

# Kicking the Camel: Adolescent Smoking Behaviors After Two Years

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**ABSTRACT.** The Public Health Model views chemical dependency and acute substance problems as the interaction of three domains: the agent, the host, and the environment. This model was used to examine the relationships between smoking severity-never smokers, former smokers, and continued smokers-and host and environmental variables in a two-year follow-up study. Our results indicate that former smokers are more like never smokers on most of the risk and protective variables examined. Final analyses indicate that continued smokers are more likely to be Non-Black and Hispanic, be older, to have a more distant maternal relationship, to have used alcohol, to feel peer pressure to try cigarettes, and to have substance using mothers at time 1 compared to never and former smokers. The implications of these results for prevention, practice, and future research are discussed. *[Article copies available for a fee from The Haworth Document Delivery Service 1-800-342-9678 E-mail address: getinfo@haworthpressinc.com Website: http://www.HaworthPress.com > © 2000 by The Haworth Press, Inc. All rights reserved.]*

**KEYWORDS.** Adolescents, cigarette use, smoking cessation

Cigarette smoking has been linked with a number of life threatening health problems. An ongoing national effort against both the initiation

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and continuation of smoking has been under way for three decades. Although there is evidence that these educational efforts have had an impact on many adult demographic groups in this country (Escobedo & Peddicord, 1996), adolescent cigarette smoking has recently shown only a slight downward trend. The concern of national epidemiologists is that the slight decrease found in 1998 may be a consequence of the large publicity campaign resulting from the tobacco settlement efforts (National Institute on Drug Abuse [NIDA] Press Release, December 18, 1998).

### *CIGARETTE USE AMONG YOUTHS*

One epidemiological study of substance use among youths in 8th, 10th, and 12th grades, and college is the NIDA-funded Monitoring the Future study. This investigation has found that, among each group, both 30-day cigarette use and daily smoking have increased during most of this decade. Nearly half of eighth grade students have tried cigarettes (46%) and 19% are current smokers. Thirty-five percent of high school seniors are current smokers, and 13% of seniors are smoking 1/2 of a pack per day (NIDA, 1998).

McGee and Stanton (1993) found that the initiation of cigarette smoking during the preadolescent years (ages 9-11) predicted continued smoking in older adolescents. The majority of adult cigarette smokers started smoking during their preadolescent or adolescent years (Mosbach & Leventhal, 1988; NIDA 1997). In fact, the risk for cigarette use initiation peaks around age 16 and becomes very low by age 20 (Chen and Kandel, 1985). Therefore, many young people who initiate cigarette use are likely to continue their behavior. Breslau and Peterson (1996) reported that persons who started smoking at age 13 or younger were significantly less likely to quit smoking compared to those who started at older ages.

Unlike other substance use that matures out—that is, the prevalence of high usage decreases with increasing age—cigarette smoking continues to be heavy and persistent throughout adulthood (Chen & Kandel, 1985). Fifty percent of males who initiate smoking during adolescence can be expected to continue smoking until age 33 and fifty percent of like females will continue smoking until age 37 (Pierce and Gilpin, 1996). Not only do young smokers persist in their behavior but they tend to become heavier smokers with age.

Cigarette smoking has been identified as an early stage of substance use related to later involvement in both legal and illegal substance use (Bailey, 1992). Yamaguchi and Kandel (1984a) found, among men, a pattern of substance use progression in which cigarettes preceded the use of marijuana (Yamaguchi & Kandel, 1984b) and prescribed psychoactive drugs (Yamaguchi & Kandel, 1984a). Among women, cigarette use preceded the use of marijuana and other illicit drugs (Yamaguchi & Kandel, 1984a, b). Similarly, Bailey (1992) reported that when adolescents moved from light cigarette use to heavy use, the transition was accompanied by the initiation of illicit substance use.

### *The Public Health Model*

The public health model is one that has seen increasing use by both health care and human service professionals. This model views chemical dependency (McNeece & DiNitto, 1994) and acute substance use problems (Mosher & Jernigan, 1989) as an interaction of three sets of variables: (1) the agent, (2) the host, and (3) the environment. For cigarette smoking, the agent would be the nicotine, the chemical to which one becomes addicted. The host is conceptualized as the child or adolescent who has started to smoke and includes their perceptions, cognitions and personality. The final factor is the environment, which includes social (i.e. peers), family, culture, SES, and school characteristics.

*The Agent.* As early as 1988, the Surgeon General's Report concluded that cigarettes and other tobacco products are addictive and that nicotine is the drug in tobacco that causes addiction (United States Department of Health and Human Services, 1988). During the past two years, revelations from tobacco company reports have disclosed the high degree of physiological dependence associated with nicotine. Adolescents have been found to use only a few brands of cigarettes. Over 88% of regular users report using Marlboro, Newport, or Camel (Johnston, O'Malley, Bachman, & Schulenberg, 1999). So there is little variability in brands used by youth nationally. Further, because of this high level of addictability of nicotine, cigarettes themselves can be conceptualized as a constant. The issue related to the agent, then, remains the severity of its use, which can be conceptualized as a function of host and environmental variables.

*The Host.* Many variables have been shown to be associated with adolescent cigarette use. Whites have the highest prevalence of regular

cigarette smoking while African Americans have the lowest (French and Perry, 1996). Females tend to smoke more than males. Building on Jessor and Jessor's problem behavior theory (1977), Chassin, Presson, and Sherman (1990) discuss that adolescents who smoke cigarettes are at higher risk for using alcohol and other drugs and vice versa. Further, they suggest that there is a problem behavior syndrome for adolescents who use substances or are involved in other risky behaviors. So, adolescents involved in one risky behavior are found to have a higher tolerance of deviance and hold less conventional attitudes. Rowe, Chassin, Presson, Edwards, and Sherman (1992) report that it is the attitudes and beliefs that the child holds which are most important for a child to move from experimental to regular smoker.

*The Environment.* The influence of peers in the onset of cigarette smoking among children and adolescents is well substantiated. This influence can be conceptualized as peer modeling or peer pressure. Smokers tend to affiliate more with smoking than nonsmoking peers (Fergusson, Lynskey, & Horwood, 1995; Headen, Bauman, Deane, & Koch, 1991; Simon, Sussman, Dent, Burton, & Flay, 1995; Spears & Akers, 1988; Urberg, Degirmencioglu, & Pilgrim, 1997). Jackson (1997) examined the onset of cigarette use among children in middle school and found that peer modeling was more strongly predictive of cigarette use onset than was parental modeling. Having friends who smoke is predictive for the initiation of cigarette smoking for both boys and girls (Killen, Robinson, Haydel, Hayward, Wilson, Hammer, Litt, & Taylor, 1997). Rowe et al. (1992) report that peer influence is most important in the transition from being a nonuser to becoming an experimental cigarette user. However, as noted before, attitudes and beliefs are most important in the transition from experimental to regular cigarette use.

In addition to peers, parental models also influence children (Oei, Egan & Silva, 1986). Jackson and Henrikson (1997) found children's risk for the onset of smoking increased with the level of parental smoking. Even if the parents quit smoking, the effect of their prior smoking was not decreased. Rowe, Chassin, Presson, and Sherman (1996) found that the transition from abstinence to experimental use was faster for children whose parents had ever smoked compared to those who never smoked. Additionally, maternal drug use and tolerance of deviance have been associated with the initiation of substance

use (Brook, Cohen, & Jaeger, 1998; Jackson, Henrikson, Dickinson, & Levine, 1997).

Another important environmental aspect is school. Educational attachment has been found to be protective against the onset of cigarette use (Jackson, 1997; Marcos & Bahr, 1995). Conversely, children who smoke are found to have school and/or legal problems (Botvin, Botvin, Baker, Dusenbury, & Goldberg, 1992; Oei et al., 1986). Youths who report smoking are found, to have lower academic performance compared to their nonsmoking classmates (Duncan, Duncan, Biglan, & Ary, 1998; Dappen, Schwartz, & O'Donnell, 1996).

Although there are many risk factors for adolescent cigarette use, other protective factors have been found, such as parental and religious attachment (Marcos & Bahr, 1995). Brook et al. (1998) found that a reported close maternal relationship was protective against the initiation of substance use. Youth reporting a positive parental relationship are less likely to initiate smoking. Further, they were less likely to make the transition from being a cigarette experimenter to a regular user (Distefan, Gilpin, Choi, & Pierce, 1998). A final protective factor is higher self-worth in that children who initiated cigarette smoking were found to have lower self-esteem than their nonsmoking peers (Jackson, 1997).

The risk and protective factors for the onset of cigarette smoking have been researched quite extensively, but the issue of who begins to smoke and then quits has not. Prior research has primarily focused on smoking cessation behavior as an outcome measure of treatment (e.g., Myers & Brown, 1997). Relatively little work has examined adolescent quitting behavior independent of an intervention. This would be a key issue for practitioners working with children and adolescents who are at risk for becoming or are current smokers. This is particularly true because previous research has shown this behavior's association with other risk behaviors.

This study builds on previous research by first using the Public Health Model to guide the question design and data analyses. The second addition this study makes is the comparison of never smokers, former smokers, and continued smokers over a two year time period. Specifically, this study addresses whether there are differences between children and adolescents in the different domains of the Public Health Model: Host and Environment (peers, school, home) at base-

line and their smoking status two years later (continued to never smoke, quit smoking, continued smoking).

### METHODS

The data for this study are from the National Longitudinal Survey of Youth (NLSY), funded by the U.S. Department of Labor since 1979. The study used a multistage stratified random sampling technique, screening 75,000 dwellings. The sample included a total of 11,406 youth, 5,828 females and 5,578 males, aged 14-21. These youth have been interviewed annually since 1979 via a face-to-face interview-with the exception of 1988 when funding only supported telephone interviews. This study boasts a high retention rate of 89% (Center for Human Resource Research, 1997). After attrition and sampling changes, the NLSY study has 4,510 women, 69% being mothers. This is a sample of women who had their children at young ages and does not represent all childbearing of this cohort of women.

Starting in 1986, the study protocol was expanded to include the women's children (aged less than one year to 21 years) with a total sample of 6,427 children in 1992. The children have been interviewed every two years. The women's protocol includes two survey schedules answered by the mother, one asks for information on the mother herself and the other queries her child/children's behaviors.

Beginning at age 10 children are asked to complete an instrument (Child Self Administered Supplement or CSAS) which asks for information regarding child-parent relationships, dating, religiosity, sex education, delinquent activities and substance use, sexual activity, and friend affiliations.

In 1994, a questionnaire was given to all youth aged 15 and older entitled the Young Adult Survey. This was completed in place of the CSAS. This instrument includes sections on family relationships, impulsivity, detailed information on alcohol use, cigarette use, and illicit substance use, future expectations, sexuality issues, neighborhood problems, behavioral problems, arrests, and convictions.

#### *Cigarette Use*

The dependent variable was drawn from the 1992 and 1994 CSAS and the 1994 Young Adult Survey. For substance, use these supple-

ments ask about the use of cigarettes, alcohol, marijuana, and "other drugs such as LSD, cocaine, uppers or downers." The 1992 survey queried for lifetime and past three-month use and age of onset. The questions from the 1994 surveys were similar, but there was also a recency of use question. For the purposes of this paper, cigarette use is the only substance investigated. Cigarette use was defined as a severity variable based upon one's use at baseline and two-year follow-up. One could be a never smoker, a quitter, or a continued smoker by follow-up. Baseline cigarette use was in 1992, and the youths responded as users or never users. If an adolescent responded with "never use" at both his or her baseline and 1994 survey he or she was coded as a "1" and referred to as a "never user." If a subject reported ever using in 1992, then it was next determined if he/she was a current smoker defined by reporting use during the past three months. If the adolescent was a current user at baseline but then reported no current use by the 1994 survey he or she was were coded a "2" and called a "quitter." Former smokers also include a small number of one-year incident cases that were "never smokers" at baseline, reported use by time 2 but was not current smokers at time 2. Therefore, they were still conceptualized as having smoked and quit. If a youth reported current use in the 1992 baseline survey as well as at the 1994 survey, he or she was coded a "3" and referred to as a "continued smoker." Incident cases reporting current smoking by 1994 were dropped from this study because they did not fit the criterion of continued smoking for at least two years.

### *Host Characteristics*

Child demographic and behavior variables, taken from reports in 1992, include: gender, race (as reported by the mother), a close attachment to the father, a close attachment to the mother, religiosity, alcohol use, illicit drug use, and academic and behavioral problems.

*Individual Characteristics.* Parental attachment had four response categories narrowed down to two levels for statistical use in logistic regression. The response choices were "not very close" and "fairly close," which were combined to make the negative response for parental attachment; while responses of "extremely close" or "quite close" were considered positive responses (coded 1).

A variable called "behavior problems" was created from responses to questions in the CSAS. Behavior problems were derived from

responses to questions such as: "Stayed out later than your parent(s) said you should?" or "Hurt someone badly enough to need bandages or a doctor?" Youths were considered without problems and coded 0 if they reported only 0-1 of the nine-problem behaviors in the past year.

Religiosity was a dichotomous variable. Those considered religious responded that they attended religious services once a month or more. Anyone reporting less frequent attendance was considered negative on this variable (coded 0).

A last individual variable was a self-worth score summarizing a child's response to questions such as "some kids are often unhappy with themselves" or "other kids are often not happy with themselves as a person" to which the child rates the statement as it applies to him/her on a four point scale. This scale has been reported to have an internal reliability score of .8 (Harter, 1985).

*Individual Substance Use Behaviors.* At baseline, in 1992, youth were asked if they had ever used alcohol, marijuana, or other drugs, such as LSD, cocaine, uppers, or downers. Youths were categorized as ever users of each substance if they responded positively to the question and were categorized as never users if they responded negatively.

### *Environmental Characteristics*

*School.* School satisfaction was based upon the response of six questions, such as "Most of my classes are boring" or "Most of the teachers are willing to help with personal problems," and the responses were dichotomized as feeling attached and satisfied with school or not feeling this way.

Other school variables from the baseline interview include the youth reporting feeling pressure to do well in school, he/she has plans to graduate from college compared to plans to drop-out, graduate high school, or obtain some post-secondary education. The final school variable was from a question that asked how satisfied youths were with their school, and they were categorized as satisfied if they reported "very satisfied" or "somewhat satisfied" and categorized unsatisfied if they responded as being "somewhat dissatisfied" or "very dissatisfied."

*Peers.* There were five questions in the 1992 survey regarding pressure from peers to be involved in negative activities. Those questions asked the respondent if they felt pressure from peers to do any of the following: try cigarettes, try marijuana or other drugs, drink alcohol,

skip school, commit a crime. The responses were dichotomous, coded "0" for "no."

*Maternal Perceptions.* The mother, as part of her interview, was asked to rate the following three areas: her relationship with her child, her child's feelings about him- or herself, and the child's friendships. The mother could respond "excellent" or "good" (categorized as "1") and "fair" to "poor" (categorized as "0.")

*Maternal Substance Use.* The second maternal area was the mother's own history of substance use. Two variables were used to measure heavy alcohol use. An index was created by multiplying the number of days in the past 30 days the woman drank alcohol with the average number of drinks consumed in a day. Heavy drinkers were those who drank at least 3-4 days a week in the past month and who, on average, drank at least four drinks per day. Non-heavy drinkers were those who drank less or abstained.

Maternal cigarette use was based upon the mother reporting she was currently smoking cigarettes in 1992. Marijuana use and cocaine use by the mothers were responses to questions asking if they had ever used either substance. A woman was coded as a "0" for negative for each of the three substance use questions.

### *Statistical Methods*

PC SAS version 6.12 (1996) for Windows was used for the statistical analyses. Chi-square and correlational analyses were used to test bivariate associations. Multiple logistic regression analyses were used to investigate associations between the cigarette use and host and environmental characteristics, while controlling for demographics. Odds ratios and 95% confidence intervals were calculated from beta coefficients and their standard errors.

## **RESULTS**

### *Descriptive Data*

The sample was approximately half male and primarily Black (42%), followed by Non-Black, Non-Hispanic (34.5%), and Hispanic (23.5%). The mean age of the sample was 12.33 years, mostly urban residents (78%) with a median household income of \$21,500 in 1992.

The sample's median income was rather low and is reflected in the large percentage of households who received AFDC, Foodstamps, or fell below the poverty line in 1992.

*Host.* The first level of host variables included the subject's relationships with the mother and father, religious attendance and behavioral problems with results reported in Table 1. Most of these youths reported having a quite close to extremely close relationship with both parents although more so with the mothers. About half of the sample reported attending religious services more than once a month while 44% reported that they'd experienced two or more of the behavioral problems during the past year.

Also found in Table 1 are the sample's substance use behaviors reported in 1992. The lifetime use of cigarettes increased over nine percent from 1992 to 1994—from 19.7% to 28.9%. Lifetime alcohol use was higher in 1992 than was cigarette use (26.8%), and the lifetime prevalence of marijuana use was rather low (3.7%). The cigarette smoking status variable indicates that 81.2% of the sample reported "never smoked" at both time points, 4.9% were "former smokers" (current smokers at time 1 or the interim but quit by time 2), and 13.9% were "continued smokers" from time 1 to time 2. Less than one percent ( $N = 12$ ) of those interviewed at time 1 were not interviewed at time 2 and thus would be unlikely to bias the data.

*Environment.* Environmental variables include school variables, feelings of peer pressure, and maternal reports. These data are reported in Table 2. Overall, the youth in this sample are reporting information that is indicative of positive experiences with school. Nearly 83% reported that they were satisfied with their school, and 72% reported feeling a connection with teachers and friends at school. Slightly more than half reported that they had future plans of graduating from college and felt pressure to do well academically. The reports of feeling peer pressure to try different negative behaviors ranged from 5.5%-12.9%. The lowest percentage reported pressure to try marijuana and the highest to skip school.

The mother's reports of heavy alcohol use during the past 30 days resulted in 14.3% reporting that they were drinking 3-4 days a week and consuming at least 4 drinks per day. Over a third of the mothers reported that they were current smokers in 1992. Slightly less than half of mothers reported they had ever used marijuana, and nearly 14% reported ever using cocaine. Most mothers rated quite positively: her

TABLE 1. Descriptive Data for the Children of the National Longitudinal Survey of Youth Ten Years and Older (N = 1,694).

	N	Percent	
<b>HOST VARIABLES</b>			
<b>Demographic Variables</b>			
Gender			
Females	851	50.2%	Mean Age: 12.33, SD 2.08
Males	843	49.8%	
Race			
Hispanics	398	23.5%	Median Family Income 1992: \$21,500
Blacks	712	42.0%	
Non-Black, Non-Hispanic	584	34.5%	
Urban Residence	1,310	77.9%	
<b>Poverty Variables 1992</b>			
AFDC	400	23.6%	
Foodstamps	606	35.8%	
Below Poverty Line	501	29.6%	
<b>Individual Level Variables</b>			
Child Perceives Close			
Relationship with Mother			
Fairly/Not Close	284	16.8%	
Extremely/Quite Close	1,410	83.2%	
Child Perceives Close			
Relationship with Father			
Fairly/Not Close	686	40.9%	
Extremely/Quite Close	993	59.1%	
Religious Service Attendance			
More than once a month	863	52.3%	
Behavioral Problems			
2 + problems	747	44.1%	
<b>Child Substance Use Behaviors</b>			
Lifetime Cigarette Use			
1992	334	19.7%	
1994	489	28.9%	
Cigarette Smoking Status 1994			
Never Smoked	1,000	81.2%	
Quit Since 1992	60	4.9%	
Current Smoker	171	13.9%	
Lifetime Alcohol Use 1992	454	26.8%	
Lifetime Marijuana Use 1992	62	3.7%	

TABLE 2. Descriptive Data for the Children of the National Longitudinal Survey of Youth Ten Years and Older: Peer and Maternal Variables (N = 1,694).

	N	Percent
<b>ENVIRONMENTAL VARIABLES</b>		
<b>School</b>		
Satisfied with School	1,363	82.9%
Future Plans for College	919	56.8%
Feels Academic Pressure	911	54.6%
Feels Connected to School	1,188	72.0%
<b>Peer Pressure Variables 1992</b>		
Feels Pressure to Try Cigarettes	192	11.6%
Feels Pressure to Try Alcohol	171	10.4%
Feels Pressure to Try Marijuana	90	5.5%
Feels Pressure to Skip School	213	12.9%
Feels Pressure to Commit a Crime	135	8.2%
<b>Maternal Variables</b>		
<b>Substance Use</b>		
Mother's 30-day Heavy Alcohol Use	243	14.3%
Mother's Current Smoking	598	35.3%
Mother's Lifetime Marijuana Use	776	48.2%
Mother's Lifetime Cocaine Use	220	13.8%
<b>Maternal Ratings of:</b>		
Her Relationship with the Child Excellent-Good	1,576	94.3%
The Child's Feelings About Self Excellent-Good	1,506	90.2%
Child's Friendships Excellent-Good	1,512	90.5%

relationship with the child, the child feeling good about self, and the child's friends.

### *Bivariate Results*

In order to test the association between the cigarette use variable and the independent variables, Mantel-Haenszel chi-square analyses were conducted and are reported in Tables 3, 4, and 5.

As seen in Table 3, there was a significant difference between the three smoking groups and ethnicity, with former and continued smokers mostly being Non-Black, Non-Hispanic, and nearly half of the never

TABLE 3. Chi-Square Results for Child Cigarette Smoking Severity and Host Variables.

1992 Variables	1994 Cigarette Smoking			Chi-square
	Never Smoked	Former Smoker	Continued Smoker	
<b>Demographic Variables</b>				
Ethnicity				
Hispanic	23.7%	20.0%	20.5%	17.09***
Black	45.8%	35.0%	28.1%	
Non-Black, Non-Hispanic		30.5%	45.0%	51.4%
Gender				
Male	50.9%	41.7%	49.1%	ns
Female	49.1%	58.3%	50.8%	
Urban Residence	77.2%	72.9%	76.5%	ns
<b>Poverty Variables</b>				all three ns
<b>Individual Variables</b>				
Close to Mother	86.0%	75.0%	75.4%	14.58***
Close to Father	61.1%	58.3%	47.6%	10.61**
High Religiosity	55.5%	48.3%	42.9%	9.72**
Behavioral Problems	48.7%	55.0%	78.4%	50.05***
<b>Substance Use Variables</b>				
Alcohol Use	17.8%	35.0%	71.3%	217.04***
Marijuana Use	1.5%	0.0%	17.5%	95.04***

ns = not statistically significant

\* =  $p < .05$

\*\* =  $p < .01$

\*\*\* =  $p < .001$

smokers were Black. There were no significant differences found for gender, residence, or the poverty variables among the three smoking groups.

Not presented in a table are the correlation and a means test analyses. A Spearman correlation was computed between cigarette smoking status and age in 1992, resulting in a significant correlation coefficient (.36,  $p \leq .0001$ ), indicating that increased age is associated with being a continued smoker. Also examined was the correlation between smoking status and self-worth scores which resulted in a weak correlation coefficient of  $r = .09$  ( $p \leq .0001$ ), so the lower one's self-worth score the more likely one is to be a continued smoker. No significant correlation was found between smoking status and family income. In order to compare the ages of the three smoking groups, a means test was conducted. The mean age in 1992 for never smokers was 11.98 (SD 1.98), for former smokers it was 12.45 (SD 2.12), and for continued smokers the mean age was 14.22 (SD 1.66). A Scheffe means test indicated that there were significant differences between all three of the group mean ages.

Significant differences were found between the three smoking groups and each of the host level variables. The reports of a close paternal relationship and religiosity were higher for never smokers, followed by former smokers, and then by continued smokers. Former smokers and continued smokers were similar in their reports of a close relationship with their mothers. Continued smokers were much more likely to report behavioral problems (78.4%) compared to the former smokers (55%) and never smokers (48.7%).

Current smokers reported more alcohol and other drug (AOD) use in 1992 than the other two groups. Nearly three quarters of the continued smokers reported using alcohol by 1992 (71.3%), compared to half as many former smokers (35.0%) followed by never smokers (17.8%). The greatest proportion of marijuana use was found among the current smokers as well. Since the data did not provide a way to measure severity of cigarette use, we used age at onset of cigarette use as a proxy for severity. This was done based upon the knowledge that those with younger ages at onset begin more severe use at younger ages as well. An ANOVA was conducted to test the differences in the mean age at onset of cigarette use between the former and continued smokers. The former smokers had a mean age at onset of 10.75 years (SD 2.42)

TABLE 4. Chi-Square Results for Child Cigarette Smoking Severity and Environmental Variables- School and Peer Levels.

1992 Variables	1994 Cigarette Smoking			Chi-square
	Never Smoked	Former Smoker	Continued Smoker	
<b>School Variables</b>				
Feels Connected to School	72.8%	80.0%	65.2%	5.93*
Satisfied with School	84.5%	82.8%	76.8%	95.04***
Feels Academic Pressure	56.5%	55.2%	44.7%	8.18**
Future Plans for College	57.6%	62.1%	48.4%	ns
<b>Peer Pressure</b>				
Feels Pressure to Try Cigarettes	6.8%	8.6%	27.8%	72.13***
Feels Pressure to Try Alcohol	7.0%	5.2%	24.26%	51.92***
Feels Pressure to Try Marijuana	4.0%	1.7%	10.1%	13.05***
Feels Pressure to Skip School	9.6%	3.4%	23.1%	30.13***
Feels Pressure to Commit a Crime	6.0%	6.9%	13.1%	10.93**

ns = not statistically significant

\* =  $p < .05$

\*\* =  $p < .01$

\*\*\* =  $p < .001$

compared to the continued smokers' mean age of 10.80 (SD 2.15), which did not reach statistical significance.

The first set of environmental variables examined was the school variables. As found in Table 4, significantly fewer of the continued smokers feel connected to their school, report being satisfied with the school, or feel pressure to do well in school compared to the other two groups. On the school variables, the former smokers appear to be more like the never smokers than the continued smokers. There was no significant difference between the three groups on their future plans to finish college.

The current smokers were much more likely to report feeling pressure from peers to try cigarettes (27.8%) compared to those who had quit (8.6%) and those who never smoked (6.8%). In fact, continued smokers were much more likely to report feeling pressure from peers

to try alcohol, marijuana, skip school, and to commit a crime compared to the other two groups. Again, the former smokers were found to more closely resemble the never smokers on each of the peer variables compared to the continued smokers.

The trend found, for other environmental variables that in which former smokers were reporting similarly to never smokers, the trend did not continue when examining maternal substance use (Table 5). The former smokers and current smokers were found to have mothers reporting similar levels of each substance category examined. Never smokers' mothers were significantly less likely to report current smoking (29%), compared to 48% of mothers of the other two groups. The mothers of never smokers were also significantly less likely to report heavy alcohol use during the past 30 days, and to report lifetime use of marijuana and cocaine.

The last set of environmental variables in Table 5 was the mothers' ratings of her relationship with the child, the child's feelings about self, and the child's friends. The mothers of continued smokers were less likely to rate their relationship with the child as "good to excellent" (86%) compared to never smokers (96%) or former smokers (98%). Similarly, the mothers of continued smokers were also significantly less likely to report that their children feel positively about themselves and that their relationships with friends are good compared to the other two groups. Again, these analyses indicate that former smokers more closely mirror never smokers than they do current smokers.

### *Multiple Logistic Regression*

During the previous analyses, the smoking variable was conceptualized as a severity variable with never smoking as the least severe and continued smoking as the most severe. From these results, it is clear that the association between smoking status and the host and environmental variables have mixed results. In most of the bivariate analyses, those who quit smoking more closely resemble never smokers than continued smokers. Most remaining results indicate a trend in which former smokers' reports fall between the never smokers and continued smokers. Because most of the results are in one of these two directions, the decision was made to combine the never smokers and former smokers for the logistic regression analyses. Further, conceptually, the former smokers and the never smokers are clearly at less risk for

smoking associated health problems than are the continued smokers. Each of the logistic models was conducted by entering all predictor variables simultaneously into the regression equation.

The models were conducted following the Public Health Model while only retaining the significant variables at the bivariate level for the host domain-individual and substance use variables- and the environment domain- school, peers, maternal substance use, and maternal ratings. Each model controlled for gender, age, and ethnicity. Blacks were the referent group due to their reporting the lowest rate of current smoking, and the results are presented in Table 6. The first logistic regression model included only gender, ethnicity and age. When controlling for other variables in the first and each other model, males were more likely to be continued smokers compared to females. Increasing age was a risk factor for being a continued smoker. Ethnicity also remained in the models with Non-Black, Non-Hispanic youth and

TABLE 5. Chi-Square Results for Child Cigarette Smoking Severity and Environmental Variables- Maternal Level.

1992 Variables	1994 Cigarette Smoking			Chi-square
	Never Smoked	Former Smoker	Continued Smoker	
<b>Maternal Substance Use</b>				
Mother's Current Smoking	29.3%	48.3%	48.5%	31.29***
Mother's 30-day Heavy Alcohol Use	11.9%	21.7%	21.0%	13.82***
Mother's Marijuana Use	43.7%	59.3%	63.0%	24.29***
Mother's Cocaine Use	12.2%	19.6%	19.4%	7.85*
<b>Maternal Ratings of:</b>				
Her Relationship with the Child Excellent-Good	96.5%	98.3%	85.7%	37.80***
The Child's Feelings About Self Excellent-Good	92.3%	88.3%	80.8%	22.13***
Child's Friendships Excellent-Good	91.7%	93.3%	84.6%	93.27**

ns = not statistically significant

\* =  $p < .05$

\*\* =  $p < .01$

\*\*\* =  $p < .001$

TABLE 6. Associations Between Continued Cigarette Use 1992-94 and Child Variables from 1992 Using Multiple Logistic Regression.

Model	Odds Ratios	(95% Confidence Intervals)
<b>HOST MODELS</b>		
<b>Demographic</b>		
Male	1.30	0.99-1.69
Hispanic	1.98	1.38-2.84
Non-Black, Non-Hispanic	4.09	2.98-5.61
Age	1.48	1.39-1.58
<b>Individual</b>		
Close Relationship with Mother	0.55	0.40-0.76
Behavioral Problems	2.88	2.15-3.84
<b>Substance Use</b>		
Alcohol Use	5.03	3.80-6.66
<b>ENVIRONMENTAL MODELS</b>		
<b>School</b>		
Satisfied with School	0.65	0.47-0.90
<b>Peer Pressure</b>		
Reported Feeling Pressure to use Cigarettes	4.00	2.74-5.82
Reported Feeling Pressure to Skip School	1.75	1.17-2.61
<b>Maternal Substance Use</b>		
Mother's Cigarette Use	1.49	1.13-1.96
Mother's Marijuana Use	1.70	1.29-2.24
Mother's Alcohol Use	1.64	1.24-2.17
<b>Maternal Ratings</b>		
Her Relationship with Child	0.52	0.32-0.86
Child's Feelings About Self	0.60	0.40-0.89
<b>FINAL MODEL</b>		
Hispanic	2.12	1.41-3.18
Non-Black, Non-Hispanic	3.41	2.40-4.86
Age	1.39	1.29-1.50
Close Relationship with Mother	0.63	0.44-0.89
Alcohol Use	3.55	2.60-4.85
Behavioral Problems	1.71	1.23-2.37
Reported Feeling Pressure to Use Cigarettes	3.47	2.35-5.13
Mother's Marijuana Use	1.62	1.19-2.20

Hispanic youth were both significantly more likely to be continued smokers compared to the referent group.

*Host Models.* All five of the individual variables were included in the next model, but only two continued to be significantly predictive of being a continued smoker after controlling for each individual variable and demographics. The youths who reported a close relationship with their mothers were half as likely to be continued smokers compared to those who did not report such a relationship. Those reporting two or more behavioral problems were nearly three times more likely to be continued smokers than those with fewer problems. Religiosity, self-worth, and reported paternal relationship did not remain significant.

The next model included lifetime alcohol use and lifetime marijuana use. After controlling for demographics, those with a lifetime history of alcohol use were five times more likely to be continued smokers compared to those who did not use alcohol in 1992. Marijuana use no longer remained significant.

*Environmental Models.* The first environmental model included the school variables: feels connected to school, is satisfied with school, and feels pressure to do well academically. After controlling for each of these variables and demographics, being satisfied with school was the only variable remaining in the model. Being satisfied with school was protective with those reporting satisfaction being slightly less than half as likely to be a continued smoker compared to those reporting dissatisfaction.

The peer model included the four peer pressure variables that were significant in the bivariate analyses—pressure to try cigarettes, alcohol, skip school, and commit a crime. Multicollinearity between pressure to try cigarettes and pressure to try marijuana was found. The variable pressure to try cigarettes is conceptually more closely linked to the outcome variable, and thus pressure to try marijuana was not included in these analyses. Of the three remaining peer pressure variables, two remained statistically significantly associated with cigarette smoking status. Those who reported feeling pressure to smoke cigarettes were as much as four times more likely to be continued smokers compared to those who did not report this pressure. Youths who reported pressure to skip school were over one-and-one-half times more likely to be continued smokers compared those not reporting such pressure.

Maternal substance use was the next model to be analyzed. The model included the mother's current cigarette use, heavy 30-day alcohol use, and lifetime marijuana and cocaine use. After controlling for each of these variables and demographics, three of the four substance use variables remained statistically significant—cigarette, marijuana, and alcohol use. Youths whose mothers reported each of these behaviors were over 1.5 times more likely to be continued smokers compared to those whose mothers did not report each behavior.

The last model included the three variables in which the mother rated her relationship with the child, her child's feelings about self, and the child's friendships. Youth whose mothers rated their relationship with them as good and rated the children's feelings about self as being positive were about half as likely to be continued smokers compared to those whose mother's reported lower ratings on these two variables. The mother's ratings of the child's friendships fell out of the model.

*Final Model.* The final logistic regression model included each of the significant variables found in the above models. The variables were forced into the analyses in a forward manner guided by the theoretical model. The demographic variables were entered first, followed by the host variables that are more proximal to the youths, and then the environmental variables that are more distal. The final model is presented in Table 6, and, as can be seen, some variables for each domain were retained in this model. In comparison to Black youth, Hispanic (O.R. 2.12) and Non-Black, Non-Hispanic youths (O.R. 3.41) continued to be significantly more likely to be continued smokers. Age also remained in this model, with the risk to be continued smokers increasing 1.39 for each year of age. This was the first model in which gender failed to reach significance. One protective variable for the host domain remained statistically significant in that those who reported a close maternal relationship were half as likely to be continued smokers compared to those reporting being less close to their mothers. One of the strongest risk factors was having ever used alcohol. Youths who reported alcohol use at time 1 were three and one half times more likely to be continued smokers at time 2, compared to those who did not report alcohol use. Behavioral problems at time 1 also remained in the model in that adolescents with more problems were more likely to continue smoking compared to those with fewer problems. Only one peer variable remained in the final model. Youths who felt pressure to

try cigarettes at time 1 were about three-and-one-half times, and as much as five times, more likely to be continued smokers at time 2 than those who did not report such pressure. The only maternal variable that remained in this model was the mother's lifetime history of marijuana use. Youths whose mothers reported a lifetime history of marijuana use at time 1 were over one and one half times more likely to be continued smokers than those whose mothers did not report marijuana use. None of the school variables nor any of the maternal rating variables held up in this final model when controlling for the other risk and protective variables and demographics.

### **DISCUSSION**

This study compared three smoking status groups using the Public Health Model in which cigarettes were defined as the agent, the youth's behaviors and social attachments were part of the host domain, and the environmental domain included measures of school, peers, and maternal variables. The three groups were defined by their self-reports of cigarette use from baseline to a two-year follow-up. One group was the never smokers who reported having never smoked at time 1 and time 2. The second group was the former smokers who reported smoking in the last three months at time 1 but were not smoking by time 2. The last group was the continued smokers who had smoked in the last three months at time 1 and reported current smoking at time 2.

The quit rate in this study, over two years, was about 1 in 4 for this sample. The Surgeon General's Report (1989) indicated that approximately half of all adult smokers have quit smoking, which is an accumulation of a quit rate of 3-4% of adults quitting per year (Cohen, Lichtenstein, Prochaska, Rossi, Gritz et al., 1989). It is difficult to generalize from the adult population to the child and adolescent population of cigarette smokers. As discussed previously, most men and women will continue to smoke, once they are regular smokers, until their thirties and beyond. For adults, the conditioned cues and physiological dependence would be dramatically different from that of children and adolescents. The quit rate could be much higher because those reporting smoking were light smokers or experimenters. Children and adolescents also face barriers to cigarette use that are not in place for adults, such as parental controls, availability due to being underage,

and cost. One study with a one-year follow-up of adolescents found that 8% of male and 9% of female smokers made the transition to becoming former smokers (Rowe et al., 1992). This is closer to our findings when one takes into account that this study had a two-year follow-up.

Results of the three group comparisons indicated that former smokers were more like never smokers than they were current smokers. This is important since youth who continued to smoke reported more behavioral problems, less school and parental attachment, lower religiosity, and felt more negative pressure from peers when compared to the youth who had quit smoking or never smoked. Mothers of current smokers were found to be more likely to be current or former substance users. Mothers of the never smokers and former smokers rated their relationships with their children their children's feelings about self, and the children's relationships with friends as significantly higher than the mothers of children who continued to smoke.

Data have indicated that experimental use peaks in middle school aged children-12-14 years (Ellickson, Bell, & McGuigan, 1993). Our data generally support this, indicating smoking intensity progresses with age. Many of our bivariate associations could have been due to the age differences between the groups. In the multiple logistic regression models, we narrowed the three smoking groups into two because of the general similarities we found among the never smokers and former smokers and because of the fact that the severity of use is clearly different between the first two groups and continued smokers. Results indicated that Hispanic and White youths were most likely to be continued smokers. One's risk of being a continued smoker increased with age. Similarly, youths who had used alcohol, who reported behavioral problems, or whose mothers reported lifetime marijuana use by time 1 were at increased risk to be continued smokers. The only protective factor to remain in the model was the child's report of feeling close to his/her mother.

The highest risk factor for being a continued smoker at time 2 was having felt peer pressure to use cigarettes at time 1. Consistent with Jackson (1997), youths reporting such pressure were more likely to have continued smoking than were those not reporting pressure to smoke, while current maternal cigarette smoking fell out of this final model.

The results indicate that there is support for the use of the Public Health Model in understanding the change in smoking status for children and adolescents. As found in the final analyses, when all variables are forced into the model, more of the variables from the host domain remained significant compared to the variables from the environmental domain. This would lend support to the findings from Rowe et al. (1992) that the child's attitudes and beliefs are most important for becoming a regular smoker.

### ***Strengths***

The longitudinal nature of the data reported here reduces recall problems associated with cross-sectional survey research. This is particularly important if the former smokers were light/experimental smokers at the time of baseline. There is a possibility that children would misremember their 1992 smoking behavior if queried in 1994 via a cross-sectional design. This is true for a host of variables reflecting the mother's and child's behaviors that are collected each year in a panel design. In addition, items included in the survey allow for a comprehensive assessment of several areas of the Public Health Model domains. Finally, the data set is somewhat unique in that it allows the influence of both maternal and child-specific characteristics to be assessed.

### ***Limitations***

Although the data set is rich in information, it is not exempt from limitations. Blacks and Hispanics are over represented in this data set. The value of this was having a sufficient sampling of these ethnic groups for analysis. However, this over representation precludes the generalization of these findings to the general population. Another limitation to consider is the lack of data concerning fathers. Although maternal influence is arguably a stronger factor in child development in some cases (i.e., absent fathers), the influence of fathers should not be discounted. Similar to the relative influence of mothers' behaviors, the fathers' behaviors might prove to be risk and protective factors for their child's drug use as well.

A final limitation is that although we examined the differences between never smokers, former smokers, and continued smokers, we

were unable to control for any type of contact with smoking prevention and intervention programs. So it is unknown whether the youths who quit simply quit because they were experimental users at baseline, or if they chose to quit, did so on their own, or sought help.

### *Implications for Practice and Research*

As discussed previously, the findings of this study indicate that there are unique risk and protective factors for continued cigarette use that vary depending upon one's ethnicity. This is important because this should guide decision-making regarding tobacco prevention and intervention programs in that the programs should be culturally sensitive.

Interestingly, the child's report of his/her relationship with the mother remained a significant protective factor; however, the mother's report of the same relationship fell out of the final model. Efforts to strengthen children's perceptions of the bond they have with their parents may be a viable avenue for prevention.

Consistent with previous research, behavioral problems and age were significant risk factors (Chassin et al., 1990). As such, prevention efforts should target children at young ages, and particularly, young children demonstrating an early onset of behavioral problems. These data also indicate the children of mothers with a history of substance use are also at higher risk for using cigarettes. Outreach to such children might be an important consideration in individually oriented prevention efforts.

Practitioners working with children and young adolescents might find these results useful to guide treatment planning. Interventions on a family level to increase communication and relationship building between children and their mothers might be key to preventing cigarette use onset or in supporting cessation of such use. Offering group interventions for this age group may help children discuss/explore their sense of peer pressure to use cigarettes. Such an intervention may also give children a more realistic perception of actual use rates among peers. Finally, group interventions can offer skills training to give children an opportunity to learn assertiveness skills and practice using them in a safe setting.

These results indicate that there are differences between children who have never smoked and those who have continued to smoke. Further, former smoking youths had similar protective factors to those

who never smoked. Maternal reports of substance use were the only variables for which former and continued smokers were similar, especially maternal marijuana use. This may indicate that these are important risk factors for the children to try cigarettes, but if there are protective factors present, then some are able to discontinue use. Further research is needed to understand the differences between these groups to enable substance use educators and interventionists to have the ability to know how to encourage and support children in their smoking cessation behaviors.

Finally, future research is needed to follow this cohort of children as future waves of data are collected. This will enable one to examine the change in smoking behaviors of the three groups as they age. The never smokers, since they were younger, may try cigarettes by future waves and the former smokers may take up cigarette smoking again in the future.

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