

Adolescent Health Psychology

Paula G. Williams
Washington State University

Grayson N. Holmbeck and Rachel Neff Greenley
Loyola University Chicago

In this article, a biopsychosocial model of adolescent development is used as an organizing framework for a review of primary, secondary, and tertiary prevention research with adolescent populations. During adolescence many critical health behaviors emerge, affecting future disease outcomes in adulthood. In addition, most of the predominant causes of morbidity and mortality in adolescence are unique to this period of development, indicating that health-focused interventions must be tailored specifically to adolescents. Moreover, it is during adolescence that lifelong patterns of self-management of and adjustment to chronic health conditions are established. Thus, an increased focus on adolescence in health psychology research is important both to improve the health of adolescents per se and to optimize health trajectories into adulthood.

Adolescence has historically been a developmental period of relative neglect with respect to research on both mental and physical health intervention and outcome. Perhaps such neglect has occurred because, from a health perspective, morbidity and mortality rates are quite low during adolescence compared with other developmental periods (Holden & Nitz, 1995). However, as we argue in this article, adolescence is a pivotal period of development with respect to health and illness. First, it is during adolescence that many positive health behaviors (e.g., diet and exercise) are consolidated and important health risk behaviors (e.g., smoking, alcohol and drug use, and unsafe sexual practices) are first evident; thus, adolescence is a logical time period for primary prevention intervention. Second, the predominant causes of morbidity and mortality in adolescence are quite different from adults, indicating that early identification and treatment of adolescent health problems must be directed toward a unique set of targets in this age group. Moreover, because of the particular developmental issues that characterize adolescence, intervention efforts designed for adults are often inappropriate or ineffective in an adolescent population. Finally, even when chronic illnesses are congenital or begin in childhood (e.g., spina bifida, Type 1 diabetes), the manner in which the transition from childhood to adolescence to young adulthood is negotiated has important implications for disease outcomes throughout the remainder of the life span.

Given the unique developmental challenges of adolescence, we argue that an effective and theoretically sound approach to adolescent health psychology research and treatment must be firmly grounded in a developmental framework. We present a biopsychosocial model of adolescent development as one such framework that can inform primary, secondary, and tertiary prevention research and interventions targeting adolescents. This article is organized around the three levels of health-related prevention as they apply to adolescence. Within these levels, we include discussion of the adolescent-focused aspects of what Smith and Ruiz (1999) characterize as the predominant research areas of health psychology: health behavior and risk reduction, psychosomatics, and management of medical illness. In the section on primary prevention, we discuss the health behaviors that initiate in adolescence, outline current research regarding the etiology of these behaviors, and highlight intervention efforts that have sought to prevent the onset of negative health behaviors. In discussing secondary prevention (i.e., actions taken toward early identification and treatment of morbidity), we focus on the relation between psychopathology and health among adolescents, examine research related to psychosocial risk factors for stress-related medical conditions in adolescents, and present successful secondary prevention interventions. With respect to tertiary prevention, we outline current research on the assessment and treatment of health problems that have progressed beyond the early stages, with a particular focus on chronic illness.

Despite its relative youth, the field of adolescent health psychology is vast, and an exhaustive review of the relevant literature is beyond the scope of this article. Rather, our intent is to outline what we believe to be some of the key theoretical issues in clinical health psychology focused on adolescence and to highlight state-of-the-art, empirically based research.

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Paula G. Williams, Department of Psychology, Washington State University; Grayson N. Holmbeck and Rachel Neff Greenley, Department of Psychology, Loyola University Chicago.

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Correspondence concerning this article should be addressed to Paula G. Williams, Department of Psychology, Washington State University, P.O. Box 644820, Pullman, Washington 99164-4820. E-mail: pwillms@wsu.edu

Biopsychosocial Model of Adolescent Development

Adolescence is a transitional developmental period between childhood and adulthood that is characterized by more biological, psychological, and social role changes than any other stage of life except infancy (Feldman & Elliott, 1990; Holmbeck, 1994; Lerner, Villarruel, & Castellino, 1999). Moreover, there are two transition points during this single developmental period—the transition to

early adolescence from childhood and the transition to adulthood from late adolescence (Steinberg, 1996). Given the magnitude of such changes, it is not surprising that there are also significant changes in the types and frequency of health problems and psychological disorders during this developmental period, as compared with childhood (Rutter, 1980).

An organizing developmental framework for understanding adolescent adaptation and adjustment is shown in Figure 1. This framework summarizes the major constructs that have been studied by researchers in this field and is based on earlier models presented by Hill (1980), Holmbeck (1994, 1996; Holmbeck et al., 2000; Holmbeck & Kendall, 1991; Holmbeck & Updegrave, 1995), Steinberg (1996; Steinberg & Morris, 2000), and Grotevant (1998). The model presented here is biopsychosocial in nature, insofar as it emphasizes the biological, psychological, and social changes of the adolescent developmental period. Throughout this review, we use this framework to highlight the relevant issues in adolescent health psychology (for more extensive discussion of this model, see Holmbeck & Shapera, 1999).

Primary Prevention in Adolescence

The goal of primary prevention is to alter risk factors prior to the onset of disease, thus preventing the disease process from beginning or greatly diminishing the severity of subsequent disease. Among adults, this may take the form of intervening to alter health risk behaviors once they have begun. However, given the difficulty of changing engrained negative health habits, attention has turned

increasingly to preventing risk behaviors from developing in the first place.

Health Behaviors That Develop in Adolescence

Epidemiological studies of the major causes of adult mortality (e.g., coronary heart disease, cancer, pulmonary disease, and stroke) have revealed that many of the predominant risk factors for these diseases are behavioral. In particular, smoking, alcohol use, dietary habits, and sedentary lifestyle are key risk factors. Smoking and alcohol use have both been documented to begin and escalate in adolescence (Chassin, Presson, Rose, & Sherman, 1996; Chen & Kandel, 1995). Dietary and exercise habits often originate in childhood, but are established more permanently during adolescence (Cohen, Brownell, & Felix, 1990). In addition, sexual behavior is typically initiated in adolescence (Katchadourian, 1990). Given that HIV and AIDS are now leading causes of morbidity and mortality in young adults (Centers for Disease Control, 1996) and that unintended pregnancy is a leading cause of morbidity among adolescent females (Holden & Nitz, 1995), sexual behavior in adolescence has become a focus for prevention efforts. Finally, given their prominent place in adolescent mortality (see Secondary Prevention in Adolescence, below), accidental injury (especially in motor vehicle accidents) and violence have also been important targets for prevention efforts.

One persistent question regarding adolescent health behavior is the extent to which many health-relevant behaviors are best subsumed under *problem* or *risk-taking* behaviors. Substantial re-

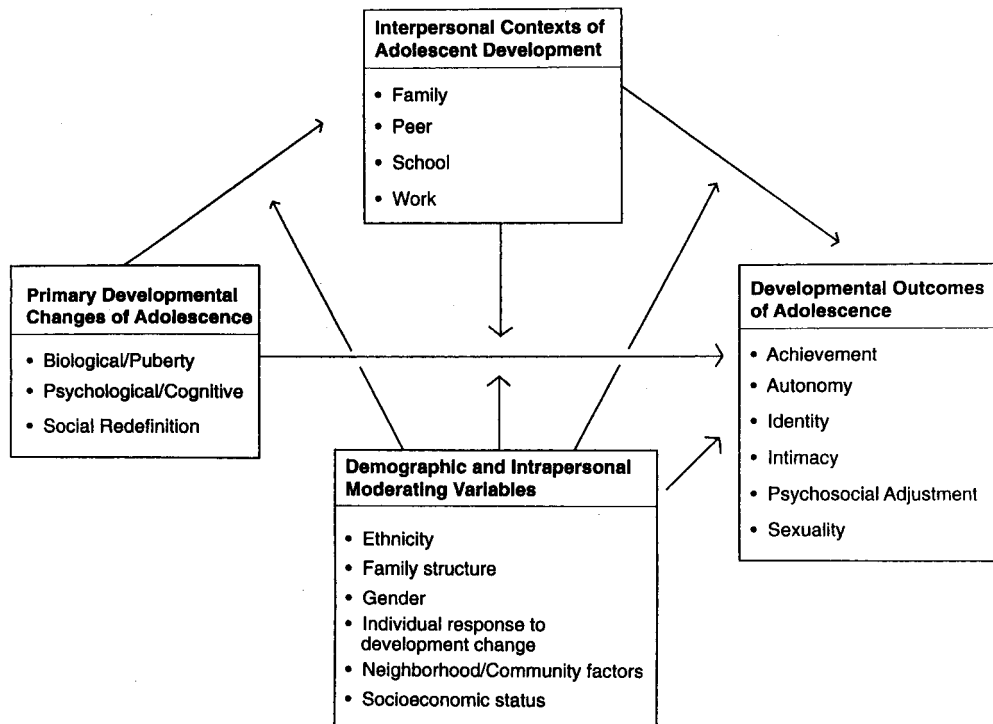


Figure 1. Framework for understanding adolescent development and adjustment. From "Research Methods With Adolescents," by G. N. Holmbeck and W. Shapera. In *Handbook of Research Methods in Clinical Psychology* (2nd ed., p. 638), 1999, New York: Wiley. Copyright 1999 by Wiley. Reprinted with permission.

search suggests that many potentially negative health behaviors, including substance use, precocious sexual behavior, and even dieting, are part of a constellation of risk-taking behaviors (see Dryfoos, 1990; Jessor, 1998; Millstein & Igra, 1995) that also include behaviors traditionally associated with psychopathology (e.g., delinquent behavior). This is an issue that appears quite unique to adolescent health psychology (vs. adult-focused health psychology); after all, many of the behaviors in question (e.g., alcohol and tobacco use) are illegal for adolescents but not for adults. Thus, some of the behaviors discussed herein may be best construed as problem behaviors that have health consequences.

Etiology and Models of Adolescent Health Behavior

Prior research supports the notion that a biopsychosocial perspective on the development of adolescent health and risk behavior is essential. It is beyond the scope of this article to fully characterize current thinking on the developmental etiology of each relevant adolescent health behavior. However, there is substantial empirical support for common etiological factors, particularly with respect to substance use behaviors (Petratis, Flay, & Miller, 1995), which correspond to the components of the model presented in Figure 1. Thus, we consider factors related to adolescent risk behavior in its broadest definition.

Of the *primary developmental changes*, perhaps the most important with respect to risk behavior is perceiving oneself to be physically older than same-age peers. Perception of being older than one's age mates has been related to cigarette, alcohol, and marijuana use, as well as earlier initiation of sexual activity (Resnick et al., 1997). Indeed, self-report of appearing older than one's peers has been broadly implicated in maladjustment among adolescents (Brooks-Gunn & Petersen, 1983), which in turn may be related to the initiation of negative health behaviors. In addition, others have noted the implications that cognitive developmental factors have for the onset of problem behaviors. For example, Holmbeck, Crossman, Wandrei, and Gasiewski (1994) examined cognitive developmental correlates of adolescent contraceptive knowledge, attitudes, and behavior. Also, recent research on adolescent risk perception suggests that decisions to engage in risky behavior may derive more from the value system or goals of the adolescent, rather than from cognitive developmental limitations (Beyth-Marom & Fischhoff, 1997).

With respect to *interpersonal contexts*, parental connectedness (i.e., feelings of warmth, love, and caring from parents) and perceived parental expectations for school completion are significant predictors of multiple risk behaviors (e.g., alcohol, tobacco, and marijuana use and early sexual activity; Resnick et al., 1997). In a similar manner, attachment organization is related to many aspects of psychosocial functioning in adolescents. For example, Allen, Moore, Kupermine, and Bell (1998) found that secure attachment, assessed through a structured interview, predicted competence with peers, lower levels of internalizing behaviors, and lower levels of deviant behavior. Parental support appears to influence health risk behavior through a variety of pathways, including adaptive coping, academic competence, and fewer deviant peer affiliations (Wills & Cleary, 1996). In addition, relations with parents may interact with other interpersonal factors to influence behavior (e.g., peer orientation, Bogenschneider, Wu, Raffaelli, & Tsay, 1998; Gerrard, Gibbons, Zhao, Russell, & Reis-

Bergan, 1999). Although some evidence suggests that it is the connection with parents more than parental monitoring per se (e.g., physical presence of a parent in the home) that influences health risk behavior (Resnick et al., 1997), this may depend on the behavior of interest. For example, Reifman, Barnes, Dintcheff, Farrell, and Uhteg (1998) found evidence that parental monitoring influences the degree of adolescent heavy drinking.

Peer relations have also been implicated in the development of negative health behavior in adolescence (e.g., substance use [Curran, Stice, & Chassin, 1997] and HIV/AIDS sexual risk behavior [Black, Ricardo, & Stanton, 1997; Romer et al., 1994]). Peer group membership is thought to be the training ground for delinquency and substance use (Patterson, DeBaryshe, & Ramsey, 1989). However, a lingering question is whether adolescents are conforming to the behavior of their peers, or whether adolescents with similar behaviors tend to segregate into social groups (Hogue & Steinberg, 1995). Although some recent evidence supports a social influence versus a social selection mechanism for peer effects on risk behavior (e.g., Wills & Cleary, 1999), this issue has not yet been fully resolved. One hypothesized mechanism for the influence of peers on risk behavior is through cognitive variables such as perceived norms (e.g., perceiving the prevalence of substance use among peers to be high), which have been consistently related to adolescent substance use (Chassin, Presson, Sherman, Corty, & Olshavsky, 1984; Donaldson, Graham, & Hansen, 1994).

In addition, connectedness with *school* has been found to be a protective factor in the development of risk behavior (Jessor, Van Den Bos, Vanderryn, Costa, & Turbin, 1995; Resnick et al., 1997), whereas academic difficulties and low commitment to school are predictive of higher levels of risk behavior (Bailey & Hubbard, 1990; Elliott, Huizinga, & Ageton, 1985; Jessor & Jessor, 1977). School is central to the lives of adolescents and is the context in which most peer relations are developed. Thus, the school setting is often the backdrop against which risk behavior develops and, as discussed below, is often the setting for prevention efforts. Finally, with respect to *work settings*, working more than 20 h per week is a consistent predictor of risk behavior (Resnick et al., 1997). However, the underlying mechanism (and direction of causation) is not well understood. For example, it may be that excessive work leads to poor school performance and/or fatigue, which in turn influences risk behavior, or it may be that excessive leisure income facilitates risk behavior (e.g., drug use; Greenberger & Steinberg, 1986).

The development of some risk behaviors in adolescence may be linked to strivings for adult social roles. Thus, many of the developmental outcomes depicted in Figure 1 may be linked to health risk behavior. For example, it has been suggested that risk-taking among adolescents may constitute attempts to establish *autonomy* and/or shape *self-identity* (Irwin & Millstein, 1992; Schulenberg, Maggs, & Hurrelmann, 1997). Moreover, the distinction has been made between *constructive* deviance (e.g., creativity and curiosity) and *destructive* deviance (Chassin, Presson, & Sherman, 1989). Constructive deviance appears to be meaningful in the development of both negative (e.g., smoking) and positive (e.g., exercise) health behaviors. In other cases, the development of risk behavior may be related to destructive deviance and *psychosocial maladjustment* (e.g., externalizing behaviors; Stice & Barrera, 1995) and, hence, may signal an emerging disorder (see *Interface of Health and Psychopathology*, below). The development of sexual prac-

tices certainly occurs in the context of the adolescent's developing *sexuality* and shifts in *intimacy* in relations with peers. It is apparent that an understanding of the developmental etiology of adolescent health behavior must be firmly placed in the context of other developmental outcomes that characterize adolescence.

Many of the pathways described above vary across ethnicity, gender, temperament, socioeconomic status (SES), and community variables. For example, rates of risk behaviors such as substance use and early sexual behavior and childbearing vary greatly across neighborhoods and communities (National Research Council, 1993), and rates of contraception vary significantly by ethnicity and religious affiliation (Moser & McNally, 1991). However, race or ethnicity, SES, and family structure together predict a relatively small amount of variance in adolescent risk behaviors (Blum et al., 2000).

Another key intrapersonal variable in the etiology of health risk behavior is temperament. Temperament dimensions are hypothesized to be indirectly linked to a variety of health risk behaviors through influence on more proximal factors, such as self-regulatory behavior or social relations (Tarter & Vanyukov, 1994; Wills, Gibbons, Gerrard, & Brody, 2000; Wills, Sandy, & Yaeger, 2000). With respect to adolescent substance use, temperament dimensions have also been found to moderate the effects of other risk factors, such as parental substance use and parent-child conflict (Wills, Sandy, Yaeger, & Shinar, 2001). In a similar manner, temperament dimensions, especially stress reactivity, appear to moderate the effects of stress on injury risk behavior (Liang et al., 1995). Indeed, accumulating evidence suggests that stress reactivity may serve as either a risk factor or a protective factor depending on the context (Boyce, 1996). A key theoretical goal in understanding adolescent health behavior is to identify specific subgroups and psychosocial contexts (i.e., adolescent by environment interactions) that predict etiological pathways.

Several methodological issues are involved in etiological health behavior research in adolescence. First, it is important to distinguish factors related to initiation of behaviors from factors related to maintenance of behaviors over time. To this end, longitudinal studies are superior, as cross-sectional designs confound factors that predict the onset of behavior with factors that result from the onset of the behavior (Chassin, Presson, & Sherman, 1995) and may overestimate the influence of predictive factors (e.g., self-reports of peer influence on substance use; Kandel, 1996). In recent years, tracking the initiation and escalation of adolescent risk behavior in longitudinal studies has become ever more refined. In particular, the advancement of statistical techniques for modeling individual differences in behavior change over time (i.e., latent growth modeling) has led to a better understanding of the patterns of adolescent risk behavior and factors that affect trajectories of risk behavior. Moreover, it is now possible to model classes of growth trajectories (*latent growth mixture modeling*; Muthén & Shedden, 1999). For example, subgroups of adolescents with differing trajectories in smoking behavior can be identified (Chassin, Presson, Pitts, & Sherman, 2000; Colder et al., 2001). These different trajectories may then be linked to different etiological pathways, which in turn imply different prevention strategies.

Primary Prevention Intervention in Adolescence

As depicted in Figure 1, the adolescent's interpersonal context is comprised of family, peer, school, and work environments, each of which affords the opportunity for preventive intervention. However, some contexts may be more amenable to intervention efforts than others. Because peer relationships take on a greater salience during the adolescent period, and because a high percentage of adolescents in the United States attend school on a full-time basis, the school environment has been targeted as a key site for primary prevention intervention. Characteristics common to exceptional primary prevention programs include being rooted in developmental theory, the use of highly trained personnel, and the incorporation of behavioral strategies and social skills training, in addition to providing information about accurate peer norms and future negative health consequences. Methodological strengths of these prevention studies include the use of comparison groups, randomization, and multiple psychometrically sound outcome measures, as well as multiple intervention sites and multiple intervention components that are implemented longitudinally (Durlak, 1997).

A number of exemplary school-based prevention programs exist that have targeted a variety of adolescent health behaviors, including the prevention of smoking, alcohol use, drug use, early sexual behavior, and health problems due to poor diet and exercise habits: sexual behavior, HIV risk reduction, and pregnancy (Allen, Philliber, Herrling, & Kuperminc, 1997; Jemmott, Jemmott, & Fong, 1998; Zabin et al., 1986); cigarette and marijuana use (Botvin, Baker, Dusenbury, Botvin, & Diaz, 1995; Botvin, Baker, Dusenbury, Tortu, & Botvin, 1990) alcohol use (Cheadle et al., 1995; Dielman, Shope, Leech, & Butchart, 1989; Perry et al., 1993; Perry et al., 1996) alcohol, cigarette, and marijuana use (Hansen & Graham, 1991) cigarette use (Perry, Kelder, Murray, & Klepp, 1992; Vartiainen, Pallonen, McAlister, & Puska, 1990) drug abuse (Johnson et al., 1990) exercise promotion (Kelder, Perry, & Klepp, 1993) and cardiovascular health (Killen et al., 1989). This list is not intended to be exhaustive; instead, it provides examples of several high-quality programs that have been subjected to rigorous empirical investigation and fared well in terms of the prevention of a variety of health problems.

For example, Project Northland (Perry et al., 1993, 1996), rooted in problem behavior theory (Jessor & Jessor, 1977), was a 3-year intervention aimed at preventing or delaying the onset of alcohol use among early adolescents and reducing use among adolescents who were already drinking. It included school-based (a peer-led school curriculum), parent (parent-children home activities concerning adolescent alcohol use and parent participation in adolescent health forums), and community (policy changes and alcohol education and enforcement task forces) intervention components. The program was evaluated at five levels in the community: student surveys, parent surveys, community leader surveys, alcohol merchant surveys, and observational study of alcohol purchasing by underage adolescents. Perry et al. (1996) reported that at completion of the program, students who participated in the intervention evidenced significantly lower scores on a measure of alcohol use, used alcohol in the past month significantly less often than the comparison group, had significantly lower scores on a scale tapping peer influence, were significantly more likely to perceive that peer drinking was not normative, and were significantly less likely to report that people their age typically drink

alcohol on dates. Other exemplary primary prevention intervention studies have used life skills training to reduce cigarette smoking and marijuana use (Botvin et al., 1995) and used community volunteerism (to enhance sense of autonomy and community connectedness) to decrease adolescent pregnancies (Allen et al., 1997). These examples illustrate that prevention efforts targeted toward adolescents can have a positive impact on adolescent health behaviors.

However, other exemplary prevention intervention research has not yielded positive outcomes. In particular, the Hutchinson Smoking Prevention Project (HSPP), a rigorous randomized trial designed to examine the effects of a theory-based, social influences curriculum, found no evidence that such an approach affected long-term deterrence of smoking among youth (Peterson, Kealey, Mann, Marek, & Sarason, 2000). The null findings of this study and the considerable heterogeneity in individual outcome (i.e., smoking) suggests the need to move toward transdisciplinary, moderated, and mediated models in primary prevention of risk behavior (Clayton, Scutchfield, & Wyatt, 2000). To sustain long-term change in risk behavior, it appears that researchers and practitioners need to expand school-based prevention within the schools (e.g., health clinics and after-school programs) and to extend efforts into the community (Dryfoos, 1995; Dryfoos & Dryfoos, 1993).

Secondary Prevention in Adolescence

The focus of secondary prevention is on the early identification and treatment of health problems before significant progression has occurred. Secondary prevention efforts are also aimed at altering negative health behaviors after their initiation (e.g., smoking cessation). In general, successful secondary prevention requires adequate documentation of the health problems that are unique to adolescence, as well as a firm understanding of which problems will have negative health trajectories into adulthood. Central to adolescent secondary prevention research is the identification of approaches to screening and intervention that are appropriate and effective for this age group.

Morbidity and Mortality in Adolescence

The targets of secondary prevention efforts are often guided by statistics for mortality (i.e., number of deaths due to particular causes) and morbidity (i.e., number of cases of particular diseases or health-related problems). The leading cause of mortality in adolescence is unintentional injury (National Center for Health Statistics, 1993), the majority of which are motor vehicle fatalities and homicides. Suicide is the third leading cause of death among adolescents and is on the rise (Buda & Tsuang, 1990). Deaths by cancer, cardiac conditions, and AIDS account for most of the remaining mortality among adolescents.

The major causes of adolescent morbidity include substance abuse and dependence, reproductive health problems (e.g., teenage pregnancy and childbearing), and sexually transmitted diseases, including HIV/AIDS. Mental health problems are also considered predominant causes of morbidity among adolescents (Holden & Nitz, 1995).

In addition, the early stages of the predominant chronic illnesses of adulthood may first become detectable in adolescence. For

example, fatty streaks (the presumed precursor to atherosclerotic plaques) in adolescence are correlated with serum cholesterol and blood pressure in this population, and fibrous plaques characteristic of atherosclerosis become evident by age 20 (Newman et al., 1986). Moreover, blood pressure in the high-normal range in adolescence is a strong predictor of adult hypertension (Shear, Burke, Freedman, & Berenson, 1986). Levels of obesity among adolescents have steadily climbed over the past two decades (Centers for Disease Control, 1994), which may be partly due to widespread shifts in dietary habits and the adoption of more sedentary lifestyles in children and adolescents in general. Not only has this trend led to increased physical morbidity among adolescents (e.g., incidence of Type 2 diabetes; Pinhas-Hamiel et al., 1996), but it foreshadows increased rates of adult morbidity and mortality related to sedentary lifestyle and obesity. Thus, prevention of adult chronic illness must be informed by examination of the early pathogenesis of these diseases in adolescence.

Interface of Health and Psychopathology

Mental health and physical health are perhaps more intimately entwined in adolescence than in any other developmental time period. The leading causes of mortality (reckless driving, homicide, and suicide) all have links to underlying psychopathology. Moreover, psychosocial factors related to psychopathology may influence physical morbidity directly through psychophysiological pathways and indirectly through health behavior. With respect to health behavior, social and emotional problems have been associated with a variety of negative health behaviors. For example, depression is reciprocally related to smoking in adolescence (Windle & Windle, 2001). Smoking, in turn, is related to a variety of short-term health complications for adolescence such as respiratory tract infections and declines in physical fitness, in addition to long-term health problems in adulthood.

As Cicchetti and Rogosch (1999) recently noted, care must be taken when deciding what constitutes a problem and what is more aptly considered developmentally normative behavior. In the case of substance use, the majority of adolescents experiment with alcohol, tobacco, and marijuana (Johnston, O'Malley, & Bachman, 1993). Indeed, measures of psychological adjustment indicate that adolescents who experiment with drugs may be better adjusted than those who abstain completely or who consume large amounts (Shedler & Block, 1990). Moreover, the correlates of problem alcohol use are different from moderate use. Colder and Chassin (1999) reported that problem alcohol use is associated with fundamental family disruptions and poor psychological functioning, whereas moderate use is associated with unconventionality and socialization processes specific to alcohol. Successful secondary prevention efforts in adolescence clearly require careful differentiation between emerging disorders and normal development. This is important not only because of the potential for negative labeling effects, but also because of possible iatrogenic effects of secondary prevention programs, particularly those conducted in peer groups (Dishion, Poulin, & Burraston, 2001). Continued longitudinal examination of health-related problems in adolescence will help to identify which difficulties portend continued problems into adulthood and which are relatively benign aspects of normal adolescent development.

In addition to relations with health behavior, social and emotional problems may directly influence physical morbidity through psychophysiological mechanisms (e.g., stress reactivity). Indeed, many of the known psychosocial risk factors for illness in adults have equivalents (and may emerge) in adolescence. These psychosocial variables (e.g., problematic social relations, anger, and aggression) appear to be similar to many of the risk factors for the development of psychopathology. Thus, successfully identifying and treating adolescent health problems early in their development requires that health be placed in the broader context of adolescent adjustment.

Unfortunately, developmental models that consider the interface of physical health per se and adjustment have not been widely articulated. One exception is Ewart's (1994) model of coronary-prone behavior. This model places the development of cardiovascular disease within a social-cognitive framework. Central to this line of research is the examination of how coronary-prone traits (e.g., hostility) originate and develop in childhood and adolescence. Studying the relation between social-cognitive processes and cardiovascular functioning in adolescence is important not only from the perspective of psychosocial epidemiology, but also for the purpose of early detection and prevention. Ewart's model builds on and compliments the existing literature in the related domain of aggression. In addition, the research that has resulted from this model (e.g., Ewart & Kolodner, 1993, 1994) is exemplary in that it (a) derives from a firm understanding of the pathogenesis of the disease (coronary heart disease), (b) examines the reciprocal relations between psychosocial processes (e.g., social competence) and cardiovascular measures, (c) utilizes a multimethod approach to measurement of key constructs, and (d) is longitudinal in nature.

Moderating Variables in Secondary Prevention

As indicated in Figure 1, there are a variety of demographic and interpersonal variables that may moderate pathways to both mental and physical health outcomes in adolescence. The rates of homicide, for example, vary by gender and ethnicity. Homicide is the leading cause of death among African-American adolescents, and the rate of homicide is 400% higher for males compared with females (National Center for Health Statistics, 1993). Gender is also a potent moderator of morbidity among adolescents. Indeed, the well-documented gender differences in self-assessed health (e.g., physical symptom reports and global health ratings) and depression among adults first emerge in adolescence (Ge, Lorenz, Conger, Elder, & Simons, 1994; Kandel & Davies, 1982; Nolen-Hoeksema, 1994; Sweeting, 1995). Longitudinal examination of the interrelation between self-assessed health and depression in adolescents indicates that poorer self-assessed health among adolescent females predicts later depressive symptoms (Williams, Colder, Richards, & Scalzo, in press). These findings are in concert with relations between chronic illness, such as Type 1 diabetes, and depression for adolescent females (Kovacs, Goldston, Obrosky, & Bonar, 1997). Other gender differences include higher incidence and prevalence of eating disorders among adolescent girls and higher rates of substance abuse and antisocial behavior among boys (Steinberg, 1996). These findings, in turn, are moderated by ethnicity. For example, the rate of body image disturbance and eating disorders is markedly lower in African-American

versus Caucasian females (Akan & Grilo, 1995; Cash & Henry, 1995; Rucker & Cash, 1992). These general findings suggest that gender and ethnicity may moderate some of the critical etiological pathways to various forms of morbidity in adolescence.

As discussed above, temperament and personality variables are also potential moderators of adolescent morbidity through risk-taking behavior. In addition, recent research has highlighted the role of SES and community-level variables (e.g., neighborhood) in adolescent well-being (Leventhal & Brooks-Gunn, 2000) and, hence, as moderators of adolescent morbidity and mortality. This is particularly true of violence (Borduin, 1999; Sampson, Raudenbush, & Earls, 1997). Also, the grave problems with respect to access to health care and insurance coverage among adolescents highlight the importance of health care policy in adolescent health (Dougherty, 1993; Ford, Bearman, & Moody, 1999).

Secondary Prevention Intervention

Whereas primary prevention programs target healthy populations prior to the onset of problem behaviors, secondary prevention efforts seek to intervene in populations in which problems have begun to emerge, to prevent the development of more serious problems. Although the distinction between different levels of intervention can be made clear on a theoretical level, in practice, there is overlap. For example, programs such as Project Northland (Perry et al., 1993, 1996) that are designed as primary prevention efforts may have secondary prevention benefits if some individuals in the intervention group have begun engaging in the targeted health behavior (e.g., smoking) prior to the intervention's onset and thus constitute an at-risk group.

Research supports the notion that secondary prevention efforts can reduce the occurrence of future health problems in several realms, including mental health disorders, substance abuse, physical health problems, recurrent adolescent pregnancies, HIV, and STDs (see Durlak & Wells, 1998, for a more extensive review). In each of these areas, intervention programs exist that have yielded promising results in terms of reducing future adolescent health problems, when compared with either a comparison sample of untreated adolescents or adolescents participating in another intervention (some examples include substance abuse [Brown, Henggeler, Schoenwald, Brondino, & Pickrel, 1999; Kivlahan, Marlatt, Fromme, Coppel, & Williams, 1990; Marlatt et al., 1998; Wagner, Brown, Monti, Myers, & Waldron, 1998] hypertension risk [Ewart, Young, & Hagberg, 1998]; HIV risk [Jemmott, Jemmott, & Fong, 1992, 1998]; and pregnancy [Levy, Perhats, Nash-Johnson, & Welter, 1992; Seitz & Apfel, 1993]).

In addition to school-based interventions, some adolescents with emerging health-related problems may require individually focused intervention. For example, adolescents who have already developed dependency on tobacco may benefit from an individual smoking cessation program. Unfortunately, our knowledge of the optimal methods of treating adolescents with emerging dependency on tobacco is limited and it is not clear that interventions that have been validated with adults are appropriate (Henningfield, Michaelides, & Sussman, 2000).

Wide variation exists with respect to the extent of understanding of various adolescent health problems. Much more is known about secondary prevention of adolescent substance use and abuse, for example, than exercise or dietary habits in this population. These

behaviors deserve more attention, as exercise and dietary habits established in adolescence, as well as the physical health sequelae (e.g., obesity and hypertension), tend to continue into adulthood (Contento & Michela, 1999; Must, Jacques, Dallal, Bajema, & Dietz, 1992). Long-term outcomes of behavioral weight loss intervention have been more successful in preadolescents than in adults (Jeffery et al., 2000), suggesting that adolescence is a critical period for examination of factors related to the treatment of obesity.

An important limitation to both school-based and individually sought secondary prevention intervention is that adolescents who are perhaps at highest risk—high school dropouts—are not reached through these mechanisms. Adolescents who experience academic failure and who drop out of school early are more likely to engage in risky behavior and are, therefore, prime targets for secondary prevention. Unfortunately, this population is exceedingly difficult to reach and engage in intervention. It is clear that future secondary prevention research should focus on innovative community-based methods for targeting this important segment of the population.

Tertiary Prevention in Adolescence

Although tertiary prevention may focus on any disease or condition that may cause lasting or irreversible damage (e.g., rehabilitation of a serious injury or substance dependence), we focus this section on chronic illness in adolescence. On the one hand, chronic illness among adolescents represents a relatively small proportion of total morbidity (Holden & Nitz, 1995). On the other hand, adolescence is a critical time point in which a variety of developmental issues may affect long-term health outcomes. For example, during adolescence, the management of an ongoing chronic illness typically shifts from being the primary responsibility of the parent to self-management on the part of the adolescent. This shift, as we describe below, occurs within the context of other developmental transitions.

Chronic Illness in Adolescence

It is estimated that between 10% and 20% of adolescents have a chronic physical condition, although many of those are relatively minor (Gortmaker, 1985). Serious chronic diseases that characterize adolescence include asthma, Type 1 diabetes, cystic fibrosis, cancer, juvenile rheumatoid arthritis, and sickle-cell disease, as well as disabilities such as spina bifida and cerebral palsy. In addition, the incidence of HIV/AIDS has increased in adolescence. These disorders currently have no cure, making disease management of paramount importance. Moreover, management of all of these disorders is largely behavioral and lifelong. As is true of primary and secondary intervention targets, an understanding of how chronic illness interfaces with biopsychosocial developmental processes among adolescents is crucial to intervention and research focused on successful management of disease.

Developmental Perspective on Chronic Illness During Adolescence

In addition to negotiating the challenges that are characteristic of normative adolescent development, adolescents with chronic

illnesses and their families must meet the demands of managing their disease. Indeed, chronic illness management is often at odds with normal adolescent strivings, placing considerable stress on both the adolescent and the family. Moreover, with some chronic conditions, adolescents are more likely to exhibit adjustment problems (Lavigne & Faier-Routman, 1992), including higher levels of internalizing symptoms (e.g., depression, suicidal ideation, and anxiety), social withdrawal, and lower levels of self-esteem than comparison children (e.g., asthma [Padur et al., 1995], cystic fibrosis [Thompson, Gustafson, & Gil, 1995], diabetes [Goldston et al., 1997], sickle-cell disease [Thompson et al., 1995], and spina bifida [Ammerman et al., 1998; Appleton et al., 1994; Blum, Resnick, Nelson, & St. Germaine, 1991]).

With respect to the primary developmental changes of adolescence (see Figure 1), the onset of puberty in adolescents may be either delayed or early as a result of their disorder. For example, the onset of puberty in adolescents with spina bifida often occurs earlier than in able-bodied children (because of early activation of the hypothalamopituitary-gonadal axis, secondary to hydrocephalus; Brauner, Fontoura, & Rappaport, 1991; Greene, Frank, Zachmann, & Prader, 1985). Thus, such children may be physically more mature than their age mates but, because of their higher levels of social isolation during late childhood and adolescence (Blum, et al., 1991), they may be socially less mature than their peers. Such precocious or advanced puberty may also necessitate parent-child discussions of sexuality at an age when children may not be cognitively ready to assimilate such information.

On the other end of the continuum, adolescents with cystic fibrosis are typically delayed in growth and pubertal development (Sawyer, Rosier, Phelan, & Bowes, 1995), and adolescents with diabetes perceive themselves to be delayed with respect to physical maturity compared with their healthy peers (Seiffge-Krenke, 1998). Thus, chronic illness and disabilities in adolescents are often related to being off time in both perceived and actual pubertal development compared with their healthy counterparts, thus setting the stage for body image concerns as well as potential asynchronies between the adolescent's physical and social development.

With respect to cognitive development, adolescence is associated with advances in problem-solving ability. However, these advances may not translate into improvement in disease management among adolescents. Indeed, declines in adherence to medical regimens on entering adolescence has been a consistent finding across chronic illnesses (Quittner, Drotar, et al., 2000; Ricker, Delamater, & Hsu, 1998; Thomas, Peterson, & Goldstein, 1997). The extent to which chronic illnesses impede normal cognitive development has not been widely researched. For example, it is not known whether hydrocephalus, characteristic of spina bifida, interferes with the development of advanced cognitive abilities during adolescence (Wills, 1993). There is some evidence, however, that sickle-cell disease may negatively affect neuropsychological functioning (Noll et al., 2001). With respect to Type 1 diabetes, short-term cognitive impairment associated with hypo- and hyperglycemia has been well-documented, but the long-term consequences of glucose fluctuations on cognitive functioning have yet to be fully explored (Weinger & Jacobson, 1998).

The role of the interpersonal relations has been central to research regarding adjustment to chronic illness, regimen adherence, and disease outcomes in adolescents. Relations with family, in

particular, predict many important psychological and physical outcomes in adolescent chronic illness (Jacobson et al., 1994; Miller-Johnson et al., 1994; Thompson et al., 1999; Wysocki, 1993). In addition, parental resources may buffer the effects of stress on psychosocial functioning in chronically ill adolescents (Timko, Stovel, Baumgartner, & Moos, 1995). However, parental involvement can also be detrimental when parents exhibit *miscarried helping* (Coyne & Anderson, 1988), characterized by fostering dependency and low self-efficacy on the part of the adolescent. Overall, these findings suggest that a central focus of intervention with chronically ill adolescents and their families is to promote positive parental involvement and minimize parent-adolescent conflict (Anderson, Brackett, Ho, & Laffel, 2000). Several critiques of this literature have noted the need to better use a normative, developmental framework in characterizing the families of children and adolescents with chronic illness (Drotar, 1997; Kazak, 1997).

Research has typically found that peer relations among adolescents with chronic illness appear very similar to their healthy counterparts (Jacobson et al., 1997; Noll et al., 1996). With respect to the effect of peer relations on chronic illness management, prior research suggests that friends may provide different kinds of support compared with family members. For example, families of adolescents with diabetes tend to provide instrumental support related to adherence behaviors (e.g., insulin injections), whereas friends are more likely to provide emotional support related to the adolescent's diabetes (La Greca et al., 1995). Indeed, perceived support from peers appears to be predictive of adaptation to chronic illness (Varni, Katz, Colegrove, & Dolgin, 1994).

Regarding the characteristic developmental outcomes of adolescence (Figure 1), behavioral autonomy is likely to be a particularly salient issue for adolescents with chronic illness. Indeed, nonadherence with a prescribed medical regimen may be a (potentially dangerous) manifestation of developmentally appropriate autonomy strivings (Anderson & Coyne, 1993; Brooks-Gunn, 1993; Holmbeck et al., 1998). As outlined above, psychosocial adjustment is of central concern in adolescent chronic illness populations and has been documented to influence disease outcomes. For example, psychiatric diagnosis and suicidal ideation are related to nonadherence to diabetes regimens (Goldston et al., 1997), and higher self-esteem is related to better regimen adherence in children and adolescents with cystic fibrosis (Ricker et al., 1998).

The relations described above may depend on a variety of moderating variables, in particular, gender. For example, disordered eating behavior has been identified as a significant problem among adolescent females with Type 1 diabetes. Indeed, the increase in incidence of eating disorders that occurs on pubertal development in adolescent females appears to be amplified among those with diabetes (Neumark-Sztainer et al., 1996). Of particular concern is the practice of intentional omission or underdosing of insulin as a weight control strategy. Indeed, such weight loss practices and disordered eating behaviors among adolescent females with diabetes are associated with impaired metabolic control and higher risk of diabetic retinopathy (Polonsky et al., 1994; Rydall, Rodin, Olmsted, Devenyi, & Daneman, 1997). Moreover, family functioning appears to bear stronger relations to diabetes outcomes in girls versus boys (Dumont et al., 1995).

Temperament and personality dimensions are another set of potential moderating variables related to chronic disease outcomes

in adolescence. For example, Wiebe, Alderfer, Palmer, Lindsay, and Jarrett (1994) found that trait anxiety significantly influenced symptom perception and interpretation among adolescents with Type 1 diabetes. These findings suggest that further study of personality dimensions in the management and progression of chronic illness in adolescence is warranted. In addition, neighborhood and community variables are beginning to receive attention as potential moderators in adolescent tertiary prevention research (Obeidallah, Hauser, & Jacobson, 2001).

As we continue to refine our models of psychosocial adjustment and disease management, our findings will become increasingly useful to interventionists who seek to design programs that improve both disease outcomes and the quality of life of adolescents with chronic conditions. Subsequently, we discuss interventions used with adolescent chronic illness populations.

Interventions for Adolescents With Chronic Illnesses

Psychosocial interventions for adolescent chronic medical conditions have targeted a variety of clinical issues, including treatment adherence, psychological adjustment, quality of life, stress management, medical procedure preparation, and family relations. Such interventions have been based on a variety of formats (e.g., individual intervention, interventions with parents, family-based intervention, and group therapy) and have utilized various therapeutic strategies (e.g., information provision, desensitization, distraction, imagery, modeling, rehearsal, relaxation, and stress inoculation; see Bearison, 1998; Thompson & Gustafson, 1996). However, intervention studies make up a minority of published research studies in the field of pediatric psychology (less than 15%; La Greca & Schuman, 1999). The relative paucity of tertiary intervention studies may be attributable, in part, to the methodological difficulties in studying pediatric populations (e.g., the low prevalence of many disorders often necessitates multisite trials to obtain adequate samples; Quittner, Drotar, et al., 2000).

Of the potential disease-related foci of tertiary prevention in adolescence, adherence to medical regimens has received perhaps the most attention. The importance of treatment adherence has been most strongly established for diabetes. The Diabetes Control and Complications Trial (Diabetes Control and Complications Research Group, 1993) clearly established that tight control of blood glucose levels is central to minimizing subsequent diabetes-related complications. For most other chronic illnesses of adolescence, however, the link between regimen adherence and improvements in disease outcome has been less well-established (Drotar et al., 2000). Moreover, with the exception of asthma and diabetes, there are no national guidelines for the treatment of most chronic illnesses in adolescents, making it difficult to clearly establish what optimal treatment adherence entails (Quittner, Drotar, et al., 2000).

In general, interventions designed to influence regimen adherence and disease-related outcomes in chronically ill adolescents have met with limited success. For example, Wysocki et al. (2000) investigated the effectiveness of Behavioral Family Systems Therapy (BFST; Robin & Foster, 1989) in families of adolescents with diabetes. Compared with education and support or standard medical care, BFST yielded more improvement in parent-adolescent relations and diabetes-specific conflict. However, there were no effects on regimen adherence, diabetes control, or health care use.

In a similar manner, Boardway, Delamater, Tomakowsky, and Gutai (1993) found that stress management training reduced diabetes-specific stress, but did not influence regimen adherence or metabolic control. Somewhat more promising is an intervention focused on parent-adolescent teamwork in diabetes management, which has been shown to be effective in maintaining parental involvement in regimen adherence and metabolic control (Anderson, Brackett, Ho, & Laffel, 1999). In addition, coping skills training appears to enhance the effectiveness of intensive diabetes management in improving metabolic control (Grey et al., 1998). With respect to intervention with adolescents with asthma, the Triple A Program, a peer-led education program, has been shown to lead to clinically relevant improvement in quality of life and asthma-related morbidity (Shah et al., 2001).

Given the relative paucity of tertiary prevention intervention studies with adolescents, it is difficult to make firm conclusions about the effectiveness of psychological interventions in this population. Although some interventions appear promising in improving psychological adjustment, this has not uniformly led to improvements in disease outcomes. Whereas some interventions have demonstrated short-term improvements in disease management for diabetes and asthma, it is not known whether the improvements are maintained over time. For the preponderance of chronic illnesses of adolescence, little is known about optimal approaches to or efficacy of tertiary prevention. Indeed, in a recent review of treatment for regimen adherence in pediatric populations, Lemanek, Kamps, and Chung (2001) identified no interventions as well-established. Establishing empirically validated approaches to intervention in chronically ill adolescents appears to be a priority for future research.

The Future of Adolescent Health Psychology

As is evident from our overview, there has been a proliferation of clinical research on health-related issues in adolescence in the past decade. The biopsychosocial changes that characterize adolescent development play a critical role in the etiology and treatment of health behavior, the onset of health problems, and the adjustment and management of chronic health conditions in this population. We have emphasized that successful intervention at any level of health and illness with adolescents requires a sound understanding of normal adolescent development. Because there are so many unique aspects to adolescent development, and because the manner in which the transition from childhood to adulthood is negotiated may affect lifelong health, we believe that a focus on adolescence in health psychology will continue to increase. Looking ahead, we highlight what we believe to be some important directions for future clinical health research with adolescents.

An Increased Focus on Reciprocal Relations

Future research must be based on explanatory models that accurately reflect the complexity and transactional nature of relations between health-related outcomes and the variables thought to predict those outcomes. For example, there are likely gene-environment interactions that characterize many relations outlined in this article. Moreover, there are clearly reciprocal relations between health problems and various predictors. For example,

poor health and risk behavior likely affect the quality and nature of peer relations (Brown, Dolcini, & Leventhal, 1997) and cognitions (Gerrard, Gibbons, Benthin, & Hessling, 1996), just as peer relations and cognitions affect health and health behavior.

Greater Attention to Moderators and Mediators

Across levels and foci of intervention, research has documented considerable individual variability in outcomes, suggesting a need to more carefully consider moderating factors (e.g., gender, ethnicity, temperament, SES, and community variables). In a similar manner, in many content areas of adolescent health psychology research, the focus must now be on explicating the mechanisms by which change occurs and by which psychosocial factors influence the development of disease in this population (see Holmbeck, 1997, for more extensive discussion of moderation and mediation in pediatric psychology).

Expansion of Research Methodologies

Although the emphasis on longitudinal studies has been beneficial in tracking trajectories of adolescent health-related variables over time, the conclusions that can be made from such studies are constrained by the time frame of assessments (e.g., annual). To capture the hypothesized processes of our current theories, researchers should consider alternate methodologies to supplement the longitudinal approach. Of particular promise are within-subject monitoring strategies, such as experience-sampling methodologies (ESMs; e.g., Larson & Richards, 1989) and daily diary methods (Quittner, Espelage, Ievers-Landis, & Drotar, 2000), which have already been successfully applied in studies of adolescents. In addition, experimental approaches could be more extensively used in adolescence health research, particularly to explicate mechanisms underlying psychophysiological pathways to disease.

Greater Consideration to Cognitive Processes

Interventions must be based on a sound understanding of the cognitive processes inherent in adolescent decision making, and far more attention must be devoted to examination of the cognitive mediators (i.e., mechanisms) of change in intervention research. As Beyth-Marom and Fischhoff (1997) noted, poor measurement and conceptualization of adolescent cognition has likely led to general misconceptions of adolescents' decision making, particularly with respect to engaging in risk behaviors. To this end, the articulation of a general, developmental model of health cognition and related health self-regulatory behavior relevant to adolescence is sorely needed.

Development of Global Prevention Programs

Global prevention programs that incorporate protective factors and target multiple risk factors can be broadly beneficial, because different adverse outcomes, both psychological and physical in nature, appear to have common risk factors. For example, secondary prevention efforts focused on early detection of precursors to psychopathology (e.g., aggression) could be expanded to include measurement and consideration of health outcomes. Thus, greater collaboration between adolescent health researchers, psychopa-

thologists, and traditional community psychology researchers would foster more efficient research and intervention strategies.

A Greater Focus on Resiliency

It is important for future research to not only continue to identify why poor health behavior and related negative outcomes occur, but also to clarify why some adolescents do well from a health perspective, even when key risk factors are present (e.g., Jessor, Turbin, & Costa, 1998). To this end, a variety of statistical approaches have been developed to investigate resiliency (e.g., prodigal analyses; Cairns, Cairns, Rodkin, & Xie, 1998).

Improved Consideration to Age and Developmental Transitions

Despite advancements in applying a developmental framework to adolescent health psychology research, the manner in which age is treated both statistically and with respect to sampling methods is often inadequate. For example, it is not unusual for studies of children, particularly in tertiary prevention research, to use a sample ranging in age from 5 to 25 years. The practice of treating age as a covariate is not an optimal solution, and sample sizes may not provide adequate power to detect interaction effects. Thus, future adolescent health research must give greater consideration to developmental issues when selecting clinical samples and when conducting and interpreting data analysis. A focus on the interface between normative developmental issues and health outcomes must be central to clinical research with adolescents. In particular, the transition from late adolescence to early adulthood has been relatively neglected. Many health-relevant risk behaviors peak during this time period, and independence from parents is often finalized. Indeed, it has been argued that emerging adulthood should be considered as a distinct developmental period (Arnett, 2000). Although some notable health-relevant research has been devoted to college populations (e.g., alcohol use; Marlatt et al., 1998) it has been rather circumscribed, and scant attention has been given to non-college-attending young adults (Arnett, 2000).

Development of Empirically Validated Treatments

In concert with other areas of clinical and consulting psychology, there must be an increased focus on demonstrating the efficacy of interventions targeting adolescent health outcomes, particularly in the area of disease management. To this end, clinical researchers will also need to consider conducting cost-benefit analyses of psychological interventions (e.g., in relation to medical and/or biological treatments).

Recent years have seen a proliferation of research devoted to understanding factors that affect the health of adolescents. Nevertheless, there are enormous gaps in our current knowledge. Given the importance of adolescence to health throughout adulthood, this age group cannot be neglected in health psychology and behavioral medicine. The successful construction of a comprehensive health psychology of adolescence will require an interdisciplinary research effort focused on the complex biopsychosocial changes that characterize this critical period of development.

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