Psychosocial risk and protective factors for adolescent tobacco use

Brian R. Flay, John Petraitis, Frank B. Hu

Knowledge of risk and protective factors for adolescent tobacco use will lead to the development of improved intervention strategies to reduce/prevent tobacco use. Theory and empirical findings demonstrate the multivariate complexity of the etiology of tobacco use. Sociocultural, social/interpersonal, and intrapersonal factors act through mediated chains of ultimate, distal, and proximal influences. Some influences moderate the effects of others. Once tobacco is used, feedback mechanisms modify prior causes that in turn alter subsequent tobacco use behavior. Most theories and cross-sectional, prospective, and causal process studies have contained major limitations: (a) most addressed only small portions of the total picture; (b) most mediational studies did not test for interactions and most moderation studies are based on limited theory (if any); and (c) most theories do not discuss how the causal processes might be different for males and females or for different ethnic groups (special cases of moderation). Furthermore, few studies focused on more distal or ultimate influences or examined multi-stream patterns, and few theories or causal process studies have specified or tested feedback loops. Determining psychosocial risk factors and how they influence tobacco use faces several major challenges, including discovering complex mediating processes, moderating variables, and overcoming limitations of surveys and theory. We offer six recommendations to advance transdisciplinary tobacco-prevention research: (a) base future studies on strong theory and aim to test one or more theories or theoretically derived hypotheses; (b) collect four or more waves of data and adopt dynamic strategies of prediction and analysis, including interactions, indirect effects, feedback loops, and transitions from one level of tobacco use to another; (c) provide evidence of generalizability to sub-populations within the study sample, such as by gender, ethnic group, and socioeconomic status; (d) use high-quality measures and multiple methodologies, including non-panel longitudinal studies, intensive interview, ethnography, experimental intervention, and small exploratory studies as well as further prospective studies; (e) include variables from multiple streams of influence to investigate interrelationships among cultural, social, and intrapersonal factors; and (f) collect data from multiple nested units (e.g., children within families, within schools, within neighborhoods) and employ multi-level analysis methods to investigate interrelationships among ultimate, distal, and proximal variables.

Psychosocial risk factors for adolescent tobacco use

Determining the psychosocial factors that increase the risk of adolescents' becoming tobacco users is important in understanding why adolescents start using tobacco, why some become regular, dependent, or addicted users, and in developing effective prevention and intervention strategies. For the latter, the assumption is that knowledge of risk factors will lead to the development of improved intervention strategies to reduce those risks, thereby reducing tobacco use.

Theory and research findings

Theory. A thorough understanding of any behavior must be based on a comprehensive and integrative analysis of (a) the broad social environment or cultural milieu surrounding the behavior, (b) the more immediate social situation or context in which the behavior occurs, (c) the characteristics or dispositions of the person performing the behavior, (d) the behavior it-
Table 1. Matrix of types and levels of influence on smoking

<table>
<thead>
<tr>
<th>Levels of influence</th>
<th>Social</th>
<th>Attitudinal</th>
<th>Intrapersonal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultimate</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>Definition:</strong> Characteristics of the people who make up adolescents' most intimate social support system. These characteristics are not specific to smoking and are beyond the personal control of adolescents but nonetheless put them at risk for succumbing to social pressure to smoke.</td>
<td><strong>Definition:</strong> Aspects of adolescents' surroundings, neighborhoods, social institutions, and culture that, although beyond the personal control of adolescents, put them at risk for developing positive attitudes toward tobacco use.</td>
<td><strong>Definition:</strong> Personality traits and intrapersonal characteristics that, although beyond the easy control of adolescents, might promote some internal motivation to smoke cigarettes or make them susceptible to the physiological effects of tobacco.</td>
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<td></td>
<td><strong>Constructs:</strong> Infrequent opportunities for rewards from family members; lack of parental warmth, support, or supervision; negative evaluations from parents; home strain; parental divorce or separation; unconventional values of parents; unconventional values among peers.</td>
<td><strong>Constructs:</strong> Local crime and employment rates; inadequate schools; poor career and academic options; infrequent opportunities for rewards at school; negative evaluations from teachers; media and advertising depictions of smoking; weak public smoking ordinances; low tobacco taxes; cigarette availability; weak school-level policies on smoking.</td>
<td><strong>Constructs:</strong> Genetic susceptibility to nicotine; lack of impulse control; external locus of control; aggressiveness; extraversion; sociability; risk-taking; sensation seeking; neuroticism or emotional instability.</td>
</tr>
<tr>
<td>Distal</td>
<td><strong>Definition:</strong> Emotional attachments of adolescents and the tobacco-specific attitudes and behaviors of influential role models who encourage smoking.</td>
<td><strong>Definition:</strong> General values and behaviors of adolescents that contribute to their attitudes toward tobacco use.</td>
<td><strong>Definition:</strong> Affective states and general behavioral skills of adolescents that promote some internal motivation to smoke and that undermine their refusal skills.</td>
</tr>
<tr>
<td></td>
<td><strong>Constructs:</strong> Weak attachment to and weak desire to please family members; strong attachment to and strong desire to please peers; greater influence by peers than parents; smoking-specific attitudes and behaviors of role models.</td>
<td><strong>Constructs:</strong> Weak commitment to conventional values, school, and religion; social alienation and criticism; weak desire for success and achievement; hedonic values and short-term gratification; rebelliousness; desire for independence from parents; tolerance of deviance.</td>
<td><strong>Constructs:</strong> Low self-esteem; temporary anxiety, stress, or depressed mood; poor coping skills; inadequate social skills; weak academic skills.</td>
</tr>
<tr>
<td>Proximal</td>
<td><strong>Definition:</strong> Beliefs about the normative nature of smoking and pressures to smoke.</td>
<td><strong>Definition:</strong> Beliefs and evaluations about the costs and benefits of smoking.</td>
<td><strong>Definition:</strong> Beliefs about one's ability to smoke cigarettes and to avoid smoking.</td>
</tr>
<tr>
<td></td>
<td><strong>Constructs:</strong> Prevalence estimates; motivation to comply with other smokers; beliefs that important others (friends, parents and other role models) encourage smoking.</td>
<td><strong>Constructs:</strong> Expected costs and benefits of not smoking; evaluation of costs and benefits of not smoking; expected costs and benefits of smoking; evaluation of the costs and benefits of smoking; attitudes toward smoking by others; attitudes toward smoking by self.</td>
<td><strong>Constructs:</strong> Refusal skills; determination to smoke; use self-efficacy; refusal self-efficacy.</td>
</tr>
<tr>
<td>Immediate</td>
<td></td>
<td>Related behaviors</td>
<td></td>
</tr>
<tr>
<td>predictors</td>
<td>Decision/intentions</td>
<td>Trial behavior</td>
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Research findings from prospective studies. Reviews of the predictors of tobacco and other substance use (Conrad, Flay, & Hill, 1992; Flay & Petrakis, 1994b; Hawkins, Catalano, & Miller, 1992; USDHHS, 1994) also suggest multivariate complexity. Each cell in Table 1 has captured attention from researchers. Table 2 summarizes the strength of evidence for each cell as derived from a review of 28 prospective studies of tobacco use (Flay & Petrakis, 1994b). In particular, social (or interpersonal) influences have been the mainstay of existing theories of tobacco use and of prospective studies (107 tests). Ultimate social influences (17 tests of six variables) are represented by characteristics of an adolescent's parents, family members, and other role models. On the distal level (55 tests of 11
Table 2. Matrix of causes of tobacco use by types and levels, with examples of each cell, and our assessment of the current level of empirical support for each.

<table>
<thead>
<tr>
<th>Levels of influence</th>
<th>Types of influence</th>
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<tbody>
<tr>
<td></td>
<td>Social/Interpersonal</td>
</tr>
<tr>
<td>Ultimate</td>
<td>Family conditions, styles, opportunities; behavior of family members</td>
</tr>
<tr>
<td></td>
<td>Support = weak$^a$</td>
</tr>
<tr>
<td>Distal</td>
<td>Social attachment; behavior and attitudes of others</td>
</tr>
<tr>
<td></td>
<td>Support = very strong</td>
</tr>
<tr>
<td>Proximal</td>
<td>Motivation to comply; social normative beliefs</td>
</tr>
<tr>
<td>Immediate</td>
<td>trial/related behavior</td>
</tr>
<tr>
<td>Predictors</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ In general, although strong for socioeconomic status, and inconsistent for family characteristics and management.

$^b$ Except for type of school (in Europe) and availability of tobacco.

$^c$ But very few studies.

$^d$ But inconsistent for perceived parent and family approval.

$^e$ But few studies of related behaviors.

variables), social influences occur as adolescents’ attachments to various role models, and the tobacco-specific behaviors of those role models. Proximal social influences (34 tests of 11 variables) take the general form of normative beliefs concerning tobacco use in the cognitive-affective theories of tobacco use (namely, theory of planned behavior and protection motivation theory), and take the more specific form of prevalence estimates and beliefs that other people encourage tobacco use.

Cultural/attitudinal influences have attracted less theoretical attention or findings from prospective studies (56 tests). Both theoretical and research attention have focused largely on proximal attitudinal influences (27 tests). Less attention has been given to the distal level (17 tests of seven variables), mostly focused on general values (i.e., not specific to tobacco use) among adolescents. Theory, but little research (12 tests of five variables), has focused on ultimate factors in adolescents’ surroundings, neighborhoods, social institutions, and culture that, although beyond their personal control, put adolescents at long-term risk of developing positive attitudes toward tobacco use.

Intrapersonal influences have attracted the least empirical study (23 tests in prospective studies). Theoretical accounts have often described intrapersonal influences only vaguely and have often lacked important details about the mechanisms by which intrapersonal constructs are thought to affect tobacco use. The ultimate level consists of biological dispositions and personality traits (as opposed to states or skills), which are difficult to modify. Such constructs include genetic susceptibility to nicotine, lack of impulse control, external locus of control, aggressiveness, risk-taking, sensation seeking, sociability, and chronic emotionality or neuroticism (10 tests of seven variables). By contrast, other intrapersonal features appear as distal (i.e., intermediate) causes of tobacco use because they appear somewhat more modifiable. These include relatively more alterable affective states (e.g., low self-esteem, anxiety, and depressed affect), and general behavioral skills (e.g., inadequate social skills and weak academic skills), which might contribute to tobacco use (five tests of two variables). The only proximal intrapersonal influence investigated appears to be tobacco-specific self-efficacy (four tests). Several psychological theories emphasize the role of intentions and decisions in the prediction of tobacco use (nine tests), and past tobacco use and other related behaviors (18 tests).

Research findings from causal process studies. As the Theory of Triadic Influence suggests, causal processes can occur through mediation, where one variable mediates the effects of another; moderation, where one variable modifies the effects of another; or feedback (reciprocal causation).

Mediation processes. Many of the causal paths suggested by the Theory of Triadic Influence have been tested and supported in 24 mediation studies of tobacco use (Flay & Petraitis, 1994b). Despite differences in the levels of exogenous and mediational variables, the mediational processes tested in these studies followed the flow through the different levels of influence depicted by the Theory of Triadic Influence. That is, with few exceptions, the mediational paths from these studies flowed from the Theory of Triadic Influence’s more
distal variables through its more proximal variables. Furthermore, few studies reported results suggesting reversed paths (except for the feedback effects of prior behavior—see below).

Our review confirms that etiological processes of tobacco use do not follow a single causal path. Instead, various pathways are interwoven with each other and no single pathway by itself dominates the etiology of tobacco use. Of course, some pathways to tobacco use received more support (e.g., social control and learning pathways).

Of the studies we reviewed, few examined multi-stream influences. However, those that did supported the inter-stream paths suggested by the Theory of Triadic Influence. For example, some studies find that the influence of parenting style or behavior variables act through (are mediated by) the intrapersonal stream (skills and self-efficacy) as well as through the social stream. A number of studies find that intrapersonal variables act through the social or attitudinal streams as well as the intrapersonal stream.

Of course, the mediational process depicted in any one study is not the whole picture of tobacco use etiology, but only a fragment of it. The Theory of Triadic Influence provides a good representation of the complete picture that would be obtained if we were to map results from all of the reviewed studies together.

*Moderating processes.* Among the sociodemographic variables, gender and ethnicity are the most widely studied; they modify the nature of some causal relationships (see the forthcoming USDHHS 1999 Surgeon General’s Report). There is some evidence that the causal process of tobacco use involving social influences is different for males and females. It seems that ultimate level social causes (parenting styles) generally have greater effects on boys than on girls, whereas distal factors (parental smoking and peer smoking) have greater effects on girls. Apparently, these often balance each other, so that the final combined effects generally (though not always) have equal effects for girls and boys (USDHHS, 1999). Lower socioeconomic status (SES), lack of religious commitment, expectations concerning weight and emotional control, and the image that smokers are independent, all seem to put females at higher risk than boys. It also seems that boys are more deterred from smoking by beliefs about the adverse effects of smoking, whereas girls are either less deterred by or disregard such beliefs. Females are also put at greater risk of smoking than males because they appear to be biologically more sensitive to nicotine, possibly because of hormonal differences. They are also more reactive to (a) levels of sensation seeking and risk-taking, (b) lack of behavioral control, and (c) low intelligence.

Although ethnic differences in adolescent tobacco use have been well documented (Mermelstein, 1999; Newcomb & Bentler, 1983; Sussman, Dent, Flay, Hansen, & Johnson, 1987), studies of the moderating effects of ethnicity on the causal processes of tobacco use have been rare. In general, as the families of minority group adolescents become more acculturated to the US, the risk of their becoming smokers approaches that of the majority population. In addition, the meaning or importance of various social factors appears to differ by ethnic group (Castro, Maddahian, Newcomb, & Bentler, 1987; Flay & Petrakis, 1994b). Another moderating effect is the synergy of risk factors influencing tobacco use. For example, McAlister, Krosnick, & Milburn (1984) found that friends’ smoking influenced high-rebellious children more than low-rebellious children. Foshee and Bauman (1992) found that a mother’s smoking aggravated the effects of low family attachment on adolescent smoking, while a father’s smoking aggravated the effects of detachment from conventional values on adolescent smoking.

One other moderating effect exists wherein one factor buffers the effects of another to influence tobacco use (e.g., Shiffman & Wills, 1985). For example, Stacy, Sussman, Burton, and Flay (1992) found that high self-efficacy not only curbs use directly, but also acts as a buffer, protecting adolescents against social influences. Bauman and Fisher (1985) found that locus of control moderated the relationship between subjective expected utility and use.

*Reciprocal and feedback pathways.* Few studies have tested this notion. However, it is well known that prior tobacco use is the best predictor of later tobacco use (see Conrad et al., 1992). The Theory of Triadic Influence proposes a feedback mechanism by which prior tobacco use affects later tobacco use. Several studies have provided support for feedback mechanisms. Krohn, Skinner, Massey, and Akers (1985) found that prior smoking affected smoking maintenance both directly and indirectly through positive and negative consequences of smoking. Bentler and Speckart (1979) tested the effects of prior behavior within the framework of the theory of reasoned action and found that part of the effects of prior drug use are mediated by intention and part are direct.

**Challenges to theory and research**

The major limitations of prospective and causal process studies relate to the limitations of theory: (a) most addressed only small portions of the total picture; (b) most mediational studies did not test for interactions; (c) most moderation studies are based on limited theory (if any); and (d) most theories do not discuss how the causal processes might be different for males and females or for different ethnic groups (special cases of moderation). In addition, few studies focused on more distal or ultimate influences or examined multi-stream patterns, and few theories or causal process studies specify or tested feedback loops.
Four major challenges

Determining psychosocial risk factors and how they influence tobacco use faces four major challenges:

Discovering complex mediating processes. Early studies, whether cross-sectional or prospective, focused on finding risk factors—that is, on simple bivariate relationships (correlations). The assumption was that identifying the risk factor would be enough to lead to the development of effective interventions. Although understanding causal mechanisms is critical for developing effective interventions, the effects of identified risk factors on tobacco use may not be direct. Instead, they may be mediated through other variables, or they may themselves be mediating the effects of a third variable. For example, the effects of media messages may be mediated by changes in knowledge; or changes in knowledge may reflect (be mediating) the effects of media messages.

Mediation paths may be complex, involving multiple steps or multiple paths. The effects of parental use, for example, may be mediated through formation of attitudes favorable to tobacco use, easy access to tobacco products, simple copying of the behavior, and/or development (through modeling) of the skills necessary to use tobacco. To capture the complex processes leading to tobacco use, multi-wave designs are critical for (a) establishing multiple temporal orders between multiple levels of variables, (b) documenting the natural history of tobacco use and different transitions (e.g., from trying, to experimenting, to regular use, to dependency/addiction), and (c) studying the temporal and developmental changes of a causal process.

Discovering moderating variables. The effects of risk factors may also be moderated by other factors. Understanding moderators may help identify groups at higher or lower risk. For example, gender may moderate the effects of acceptance of deviance. While boys are more likely to be at risk for tobacco use because they tend to be more likely to rebel, the relationship between acceptance of deviance and tobacco use is significantly stronger for girls than it is for boys. Relatively few studies to date have investigated such interactions, particularly with prospective data.

With the exception of many moderating effects of gender (USDHHS, 1999), most reported moderating effects have not yet been replicated. Indeed, interaction effects in general are notoriously difficult to replicate, largely because of statistical power issues. Future moderator variable studies demand large samples, careful assessment of outliers (some reported moderating effects may be caused by one or two extreme cases), and reliable measures.

Limitations of surveys. Most studies designed to identify risk factors to date have consisted of surveys of adolescents. The best of these are prospective, starting before most adolescents ever try smoking and continuing until most of those who will ever become regular users of tobacco have done so. Even the best prospective surveys, however, have limitations. One major limitation concerns the types of variables that can be included. Potential risk factors are usually limited to cognitive, affective, intrapersonal, and interpersonal factors (and usually not all of these). Biological factors are rarely included. Broad sociocultural environmental factors are also difficult to include, although some surveys include the respondents' perceptions of them. Even distal interpersonal factors, such as the behavior of important others (e.g., parents, peers), are rarely included (except as perceptions).

Few studies have focused on relatively long-term or more distal causes of tobacco use (such as neighborhood characteristics, media, and culture). The scarcity of research in these areas reflects the limitations of surveys and the emphasis of the theories that have guided much of the research. Until recently, research on adolescent tobacco use was greatly influenced by theories describing cognitive processes of a behavior that provide no or little guidance about the broad environmental and contextual factors in tobacco use (or any other behavior, for that matter).

Another major limitation concerns limited ability to infer causal relationships. A stronger approach to inferring cause requires manipulation of presumed causes, best achieved in intervention studies.

Limited theory. Existing micro-level theories have spawned many studies on tobacco use etiology that have led to some convincing data regarding many of the pathways. These theories and the research generated by them, however, have been narrow relative to the multilevel and multi-stream nature of the etiological processes of tobacco use. In addition, existing theoretical models have not been specific enough to guide research on the multidimensional aspects of tobacco use etiology. These theoretical limitations tend to constrain researchers from integrating knowledge from different disciplines and adapting more comprehensive approaches to etiology and prevention research.

Given the limitations of current theory and most research, we should rethink our philosophy and our paradigm for etiology research. We are not alone in this call. Several others (e.g., Anderson, 1995; Biglan, 1994; Biglan & Hays, 1994; Clayton, 1992; Glantz & Pickens, 1992; Wulfert & Biglan, 1994) have advocated a contextual approach to research on adolescent substance use. Our theoretical foundation, namely, the Theory of Triadic Influence, does not favor one paradigm and disregard another. Instead, we believe that each conceptualization is important and that they can be integrated into a unifying theoretical model. As a matter of fact, the Theory of Triadic Influence is the product of such integration, and addresses both intra-organism relationships (e.g., cognitive process and personality influences), and contextual level factors (e.g., neighbor-
provide evidence of generalizability to subpopulations within the study sample, such as by gender, ethnic group, and socioeconomic status; (d) use high-quality measures (perhaps fewer of them) to improve the statistical reliability of prediction, and utilize multiple methodologies, including non-panel longitudinal studies, intensive interview, ethnography, experimental intervention, and small exploratory studies as well as further prospective studies; (e) include variables from multiple streams of influence to investigate interrelationships among cultural, social, and intrapersonal factors; and (f) collect data from multiple nested units (e.g., children within families, within schools, within neighborhoods) and employ multi-level analysis methods to investigate interrelationships among ultimate, distal, and proximal variables.

With respect to the last point, researchers of biological/genetic characteristics should include psychosocial variables as potential covariates, mediators, or moderators. In turn, psychosocial researchers need to include biological/genetic variables that might themselves be moderators of psychosocial influences. Similarly, researchers of ultimate sociocultural predictors need to include psychosocial variables as potential covariates, mediators, or moderators. It is likely that the influence of all ultimate-level sociocultural variables is mediated through other variables, rather than affecting tobacco use directly.

Researchers in the tobacco area should also learn from research in the alcohol, drug, adolescent sexuality, juvenile delinquency, and antisocial behavior areas (and vice versa). The predictors, causes, and processes are similar for all these areas, and the extent to which and how these behaviors are related to each other are important issues.

Implications for prevention research

This review holds obvious implications for prevention practice. For example, effective interventions will need to alter one or more—preferably more—risk or protective factors, and/or the causal processes involved in how they influence tobacco use.

Future intervention (prevention or treatment/cessation) should be designed as tests of the causal role of risk factors in the etiology of tobacco use. As in any area of research, experimental manipulation provides the strongest test of a causal process. Well-designed intervention studies ought to show that (a) the intervention altered a presumed causal variable or process, (b) the intervention also altered tobacco use, and (c) the alteration in the presumed causal variable/process mediated the effects of the intervention on tobacco use. Dielman, Shope, Butchart, Campaneilli, and Caspar (1989), MacKinnon et al. (1991), and Donaldson, Graham, and Hansen (1994) provided examples of the approach. To optimize the value of intervention studies for both understanding etiology and understanding the generalizability or limits of the intervention, they should
also include measures and analysis of other presumed causes, mediator and moderator variables, and possible reciprocal causation (feedback).

Prevention research is needed on comprehensive, early, and continued interventions. The Theory of Triadic Influence suggests that short-term interventions that focus at the proximal cognitive/affective level are likely to have large initial effects that then decay fairly quickly because all of the distal and ultimate influences on the behavior and its precursors remain unaffected. Longitudinal assessment of the influence of distal and ultimate predictors on the variables targeted by interventions would enable tests of this hypothesis. The effects might be observed to be disrupted by the intervention, but to then have renewed effects over time. Growth-curve analysis should prove useful in studying the effects of extended interventions.

Interventions that involve altering the broad sociocultural environment are warranted, but it would seem wise for evaluations to include assessments of the effects of such interventions on likely mediators. Indeed, testing for the effects of interventions on mediators would provide tests of mediation models.

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References


