinally the vulnerability to nicotine dependence in a group that has smoked cigarettes over several decades. The importance of the current study is also highlighted as women in late midlife are an under-studied group. Women in this age group incur the adverse health consequences of smoking at a greater rate than men.⁸ According to the Centers for Disease Control and Prevention, smoking-related diseases cause the deaths of about 173,940 women in the United States each year. On average, these women died 11.9

Address Correspondence to Dr. Judith Brook, Department of Psychiatry, New York University School of Medicine, 215 Lexington Avenue, 15th Floor, New York, NY 10016. Tel (212) 263-4662; Fax (212) 263-4660; judith.brook@nyumc.org.

Competing Interests The authors declare that their findings do not pose any actual or potential conflict of interest including any financial, personal, or other relationships with other people and/or organizations that could inappropriately influence, or be perceived to influence, their work. As corresponding author, Dr. Judith S. Brook had full access to the data in the study, takes full responsibility for the integrity of the data, accuracy of the data analysis, and assumes final responsibility for the decision to submit this manuscript for publication. The material contained in the manuscript represents original work, has not been published elsewhere, and is not under consideration elsewhere. All of the authors have read and approved this manuscript.

years earlier because they smoked.¹ Moreover, there is also scant literature pertaining to the mechanisms operative between maladaptive personal attributes **in the forties** and nicotine dependence **in the mid-sixties**, particularly in women. This research is designed to fill these gaps.

Our earlier research, though with a younger age sample, highlights Family Interactional Theory (FIT),⁹ which employs a multidimensional approach and emphasizes earlier personal attributes along with interpersonal and contextual factors related to substance use. More recently, FIT was expanded to include the developmental stage of midlife. Accordingly, maladaptive personal attributes in the forties are associated with interpersonal factors (e.g., marital/partner relations), which, in turn, are related to maladaptive personal attributes in the mid-sixties. Maladaptive personal attributes in the mid-sixties ultimately predict nicotine dependence. In addition, there are stabilities in marital/partner conflict, maladaptive personal attributes, and smoking over time.

Maladaptive personal attributes, such as depressive symptoms and anxiety, are related to smoking, both in cross-sectional and in longitudinal study designs.^{6,10-12} Maladaptive personal attributes refer to inner states, such as depression and anxiety, both predisposing to or being accompanied by interpersonal sensitivity. Thus, depression and anxiety may involve extreme withdrawal from people or situations. Similarly, suspiciousness and hostility may predispose to or be accompanied by difficulty in social interactions. Two possible mechanisms may account for the association between maladaptive personal attributes and smoking. The first is that individuals demonstrating such traits use nicotine as a form of self-medication.¹³ That is, individuals with earlier maladaptive personal attributes experience distress as a consequence of their personal attributes. They may use psychoactive substances, including nicotine, as a means of relieving this suffering. The second possible mechanism is that maladaptive personal attributes and nicotine dependence may share a common genetic vulnerability.¹⁴ The continuity of smoking is well established in the literature.^{15,16} In a related vein, there is evidence that points to the continuity of personal attributes over time, especially in adulthood.¹⁷ Therefore, we hypothesize that (a) maladaptive personal attributes **in the forties** are correlated with cigarette smoking **in the forties**, which, in turn, is associated with nicotine dependence **in the mid-sixties**; and (b) maladaptive personal attributes **in the forties** are associated with maladaptive personal attributes **in the mid-sixties**, which, in turn, are related to nicotine dependence **in the mid-sixties**.

Earlier maladaptive personal attributes are associated with experiencing familial difficulties such as family financial problems.¹⁸ As Whooley et al.¹⁸ note, this association is likely related to the fact that problematic personal attributes are associated with both poor job performance, and, in some cases, subsequent unemployment. Either of these factors would lead to increased family financial difficulty in individuals manifesting earlier maladaptive personal attributes.

Several researchers have identified several theoretical concepts that may explain the association between earlier maladaptive personal attributes and marital/partner conflict. These include (1) decreased role functioning of the partner with maladaptive attributes,^{19,20} (2) increased emotional burden on the spouse in such cases, and (3) choosing a partner who has personality problems. Conflict in the marital relationship is particularly problematic as it is continuous over time.²¹ We further postulate that there is a reciprocal association between marital/partner conflict and smoking from the forties to the mid-sixties.

In this study, we focus on the postulated sequence of the domains (e.g., maladaptive personal attributes, marital conflict, and family financial difficulty) that predict nicotine

dependence in women at the mean age of 65. The sequence of the domains are based on our conceptual theory as well as supported by the data.⁹ Here we focus on family financial difficulties in women at mean age of 65 as precursors of marital/partner conflict. Given the heightened stress experienced by those with financial difficulties,^{22,23} it is understandable that financial difficulty is related to later marital conflict.²⁴⁻²⁹ Moreover, there is a considerable literature demonstrating that low levels of marital satisfaction predict anxiety and depressive symptoms.³⁰⁻³² **Therefore**, based on our theoretical framework, we hypothesize that, in the mid-sixties, family financial difficulties is associated with marital/partner conflict and maladaptive personal attributes, which in turn, are associated with nicotine dependence.

The Current Study

Based on the relationships described above, we propose a conceptual model through which maladaptive personal attributes **in the forties** predict nicotine dependence in late midlife, as mediated through a number of factors. We hypothesize the following: (1) maladaptive personal attributes **in the forties** are associated with smoking over time, which in turn is related to nicotine dependence in late midlife; (2) maladaptive personal attributes **in the forties** are associated with maladaptive personal attributes **in the mid-sixties**, which, in turn, are related to nicotine dependence in late midlife; (3) there is a reciprocal association between marital/partner conflict and smoking from the forties to the mid-sixties; (4) the association between maladaptive personal attributes **in the forties** and nicotine dependence **in the mid-sixties** is also mediated by interpersonal factors (i.e., marital/partner conflict) and contextual factors (i.e., family financial difficulty); and (5) in late midlife, the association between family financial difficulty and nicotine dependence is mediated by marital/partner conflict and maladaptive personal attributes. Figure 1 **depicts the full hypothesized model**.

METHODS

Participants and Procedure

Data on the participants in this study came from a community-based random sample residing in one of two upstate New York counties first assessed in 1975 (T1; N=975). Population data from the 1970 census (updated for 1975) for sampling units in Albany and Saratoga counties were obtained. A systematic sample of primary sampling units (areas) in each county was then drawn with probability proportional to the number of households. Blocks were selected with probability proportional to size (number of households). Address lists were compiled. As regards the inclusion criteria, households with at least one child between 1 and 10 years of age were qualified to participate. In each household, one child was randomly selected. There was a close match of the participants on family income, maternal education, and family structure with the 1980 survey conducted for upstate New York by the U.S. Bureau of Census.³³ For example, 75% of the children lived with married parents, and 19% lived with a mother who was not currently married; the census figures were 79% and 17%, respectively.³³

The original maternal/youth study (T1) only assessed behavior among youngsters. The mean age of the mothers at T1 was 32. Ninety two percent of the women were white. Interviews of the mothers were conducted in 1983 (T2, N=749; $\bar{X}$ age=40), 1985-1986 (T3, N=717; $\bar{X}$ age=43), 1992 (T4, N=719; $\bar{X}$ age=48), and in 2009 (T5, N=479; $\bar{X}$ age=65). 75 of the women were deceased by T5, 27 refused to participate, and the remainder (N=168) were lost to follow-up. To maintain our longitudinal study of the participants, we contacted the

participants on a regular basis, including phone calls, sending letters and news letters, and using advanced searching techniques such as Facebook and Twitter in 2009.

In the current analysis, we included the 479 mothers who participated at T5 and at least twice between 1983 and 2009. Eighty-eight percent of these participants participated in the longitudinal study at all waves. The mean (SD) age at T5 was 65.3 (6.3). Among these participants, 35.5%, 32.7%, and 27.2% smoked cigarettes at T2, T3, and T4, respectively. 60.9% of the smokers smoked cigarettes at all time points. Among the T2 smokers, 9.8% quit smoking at T3, 33.7% quit smoking at T4. The percentage of these women who had nicotine dependence at T5 was 10.7%. The mean (SD) family annual income at T5 was \$85,826 (SD=\$66,752). Thirty nine percent of the participants had an educational level of some college or greater. T-test analyses indicated that, compared with the non-participants at T5, the 479 participants showed greater T2 mean family income ($t=5.2$, $p<.001$), lower T2 depression ($t=2.4$, $p=.02$), lower T2 interpersonal difficulty ($t=2.1$, $p=.04$), and a lower T2 percentage of smoking (35.4% and 45.7%, respectively; $\chi^2(1) = 8.2$, $p\text{-value} = .004$). 50.5% of the participants who were deceased by T5 smoked at T2.

Extensively trained and supervised lay interviewers administered interviews in private at T1, T2, T3, and T4. At T5, the participants were given self-administered questionnaires. Written informed consent was obtained from the participants at each wave. The Institutional Review Boards of the Mount Sinai School of Medicine, New York Medical College, and New York University School of Medicine approved of the procedures used in this research study. Additional information regarding the study methodology is available in prior publications.³³

Measures

Maladaptive Personal Attributes at T2-T5—The maladaptive personal attributes domain at T2 consisted of three manifest variables: A) Depression (5 items scored on a 5 point scale: not at all (1) to extremely (5);³⁴ $\alpha=.80$; e.g., Within the past few years, how much were you bothered by feeling low in energy or slowed down?), B) Anxiety (4 items scored on a 5 point scale: not at all (1) to extremely (5);³⁴ $\alpha=.74$; e.g., Within the past few years, how much were you bothered by feeling nervous or shaky inside?), and C) Interpersonal difficulty (5 items scored on a 5 point scale: not at all (1) to extremely (5);³⁴ $\alpha=.71$; e.g., Within the past few years, how much were you bothered by feeling easily annoyed or irritated by others?).

The maladaptive personal attributes domain at T5 consisted of five manifest variables: A) Depression [8 items scored on a 5 point scale: not at all (0) to extremely (4);³⁵ $\alpha=.90$; e.g., Within the past five years, how much were you bothered by feeling hopeless about the future?], B) Anxiety [3 items scored on a 5 point scale: not at all (0) to extremely (4);³⁵ $\alpha=.85$; e.g., Within the past five years, how much were you bothered by feeling fearful?], C) Phobic anxiety [4 items scored on a 5 point scale: not at all (0) to extremely (4);³⁵ $\alpha=.81$; e.g., Within the past five years, how much were you bothered by feeling afraid when you are in open spaces or on the street?], D) Hostility [4 items scored on a 5 point scale: not at all (0) to extremely (4);³⁵ $\alpha=.80$; e.g., Within the past five years, how much were you bothered by feeling easily annoyed or irritated?], and E) Suspiciousness [3 items scored on a 5 point scale: not at all (0) to extremely (4);³⁵ $\alpha=.66$; e.g., Within the past five years, how much were you bothered by feeling others are to blame for most of your troubles?].

Cigarette Smoking from T2 through T4—Cigarette Smoking from T2 through T4 was assessed. At each wave of data collection (T2-T4), the participants were asked to report on the frequency of their cigarette smoking. The frequency was rated as none (1), used to

smoke but stopped (2), less than half pack a day (3), half pack to one pack a day (4), and more than one pack a day (5).

Marital/Partner Conflict at T4 and T5—The marital/partner conflict domain at T4 consisted of three manifest variables: A) Arguments with spouse/partner [3 items scored on a 5 point scale: never (1) to almost every day (5);⁹ alpha=.68; e.g., How often do you have differences of opinion with the child's father (or father substitute)?], B) Marital/partner harmony [4 items scored on a 5 point scale: never (1) to always (5);³⁶ alpha=.94; e.g., How often do you engage in outside interests together?], and C) Admiration of spouse/partner [4 items scored on a 5 point scale: not at all (1) to in every way (5);³⁷ alpha=.91; e.g., How much do you admire the child's father (or father substitute) in his role as a companion to you?].

The marital/partner conflict domain at T5 consisted of five manifest variables: A) Arguments with spouse/partner [6 items scored on a 5 point scale: never (0) to always (4);¹⁰ alpha=.88; e.g., How often do the two of you argue or fight about things?], B) Marital/partner harmony [7 items scored on a 5 point scale: never (0) to always (4);³⁶ alpha=.93; e.g., How often do you have fun together?], C) Emotional intimacy with spouse/partner [6 items scored on a 4 point scale: not at all (0) to a lot (3);³⁸ alpha=.95; e.g., How much does your spouse/partner really care about you?], D) Satisfaction with spouse/partner [4 items scored on a 6 point scale: never (0) to all of the time (5);³⁶ alpha=.90; e.g., In general, how often do you think that things between you and your spouse/partner are going well?], and E) Being married at interview [1 item scale on a two point scale: being married (1)-not being married (0)].

Family Financial Difficulty at T5—The family financial difficulty domain at T5 consisted of three manifest variables: A) Financial strain [7 items scored on a 5 point scale: never (1) to almost always (5);³⁹ alpha=.90; e.g., How often is it hard to live on your present income?], B) Financial problems [14 items scored on a 4 point scale: completely untrue (0) to definitely true (3);⁴⁰ alpha=.90; e.g., Because of the current economic condition, how true is it that you find it more difficult to pay for food?], and C) Symptoms due to financial worries [5 items scored on a 4 point scale: completely untrue (1) to definitely true (3); Original; 4-item scale; alpha=.79; e.g., Because of the current economic condition, how true is it that you sometimes feel anxious?]

DSM-IV Nicotine Dependence at T5—Nicotine dependence was assessed at T5 by the UM-CIDI nicotine dependence measure.⁴¹ We adapted this measure to make it consistent with the DSM-IV criteria for nicotine dependence. As in DSM-IV, a positive diagnosis was obtained when at least three out of seven criteria in the appropriate categories were endorsed by the participant. The seven criteria for nicotine dependence included: (1) physical tolerance, (2) signs of withdrawal when the subject refrained from smoking, (3) smoking in larger amounts and/or over a longer period than intended, (4) unsuccessful attempts to cut down or control the amount of smoking, (5) a large amount of time spent smoking (e.g., chain-smoking), (6) giving up or reducing social, occupational, or recreational activities due to smoking, and (7) continuing smoking despite knowing it has caused mental or physical health problems. Among the participants, 10.7% were diagnosed as having a diagnosis of nicotine dependence at T5.

Data Analysis

We used a latent variable structural equation model to examine the empirical validity of the hypothesized pathways. The structural equation model⁴² is a multivariate statistical method that evaluates both the measurement quality of a set of variables used to assess a latent

construct (the measurement model) and the relationships among the latent constructs (the structural model). To account for the influences of the participants' age and earlier educational level, family income, marital status (T2), T2-T4 frequency of alcohol use, and T2-T4 frequency of marijuana use on these models, we used partial correlation matrix as the input matrices (see Appendix A), which were created by statistically partialing out (removing the effect of the baseline measure) the effects of the variables cited above on each of the original manifest variables. We used Mplus⁴³ to estimate our proposed model. Because of the nonnormal distribution of the model variables (e.g., nicotine dependence), we used Mplus's maximum likelihood with robust standard errors (MLR) as the estimator. We used Mplus's default option (i.e., full information maximum likelihood approach),⁴⁴ to treat missing data. The advantage of FIML is that the results are less likely to be biased even if the data are not missing completely at random.⁴⁵ We chose two fit indices to assess the fit of the models: (1) the root mean square error of approximation (RMSEA), (2) the Bentler's comparative fit index (CFI),⁴⁶ and (3) the standardized root mean square residual (SRMR). Values between .90 and 1.0 on Bentler's CFI indicate that the model provides a good fit to the data.⁴⁷ Value for the RMSEA and the SRMR should be below .10 to indicate a good fit. In order to test the mediational effects,^{48,49} we calculated the standardized total effects and total indirect effects by using Mplus's MODEL INDIRECT command. The standardized total effects equal the sum of the direct and the indirect effects of each earlier latent variable (estimated in the analysis) on nicotine dependence during the mid-60s. The total indirect effect of a latent construct on nicotine dependence is the mediated effect via other intermediate variables, which are depicted in the model.

RESULTS

Table 1 presents the descriptive statistics, including means and standard deviations of the dependent and independent variables. With regard to the measurement model, all factor loadings were significant ($p < .001$), showing that the indicator variables were satisfactory measures of the latent constructs. The RMSEA was .057, the Bentler's comparative fit index was .94, and the SRMR was .058. These results reflect a satisfactory model fit. The obtained path diagram along with the standardized regression coefficients and Z-statistics are depicted in Figure 2.

As shown in Figure 2, all standardized pathways depicted were statistically significant ($p < .05$; one-tailed test) **with two exceptions**. First, T2 maladaptive personal attributes was directly associated with the following: a) T2 smoking ($\beta = .16$; $z = 3.14$), b) T4 marital/partner conflict ($\beta = .26$; $z = 4.49$), c) T5 family financial difficulty ($\beta = .31$; $z = 6.10$), and d) T5 maladaptive personal attributes ($\beta = .37$; $z = 6.85$). Second, T2 cigarette smoking was associated with T4 cigarette smoking ($\beta = .78$; $z = 27.44$). T4 cigarette smoking was ultimately associated with T5 nicotine dependence ($\beta = .44$; $z = 9.33$). Third, T4 marital/partner conflict was associated with T4 cigarette smoking ($\beta = .08$; $z = 2.07$). Fourth, T4 marital/partner conflict was associated with T5 marital/partner conflict ($\beta = .48$; $z = 8.28$), which, in turn, was associated with T5 maladaptive personal attributes ($\beta = .20$; $z = 3.31$), which, ultimately, was associated with T5 nicotine dependence ($\beta = .10$; $z = 2.03$). Fifth, T5 family financial difficulty was directly associated with T5 marital/partner conflict ($\beta = .25$; $z = 5.00$) and T5 maladaptive personal attributes ($\beta = .32$; $z = 5.47$). Different from the proposed model, the pathways from T3 smoking to T4 marital partner conflict ($\beta = .07$; $z = 1.37$) and from T4 smoking to T5 marital/partner conflict ($\beta = .03$; $z = .52$) were not statistically significant ($p > .05$).

Table 2 presents the results of the total effect analyses. As shown in Table 2, all the latent/manifest constructs had significant total effects ($p < .05$, one-tailed test). Among them, T4 cigarette smoking had the greatest total effect on later nicotine dependence ($\beta = .44$; $z = 9.33$; $p < .001$). In addition, the total indirect (i.e., mediated) effects of T2 maladaptive personal

attributes, T2 cigarette smoking, T3 cigarette smoking, T4 marital/partner conflicts, T5 family financial difficulty, and T5 marital/partner conflict on nicotine dependence were also significant ($p < 0.05$, one-tailed test).

Alternative models

There are alternative pathways to nicotine dependence. One possibility is that maladaptive personal attributes and family financial difficulty predict marital/partner conflict, which, in turn, is related to nicotine dependence. We tested this alternative model. The results showed that the direct path from marital/partner conflict to nicotine dependence was not significant ($\beta = .08$; $z = 1.54$; $p > 0.05$). Another possibility is that maladaptive personal attributes and marital/partner conflict predict family financial difficulty, which, in turn, is related to nicotine dependence. We also tested this alternative model. The results showed that the direct path from family financial difficulty to nicotine dependence was not significant ($\beta = .06$; $z = 1.36$; $p > 0.05$). The results of this study provide support for the proposed model. Furthermore, our obtained model is in accord with our theoretical framework. Nevertheless, future research is needed to further verify the results.

DISCUSSION

The present study is unique and extends previous research in two main ways. First, to our knowledge, this is the first longitudinal study that examines the network of psychosocial predictors (particularly earlier maladaptive personal attributes) of nicotine dependence in a community sample of women in their forties and extending to their mid-sixties. Second, the longitudinal design allows us to investigate the concurrent predictors of nicotine dependence while controlling for earlier measurements of tobacco use, maladaptive personal attributes, marital/partner conflict, **alcohol use, marijuana use**, and SES.

The findings of the present study lend support to our major hypotheses regarding the pathways to nicotine dependence among women in their mid-sixties as presented in our model (see Figure 1). There is a direct link between cigarette smoking in the mid-forties and nicotine dependence in late midlife, as well as a direct link from earlier cigarette smoking to cigarette smoking in the 40's. Besides the direct and indirect associations between earlier cigarette smoking and nicotine dependence in late midlife, the impact of earlier maladaptive personal attributes as related to the later nicotine dependence is evident.

As regards the impact of earlier cigarette smoking (**from mean age of 40 to 48**) on later nicotine dependence at mean age 65, the total effect analyses showed that earlier cigarette smoking accounted for more variability in nicotine dependence in late midlife than any of the other latent constructs in our model. Several possible mechanisms may be involved. One possibility is the addictive property of nicotine.⁵⁰ A second possible mechanism is that temperamental or similar personal attributes may underlie earlier cigarette smoking and later nicotine dependence. Indeed, our data provide some support for the latter hypothesis. In a related vein, depressive symptoms and novelty-seeking have been found to be related to smoking.^{51,52} Although there is considerable continuity in smoking over the span of 25 years, there is evidence for some discontinuity.

With respect to the role of earlier maladaptive personal attributes, our findings suggest that earlier maladaptive personal attributes have an impact not only on earlier smoking, but also on nicotine dependence 25 years later. Furthermore, earlier maladaptive personal attributes are related to cigarette smoking through a network of mediators involving family financial difficulty, certain interpersonal attributes (i.e., marital/partner conflict), and later maladaptive personal attributes.

Another domain which has an impact on nicotine dependence in late midlife involves the conflict between the participants and their spouses (partners) during late midlife, which is reflective of (a) financial stress (family financial difficulty), (b) earlier marital conflict, and (c) earlier maladaptive personal attributes. Thus, the earlier emphasis in FIT⁹ with regard to the significance of family factors (e.g., spousal relations) as well as earlier maladaptive personal attributes is carried over to later life, with the importance noted above of the marital/partner relationship. We extend FIT by incorporating the following: earlier marital/partner conflict is related to later marital/partner conflict, which in turn is associated with nicotine dependence.

Our findings suggest that family financial difficulty is associated with conflict in the marital relationship. Indeed, there is some evidence that conflicts about money arise most frequently under conditions of economic strain.²⁷ There is also evidence suggesting that financial difficulties are associated with signs of emotional distress, such as depression²⁶ and hostility.⁵³ According to the self-medication theory, individuals may smoke in order to deal with internal distress, such as depression or anxiety.¹³

As we noted in the Introduction, these findings take on particular weight in our assessment of a female community sample in late midlife. Individuals at this stage of life are generally at greater risk to experience the adverse health conditions associated with cigarette smoking.^{54,55} Furthermore, women are especially vulnerable to the negative health consequences of smoking.⁸ Therefore, it is critically important to identify the risk factors for cigarette smoking in this population, as our findings attempt to do.

Limitations

The results reported here must be interpreted in light of several limitations. First, the present study is limited by its lack of representation of ethnic minorities. We can only generalize our findings to our population, which consists primarily of White women. Second, we are limited to self-reported measures of cigarette smoking and nicotine dependence. Self-reported measures of cigarette smoking and nicotine dependence, however, have generally been found to be reasonably accurate in U.S. samples.⁵⁶ Third, based on the literature, our findings suggest a pathway from contextual factors (i.e., family financial difficulty) to the interpersonal factors (i.e., marital/partner conflict). However, the association could be bi-directional. Fourth, the data on nicotine dependence of the sampled women were not available in early waves (T2-T4). However, many individuals in their forties who smoke are nicotine dependent. Fifth, we do not have data on the presence of trauma histories or on-going exposure to psychological trauma, as these factors are frequent concomitant and causal agents for smoking and nicotine dependence. Sixth, some other important biological and psychological factors, such as physical illness, epigenetic factors, cognitive changes, changes in the immune system, and relationships with children and grandchildren, were not included in our study. Including these measures might have led to a more complete interpretation of the findings.

Conclusions and Policy Implications

Despite these limitations, this study offers insights for future research. The findings point to the significance of earlier cigarette smoking as well as a number of psychosocial dimensions as related to nicotine dependence in late midlife. These dimensions include personal (i.e., maladaptive personal attributes), interpersonal (i.e., marital/partner conflict) and contextual factors (i.e., family financial difficulty). In addition, our findings also highlight several developmental points of intervention. In earlier midlife (mean age in the 40s), one might focus on maladaptive personal attributes and marital conflicts as well as smoking. In later

midlife, treatment should include attention to family financial difficulties as well as the dimensions noted above in early midlife. Research should also examine other types of dimensions that may mediate between maladaptive personal attributes and later nicotine dependence. Interventions addressing each of the above factors (i.e., maladaptive personal attributes, marital/partner conflict, family financial difficulty, and earlier cigarette smoking) might alleviate nicotine dependence if examined separately. Moreover, interventions which address not only these specific factors, but also their complex interplay, would help guide treatment programs and shape implications for policy more effectively.

Acknowledgments

Funding This work was supported by the National Cancer Institute (Grant #5R01 CA122128-02), and the National Institute on Drug Abuse (Research Scientist Award #DA00244). The grants were awarded to J.S.B.

Appendix

Appendix A

Partial Correlation Matrix of the Manifest Variables (N=479).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
Nicotine Dependence T5 (A)	1.00																					
Depression T5 (B)	.12	1.00																				
Anxiety T5 (C)	.10	.74	1.00																			
Hostility T5 (D)	.12	.66	.60	1.00																		
Phobic Anxiety T5 (E)	.09	.48	.39	.45	1.00																	
Paranoid Ideation (F)	.10	.45	.38	.44	.43	1.00																
Marital/Partner Harmony T5 (G)	-.12	-.37	-.26	-.26	-.23	-.27	1.00															
Emotional Intimacy with Spouse/Partner T5 (H)	-.10	-.36	-.24	-.25	-.24	-.31	.85	1.00														
Satisfaction with Spouse/Partner T5 (I)	-.16	-.33	-.23	-.21	-.23	-.31	.80	.87	1.00													
Arguments with Spouse/Partner T5 (J)	.16	.32	.30	.41	.18	.29	-.55	-.56	-.65	1.00												
Married at T5 (K)	-.07	-.11	.01	.02	-.10	-.04	.24	.33	.36	-.07	1.00											
Financial Strain T5 (L)	.09	.44	.31	.29	.20	.26	-.25	-.26	-.26	.20	-.16	1.00										
Financial Problems T5 (M)	.07	.39	.28	.23	.16	.21	-.21	-.24	-.22	.15	-.12	.82	1.00									
Symptoms Due to Financial Worries T5 (N)	.10	.54	.43	.33	.22	.35	-.27	-.30	-.27	.22	-.07	.61	.69	1.00								
Marital/Partner Harmony T4 (O)	-.09	-.25	-.15	-.18	-.18	-.16	.41	.36	.41	-.22	.34	-.14	-.12	-.15	1.00							
Argument with Spouse/Partner T4 (P)	.06	.17	.10	.09	.16	.11	-.34	-.32	-.27	.19	-.19	.10	.03	.13	-.50	1.00						
Admiration of Spouse/Partner T4 (Q)	-.15	-.25	-.15	-.17	-.15	-.15	.42	.43	.44	-.27	.39	-.13	-.11	-.14	.82	-.49	1.00					
Cigarette Smoking T4 (R)	.44	.06	.04	.11	.01	.06	-.15	-.10	-.11	.14	-.05	.08	.06	.03	-.13	.04	-.20	1.00				
Cigarette Smoking T2 (S)	.43	.06	.04	.09	.01	.06	-.14	-.08	-.10	.14	-.05	.07	.06	.02	-.07	.02	-.15	.79	1.00			
Depression T2 (T)	.04	.42	.34	.28	.21	.24	-.31	-.30	-.27	.22	-.14	.27	.21	.26	-.22	.18	-.24	.09	.14	1.00		
Anxiety T2 (U)	.07	.39	.38	.29	.19	.22	-.23	-.24	-.19	.18	-.10	.21	.19	.26	-.12	.08	-.14	.10	.15	.70	1.00	
Interpersonal Difficulty T2 (V)	.10	.42	.37	.38	.22	.32	-.30	-.26	-.25	.24	-.06	.24	.19	.30	-.20	.18	-.20	.07	.12	.72	.74	1.00

Note: 1. The participants' age and T2 educational level, T2 family income, T2 marital status, T2-T4 alcohol use, and T2-T4 marijuana use were statistically controlled;

2. T2 = Time 2, $\bar{X}$ age=40; T4 = Time 4, $\bar{X}$ age=48; T5 = Time 5, $\bar{X}$ age=65.
 3. $p < .05$ when correlation coefficient $> .09$; $p < .01$ when correlation coefficient $> .12$; $p < .001$ when correlation coefficient $> .16$.

REFERENCES

- Centers for Disease Control and Prevention. Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000–2004. MMWR Morb Mortal Wkly Rep. 2008; 57:1226–1228. Retrieved from <http://www.cdc.gov/mmwr/>. [PubMed: 19008791]
- Buist AS, McBurnie AN, Vollmer WM, et al. International variation in the prevalence of COPD (The BOLD Study): A population-based prevalence study. Lancet. 2007; 370:741–750. [PubMed: 17765523]
- Hozawa A, Houston T, Steffes MW, et al. The association of cigarette smoking with self-reported disease before middle age: The Coronary Artery Risk Development in Young Adults (CARDIA) study. Prev Med. 2006; 42:193–199. [PubMed: 16480762]
- Lubin JH, Alavanja MCR, Caporaso N, et al. Cigarette smoking and cancer risk: Modeling total exposure and intensity. Am J Epidemiol. 2007; 166:479–489. [PubMed: 17548786]
- Breslau N, Novak SP, Kessler RC. Daily smoking and the subsequent onset of psychiatric disorders. Psychol Med. 2004; 34:323–333. [PubMed: 14982138]
- Brook JS, Ning Y, Brook DW. Personality risk factors associated with trajectories of tobacco use. Am J Addict. 2006; 15:426–433. [PubMed: 17182444]
- Juon HS, Ensminger ME, Sydnor KD. A longitudinal study of developmental trajectories to young adult cigarette smoking. Drug Alcohol Depend. 2002; 66:303–314. [PubMed: 12062465]

8. Mucha L, Stephenson J, Morandi N, Dirani R. Meta-analysis of disease risk associated with smoking, by gender and intensity of smoking. *Gend Med*. 2006; 34:279–291. [PubMed: 17582369]
9. Brook JS, Brook DW, Gordon AS, Whiteman M, Cohen P. The psychosocial etiology of adolescent drug use: A family interactional approach. *Genet Soc Gen Psych Monogr*. 1990; 116:111–267. Retrieved from <http://heldref.metapress.com/app/home/journal.asp?referrer=parent&backto=linkingpublicationresults,1:119939,1&linkin=634224990482328750>.
10. Escobedo LG, Reddy M, Giovino GA. The relationship between depressive symptoms and cigarette smoking in U.S. adolescents. *Addiction*. 1998; 93:433–440. [PubMed: 10328050]
11. Orlando M, Ellickson PL, Jinnett K. The temporal relationship between emotional distress and cigarette smoking during adolescence and young adulthood. *J Consult Clin Psychol*. 2001; 69:959–970. [PubMed: 11777123]
12. Windle M, Windle RC. Depressive symptoms and cigarette smoking among middle adolescents: Prospective associations and intrapersonal and interpersonal influences. *J Consult Clin Psychol*. 2001; 69:215–226. [PubMed: 11393599]
13. Khantzian, EJ.; Albanese, MJ. Understanding addiction as self medication: *Finding hope behind the pain*. Rowman & Littlefield; Lanham, MD: 2008.
14. Johnson EO, Rhee SH, Chase GA, Breslau N. Comorbidity of depression with levels of smoking: An exploration of the shared familial risk hypothesis. *Nicotine Tob Res*. 2004; 6:1029–1038. [PubMed: 15801576]
15. Mayhew KP, Flay BR, Mott JA. Stages in the development of adolescent smoking. *Drug Alcohol Depend*. 2000; 59(Suppl.1):S61–S81. [PubMed: 10773438]
16. Patton GC, Coffey C, Carlin JB, Sawyer SM, Wakefield M. Teen smokers reach their mid twenties. *J Adolesc Health*. 2006; 39:214–20. [PubMed: 16857533]
17. Caspi A, Roberts BW. Personality development across the life course: Arguments for continuity and change. *Psychol Inq*. 2001; 12:49–66.
18. Whooley MA, Kiefe CI, Chesney MA, Markovitz JH, Matthews K, Hulley SB. Depressive symptoms, unemployment, and loss of income: The CARDIA study. *Arch Intern Med*. 2002; 162:2614–2620. Retrieved from <http://archinte.ama-assn.org>. [PubMed: 12456234]
19. Benazon NR, Coyne JC. Living with a depressed spouse. *J Fam Psychol*. 2000; 14:71–79. [PubMed: 10740683]
20. Coyne JC, Thompson R, Palmer SC. Marital quality, coping with conflict, marital complaints, and affection in couples with a depressed wife. *J Fam Psychol*. 2002; 16:26–37. [PubMed: 11915407]
21. Huston TL, Caughlin JP, Houts RM, Smith SE, George LJ. The connubial crucible: Newlywed years as predictors of marital delight, distress, and divorce. *J Pers Soc Psychol*. 2001; 80:237–252. [PubMed: 11220443]
22. Lantz PM, House JS, Mero RP, Williams DR. Stress, life events, and socioeconomic disparities in health: Results from the Americans' Changing Lives Study. *J Health Soc Behav*. 2005; 46:274–288.
23. Saunders P. Poverty and health: Exploring the links between financial stress and emotional stress in Australia. *Aust N Z J Public Health*. 1998; 22:11–16. [PubMed: 9599847]
24. Andrews B, Wilding AM. The relation of depression and anxiety to life-stress and achievement in students. *Br J Psychol*. 2004; 95:509–521. [PubMed: 15527535]
25. Butterworth P, Rodgers R, Windsor TD. Financial hardship, socio-economic position and depression: Results from the PATH Through Life Survey. *Soc Sci Med*. 2009; 69:229–237. [PubMed: 19501441]
26. Conger RD, Conger KJ. Resilience in Midwestern families: Selected findings from the first decade of a prospective, longitudinal study. *J Marriage Fam*. 2002; 64:361–373.
27. Conger, RD.; Ge, X.; Lorenz, FO. Economic stress and marital relations. In: Conger, RD.; Elder, GH.; Lorenz, FO.; Simons, RL.; Whitbeck, LB., editors. *Families in troubled times: Adapting to change in rural America*. Aldine de Gruyter; Hawthorne, NY: 1994. p. 187-203. Whitbeck
28. Gump BB, Matthews KA, Räikkönen K. Modeling relationships among socioeconomic status, hostility, cardiovascular reactivity, and left ventricular mass in African American and White children. *Health Psychol*. 1999; 18:140–150. [PubMed: 10194049]

29. Stansfeld SA, Head J, Fuhrer R, Wardle J, Cattell V. Social inequalities in depressive symptoms and physical functioning in the Whitehall II study: Exploring a common cause explanation. *J Epidemiol Community Health*. 2003; 57:361–367. [PubMed: 12700221]
30. Beach SRH, Katz I, Kim S, Brody GH. Prospective effects of marital satisfaction on depressive symptoms in established marriages: A dyadic model. *J Soc Pers Relat*. 2003; 20:355–371.
31. Davila J, Karney BR, Hall TW, Bradbury TN. Depressive symptoms and marital satisfaction: Within-subject associations and the moderating effects of gender and neuroticism. *J Fam Psychol*. 2003; 17:557–570. [PubMed: 14640805]
32. Kouros CD, Papp LM, Cummings E. Interrelations and moderators of longitudinal links between marital satisfaction and depressive symptoms among couples in established relationships. *J Fam Psycho*. 2008; 22:667–677.
33. Cohen, P.; Cohen, J. Life values and adolescent mental health. Lawrence Erlbaum; Mahwah, NJ: 1996.
34. Derogatis LR, Lipman RS, Rickels K, Uhlenhuth EH, Covi L. The Hopkins Symptom Checklist (HSCL): A self-report symptom inventory. *Behav Sci*. 1974; 19:1–15. [PubMed: 4808738]
35. Derogatis, LR. Symptom checklist 90-R: Administration, scoring, and procedures manual. 3rd ed. National Computer Systems; Minneapolis, MN: 1994.
36. Spanier GB. Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads. *J Marriage Fam*. 1976; 38:15–28.
37. Brook JS, Zheng L, Whiteman M, Brook DW. Aggression in toddlers: Associations with parenting and marital relations. *J GenetPsychol*. 2001; 162:228–241.
38. Schaefer MT, Olson DH. Assessing intimacy: The Pair Inventory. *J Marital Fam Ther*. 1981; 7:47–60.
39. Hilton JM, Devall EL. The Family Economic Strain Scale: Development and evaluation of the instrument with single- and two-parent families. *J Fam Econ Issues*. 1997; 18:247–271.
40. Perron, R. Recession takes toll on Hispanics 45+: Boomers particularly hard hit. AARP; Washington, DC: 2010. Retrieved from: <http://assets.aarp.org/rgcenter/econ/hispeconomy.pdf>
41. Anthony JC, Warner L, Kessler R. Comparative epidemiology of dependence on tobacco, alcohol, controlled substances, and inhalants: Basic findings from the National Comorbidity Survey. *Exp Clin Psychopharmacol*. 1994; 2:244–268.
42. Chou, CP.; Bentler, PM. Estimation and tests in structural equation modeling. In: Hoyle, RH., editor. *Structural equation modeling: Concepts, issues, and applications*. Sage; Thousand Oaks, CA: 1995. p. 37-55.
43. Muthén, LK.; Muthén, BO. Mplus user's guide. 6th edn. Muthén & Muthén; Los Angeles, CA: 2010. Retrieved from <http://www.statmodel.com/download/usersguide/Mplus%20Users%20Guide%20v6.pdf>
44. Little, RJA.; Rubin, DB. *Statistical analysis with missing data*. Wiley; Hoboken, NJ: 2002.
45. Muthén B, Kaplan D, Hollis M. On structural equation modeling with data that are not missing completely at random. *Psychometrika*. 1987; 52:431–462.
46. Bentler PM. Comparative fit indexes in structural models. *Psychol Bull*. 1990; 107:238–246. [PubMed: 2320703]
47. Kelloway, EK. *Using Lisrel for structural equation modeling*. Sage; Thousand Oaks, CA: 1998.
48. Baron RM, Kenny DA. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J Pers Soc Psychol*. 1986; 51:1173–1184. [PubMed: 3806354]
49. MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variable effects. *Psychol Methods*. 2002; 7:83–104. [PubMed: 11928892]
50. Karan, LD.; Rosecrans, JA. Addictive capacity of nicotine. In: Piasecki, M.; Newhouse, PA., editors. *Nicotine in psychiatry: Psychopathology and emerging therapeutics*. American Psychiatric Press; Washington, DC: 2000. p. 83-110.

51. DiFranza JR, Savageu JA, Fletcher K, et al. Susceptibility to nicotine dependence: The Development and Assessment of Nicotine Dependence in Youth 2 study. *Pediatrics*. 2007; 120:974–983.
52. Hu MC, Davies M, Kandel DB. Epidemiology and correlates of daily smoking and nicotine dependence among young adults in the United States. *Am J Pub Health*. 2006; 96:299–308. [PubMed: 16380569]
53. Conger RD, Elder GH, Lorenz FO, et al. Linking economic hardship to marital quality and instability. *J Marriage Fam*. 1990; 52:643–656.
54. Centers for Disease Control and Prevention. [Retrieved September 9, 2010] Lung cancer risk by age. 2010. from <http://www.cdc.gov/cancer/lung/statistics/age.htm>
55. Devereux G. ABC of chronic obstructive pulmonary disease: Definition, epidemiology, and risk factors. *BMJ*. 2006; 332:1142–1144. [PubMed: 16690673]
56. West R, Zatonski W, Przewozniak K, Jarvis MJ. Can we trust national smoking prevalence figures? Discrepancies between biochemically assessed and self reported smoking rates in three countries. *Cancer Epidemiol, Biomarkers, Prev*. 2007; 16:820–822. [PubMed: 17416777]

Figure 1.
Hypothesized Model.
Note:

1. T2 = Time 2, $\bar{X}$ age=40; T4 = Time 4, $\bar{X}$ age=48; T5 = Time 5, $\bar{X}$ age=65;
2. T3 measures were omitted as they were close in time to the T2 measures.

Figure 2.

Obtained model: standardized pathways (z-statistic) to nicotine dependence (N=479).

Note:

1. * $p < 0.05$ (one-tailed test); * $p < 0.01$ (one-tailed test); *** $p < 0.001$ (one-tailed test);
2. CFI=.94; RMSEA=.057; SRMR=.058
3. The participants' age and T2 educational level, T2 family income, T2 marital status, T2-T4 alcohol use, and T2-T4 marijuana use were statistically controlled;
4. T2 = Time 2, $\bar{X}$ age=40; T4 = Time 4, $\bar{X}$ age=48; T5 = Time 5, $\bar{X}$ age=65;
5. T3 measures were omitted as they were close in time to the T2 measures.

Table 1

Descriptive Statistics (N=479)

Dependent and Independent Variables	Variable Range	Mean	Standard Deviation
Nicotine Dependence T5	0-1	.11	.31
Depression T5	0-32	7.04	5.89
Anxiety T5	0-12	2.83	2.28
Hostility T5	0-16	1.57	2.07
Phobic Anxiety T5	0-16	.62	1.55
Paranoid Ideation	0-12	.68	1.27
Arguments with Spouse/Partner T5	0-24	6.85	3.97
Marital/Partner Harmony T5	0-28	20.16	6.40
Emotional Intimacy with Spouse/Partner T5	0-20	14.86	4.55
Satisfaction with Spouse/Partner T5	0-20	16.27	4.49
Married at T5	0-1	.67	.47
Financial Strain T5	0-35	12.35	6.17
Financial Problems T5	0-52	11.28	9.13
Symptoms Due to Financial Worries T5	0-15	3.10	3.18
Argument with Spouse/Partner T4	3-15	5.56	2.06
Marital/Partner Harmony T4	4-20	14.70	4.65
Admiration of Spouse/Partner T4	4-20	15.63	4.05
Cigarette Smoking T4	1-5	1.88	1.36
Cigarette Smoking T3	1-5	2.07	1.51
Cigarette Smoking T2	1-5	2.15	1.51
Depression T2	5-25	10.17	3.08
Anxiety T2	4-20	8.49	2.64
Interpersonal Difficulty T2	5-25	9.74	2.73

Note: T2 = Time 2, $\bar{X}$ age=40; T3 = Time 3, $\bar{X}$ age=43; T4 = Time 4, $\bar{X}$ age=48; T5 = Time 5, $\bar{X}$ age=65.

Table 2

Standardized Total Effects (z-statistic) of Maladaptive Personal Attributes, Marital/Partner Conflict, Family Financial Difficulty, Neighborhood Poverty, Earlier Marital/Partner Conflict, Earlier Cigarette Smoking, and Earlier Maladaptive Personal Attributes on Nicotine Dependence Among Women in the Mid-Sixties (N=479).

Independent Constructs	Nicotine Dependence in the Mid-Sixties (T5)	
	Standardized Total Effects (z-statistic)	Standardized Total Indirect Effects (z-statistic)
Maladaptive Personal Attributes T5	.10 (2.03) *	Not Applied
Marital/Partner Conflict T5	.02 (1.69) *	.02 (1.69) *
Family Financial Difficulty T5	.04 (1.86) *	.04 (1.86) *
Marital/Partner Conflict T4	.04 (2.45) **	.04 (2.45) **
Cigarette Smoking T4	.44 (9.33) ***	0.001 (.49)
Cigarette Smoking T2	.34 (8.51) ***	.34 (8.51) ***
Maladaptive Personal Attributes T2	.11 (3.54) ***	.11 (3.54) ***

* Note: 1. $p < 0.05$

** $p < 0.01$

*** $p < 0.001$ (one-tailed test)

2. The participants' age and T2 educational level, T2 family income, T2 marital status, T2-T4 alcohol use, and T2-T4 marijuana use were statistically controlled;

3. T2 = Time 2, $\bar{X}$ age=40; T4 = Time 4, $\bar{X}$ age=48; T5 = Time 5, $\bar{X}$ age=65.