# The Science of Adolescent Risk-Taking: Workshop Report

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# THE SCIENCE OF ADOLESCENT RISK-TAKING

## WORKSHOP REPORT

Committee on the Science of Adolescence

Board on Children, Youth, and Families

INSTITUTE OF MEDICINE *AND*
NATIONAL RESEARCH COUNCIL
*OF THE NATIONAL ACADEMIES*

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# Reviewers

This workshop report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the process. We wish to thank the following individuals for their review of this report:

**Trina Anglin,** U.S. Department of Health and Human Services, Health Resources and Services Administration, Rockville, MD
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Although the reviewers listed above provided many constructive comments and suggestions, they did not see the final draft of the report before its release. The review of this report was overseen by **Nancy E. Adler,**

Departments of Psychiatry and Pediatrics and Center for Health and Community, University of California, San Francisco. Appointed by the Institute of Medicine and the National Research Council, she was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authors and the institution.

# Contents

# Preface

The Board on Children, Youth, and Families (BCYF) of the Institute of Medicine and the National Research Council (NRC) has organized a series of planning meetings, workshops, and consensus studies over the past decade that address different facets of adolescent health and development (see www.bocyf.org). One focus of this work involves threats to adolescent health and well-being that inhere in young people's inclination to engage in risky and reckless behavior. While many of these risks also affect young and even older adults, the circumstances of adolescence—including rapid developmental changes and physical growth as well as family and social contexts—mean that risk behavior at this stage is different in significant ways from adult behavior. The board has found considerable evidence that the greatest contributors to morbidity and mortality in adolescence are not disease and illness, but instead such behaviors as unsafe driving; experimentation with alcohol, tobacco, and illicit drugs; involvement in crime; and unsafe sex (NRC and IOM, 2001, 2004, 2006, 2007).

Although significant progress has occurred in the study of adolescent risk-taking, the board observed that findings from this body of work had not been integrated across disciplines (e.g., neuroscience, psychology, sociology, public health) or risk domains (e.g., substance use, sexual risk-taking, delinquency). The board further thought that prevention and health promotion efforts would be informed by a systematic examination of current theory and research on adolescent risk-taking that drew on contributions from multiple disciplines and that focused on different risk behaviors.

From these decisions emerged a proposal for a series of workshops that would bring together scientists from a broad array of disciplines, including researchers who study adolescent brain, pubertal, cognitive, and psychosocial development; the influences of the family, peer group, school, neighborhood, community, and mass media on adolescent behavior; adolescent physical health, mental health, substance use, delinquency, sexual behavior, and driving; and approaches to the prevention of unhealthy adolescent risk-taking. The workshops and the formation of the committee that helped plan and convene them were funded by three offices in the U.S. Department of Health and Human Services: the Administration for Children and Families; the Office of the Assistant Secretary for Planning and Evaluation; and the National Institute on Drug Abuse.

The first of the three workshops convened by the Committee on the Science of Adolescence focused on the prevalence and nature of adolescent risk-taking and on the potential contributions of the neural, biological, intellectual, and socioemotional developments characteristic of adolescence. The second workshop examined interpersonal, institutional, and contextual influences on adolescent risk behavior. The final workshop integrated lessons learned from the previous two workshops, combining the prior emphases on individual and contextual influences and examining the potential implications of this work for policy and practice.

This report summarizes the presentations and discussions from the three workshops.[1] It can serve to introduce readers to a small portion of current theory and research on contributors to risky behavior in adolescence. It is not intended as a comprehensive summary of the existing body of literature, nor does it make any specific recommendations. Its purpose is to stimulate further work on the subject and to encourage more of the cross-disciplinary thinking that characterized the workshops themselves. It is important to note that the workshop presenters were given a range of assignments and also took different approaches in their presentations. Some provided detailed overviews of research literature, whereas others were asked to discuss theoretical issues more abstractly or to explore links among different disciplines. This summary, which can only describe what was presented, reflects these variations and thus some sections include more thorough supporting citations than others.

We are particularly grateful for the contributions of the expert presenters, paper authors, and workshop participants who contributed to the meeting (see the appendixes for the workshop agendas and lists of participants). Special appreciation also goes to the members of the com-

[1] Presentation materials from these workshops are available at http://www.bocyf.org/adolescent_science_3workshops.html.

mittee, who volunteered their time and intellectual efforts to shape the workshop programs and identify themes and contributors. In addition, we give special thanks to Alexandra Beatty, who prepared a comprehensive draft of the summary report; Jennifer Appleton Gootman, who directed the planning and workshops preparation and the production of the final publication; and Reine Y. Homawoo and Wendy Keenan, who assisted with preparation of the workshops and the final report.

Laurence Steinberg, *Chair*
Committee on the Science of Adolescence

# 1

# Introduction: Why Study Adolescence?

Adolescence has long been recognized as a period of heightened risk-taking and, accordingly, a stage that requires special oversight from adults.[1] Nevertheless, expectations regarding this period—and views of how adolescents should be treated—have varied. A common subject of social commentary in the United States is that young people today begin adolescence too early and leave it too late.[2] The decline in the age of onset of menarche for girls—from approximately age 17 in 1830 to just under age 13 by the middle of the twentieth century (Susman et al., 2010)—as well as the challenges of achieving financial independence in the current U.S. economy both support the idea of a protracted adolescence. This idea that adolescents undergo a protracted period of development is not unique to modern times, however. As early as 1563 an English statute decreed that all craftsmen should complete an apprenticeship of at least 7 years because "until a man grows into 23 years, he for the most part, though not always, is wild, without judgment and not of sufficient experience to govern himself" (Hibbert, 1987).

[1] G. Stanley Hall was a pioneer in the scientific study of adolescence, defining it in 1904 as a time of storm and stress, although it was identified as a distinct phase of life as early as the fourth century BC.

[2] See, e.g., "A Generation of Gripers . . . and How They Grew," *Psychology Today*, May 1992; "It's Time to Grow Up—Later," *USA Today*, September 30, 2004, by Sharon Jayson; "It's Cooler Than Ever to Be a Tween, but Is Childhood Lost?" *USA Today*, February 2, 2009, by Sharon Jayson.

Most adolescents progress to adulthood with relatively little difficulty, experiencing excellent physical health and strength and not engaging in behaviors that put themselves or others at risk. Others, however, take many sorts of unhealthy risks—in their sexual behavior, in driving, in substance use, in criminal activity—or experience emotional distress or mental health disorders. For a substantial number of adolescents, the consequences are severe: they may limit a young person's opportunities to grow into a productive adult, they are the source of lifelong health problems, and they result in a significant risk of injury and death for adolescents.[3]

Many adolescent risk behaviors—particularly poor driving, either with or without concomitant use of alcohol or illicit substances, and crime—also put others at risk, and all of these factors together make the prevention of risk behaviors in adolescence an important public health issue. Risky adolescent driving illustrates well the seriousness of the public health concern. According to the Centers for Disease Control and Prevention, one in three deaths among teenagers is caused by a motor vehicle crash, which translates into 4,544 deaths among 16- to 19-year-olds in 2005, in addition to the deaths of others involved in the crashes caused by adolescents. These statistics do not capture injuries or other damage, nor do they reflect the economic cost—the cost of all crashes involving drivers ages 15 to 20 in 2002 was $40.8 billion (U.S. Department of Transportation, 2003).

Researchers have produced a substantial body of work on the biological and psychological changes that occur during adolescence, as well as the family, peer, and cultural influences that shape adolescents' lives in important ways. This evidence—as well as the evidence-based practice of health care practitioners and others who work with adolescents—can guide current and future efforts to promote healthy behavior and also to prevent risky behaviors that are prevalent during this stage of development. The Institute of Medicine and the National Research Council formed the Committee on the Science of Adolescence, with the support of the U.S. Department of Health and Human Services' Administration for Children, Youth, and Families (ACF), the Office of the Assistant Secretary of Planning and Evaluation (ASPE), and the National Institute on Drug Abuse (NIDA). The committee planned and convened a series of three public workshops in 2008 and 2009 to review the science of adolescence from a

[3] The definition of developmental stages is an evolving process and some researchers have argued for identifying emerging adulthood—a time between physical maturation and fiscal independence—as a distinct phase. The workshop series focused on adolescence as it is generally understood currently—that is, the stage from the end of childhood and beginning of puberty to the cusp of adulthood, or approximately the late teens and early twenties.

life-course perspective and to explore the implications of this research for the design, implementation, and evaluation of prevention programs for adolescents, as well as other means of fostering healthy development.

## WORKSHOP APPROACH

The three workshops examined scientific work on processes both within individuals and in the environment, including social factors that affect behavior during adolescence. The goals were to bridge multiple disciplines in the biological, health, social, and behavioral sciences; identify ways of integrating findings from each of these fields that can improve understanding of why adolescents engage in risky behavior; improve strategies for prevention and intervention; and flag areas in which further research is needed.

The workshop series began on November 20, 2008, with presentations by committee members (and one outside guest). The first workshop featured overviews on the physical and mental health status of adolescents and data trends on the nature, prevalence, historical trends, developmental course, and demographic variations of adolescent risk behaviors, including sexual risk-taking, substance use, criminal behavior, and risky driving. The afternoon presentations focused on individual processes that may inform prevention and intervention efforts. A panel on biological, cognitive, and psychosocial influences on adolescent risk behavior examined the extent to which context (e.g., family, peers, school, neighborhood) relates to or affects individual processes and how an understanding of individual development in adolescence may inform prevention and intervention. Areas of focus included puberty and neuroendocrine changes, brain development, cognition and decision making, and psychosocial development.

Following this workshop, the committee met and identified areas that would be the basis for the subsequent workshops. Following from the first workshop's focus on individual-level influences, the committee planned the second workshop to focus on social and environmental influences. The committee also considered the importance of discussing integration among individual processes and social and environmental influences and therefore decided on a third workshop to focus on integrative thinking.

The second workshop—on social and environmental influences on adolescent risk behavior—was held on May 28, 2009. A series of presentations covered the following areas of influence: family, siblings, peers, schools, communities, and the media. Presenters explored evidence on the extent to which these various factors influence adolescent risk behavior and discussed how this knowledge can inform the development of prevention, health promotion, and treatment interventions.

Following the second workshop, the committee identified areas in which the integration of individual biological, cognitive, and psychosocial influences and social and environmental influences may further the understanding of adolescent risk behavior. Seven papers were commissioned around topics identified by the committee, and these papers served as the basis for the presentations at the third workshop, held on December 14, 2009. These presentations considered the impact of various influences and contexts—including public policy, biology, family, schools, and community—on adolescent risk behavior. Presenters considered overarching lessons about the genesis of risky behavior in adolescence, as well as how knowledge could be integrated across domains of influence. They discussed next steps in the science agenda and whether current approaches to the study of adolescent risk behavior should change and, if so, in what ways.

This report describes the information presented and discussed at the three workshops and highlights key observations from the evidence that is relevant to adolescent risk prevention and health promotion.[4] We note that the workshop series included structured discussions designed to elicit varying research perspectives as well as more formal, data-based presentations—and that presenters took a variety of approaches to the tasks they were asked to undertake. This report, which is intended only to document what was presented and discussed during the three public workshops, reflects this variation.

Experiences in the prenatal and early childhood periods may have significant influences on life-course development, including adolescence, predisposing individuals to particular outcomes. Nevertheless, rather than life-course developmental issues, the workshop series focused on adolescent risk behaviors for several reasons. First, this developmental period presents significant threats to young people's health, development, and safety. Second, research on this topic is fragmented across disciplines: although many biological processes and other influences that are specific to this period increase susceptibility to risk-taking and therefore have a lifelong influence on health and well-being, research on them has remained overly segregated within individual disciplines. Bringing this work together is therefore needed to advance research and its applications. For example, recent research on adolescent brain development has provided new insights and opened up new possibilities for intervention. This research, discussed in detail in Chapter 3, suggests that there may be some neurobiological factors or mechanisms that affect adolescents regardless of their social context. This is not to say that social and cultural

[4] Agendas for each workshop and lists of workshop participants are included in Appendixes A, B, and C.

factors are unimportant. The experience of adolescence—and patterns of risk-taking—are likely to vary in important ways around the world. However, very little research has been conducted on cross-national variation in adolescent risk behavior; consequently, this report reflects the fact that the bulk of the research currently available draws on data collected in the United States.

## STRUCTURE OF THE REPORT

Following this introduction, Chapter 2 sets the stage for an exploration of the research by providing a portrait of the physical and mental health status of adolescents in the United States and describes the risks some young people are taking. The next three chapters describe theoretical explanations for why adolescence is a high-risk stage of development and why some adolescents engage in more risky behaviors than others. Chapter 3 examines biobehavioral processes related to risk-taking, and Chapter 4 focuses on social and cognitive theories regarding decision making. Chapter 5 describes research on sociological and contextual factors and some of the variables that may help link context and behavior, such as values, social skills, and social supports. The closing chapter explores possibilities for integrating these perspectives, highlighting practical approaches to minimizing risk. It also describes specific areas in which additional research is needed.

# 2

# Adolescents and the Risks That Affect Them

Broadly speaking, adolescence is understood to mean the period between childhood and adulthood. Although the precise age range it encompasses is debatable, it is agreed that during this period young people experience rapid physical and cognitive growth, reach puberty, and move from the relative security of childhood to confront an array of social and other life challenges. Adolescents are defined here as 10- to 19-year-olds and are currently 13.9 percent of the U.S. population. They are generally healthy, yet an overview of the health status of this demographic group illustrates the breadth of the public health challenge they present.

This chapter begins with a portrait of the health and circumstances of U.S. adolescents and then takes a close look at a few of the most prevalent risks they take—sexual risk-taking, substance use, illegal behavior, and risky driving. The chapter closes with a look at the most common emotional disorders that affect them.

## OVERVIEW OF HEALTH AND RISK FACTORS THAT AFFECT ADOLESCENTS

Demographically, adolescents are a changing group, as workshop presenter Robert Wm. Blum explained. In 1980, 80 percent of young people ages 15 to 24 in the United States were white. In 2010, that figure is closer to 60 percent, and by 2040 it is projected to be under 50 percent (Mulye et al., 2009). As in the population at large, the fastest growing group is of Hispanic and Latino origin.

Similar disparities are evident in death rates for different subgroups of teenagers. American Indian/Alaskan native adolescents had the highest rate in 2003 (91 per 100,000), and those of Asian/Pacific Islander descent had the lowest (37 per 100,000). Black youth had the second-highest rate: 82 per 100,000. Deaths in this age group are largely preventable. A total of 75 percent of all deaths in the second decade of life are caused by vehicular injuries, homicide, or suicide, climbing from 47 percent for 10-year-olds to 81 percent for 18-year-olds. Trends in mortality from vehicular crashes support the proposition that many of the risks that affect adolescents can be mitigated through legislative interventions—an important reason to explore risk patterns closely. Deaths from vehicular crashes among young people fell by 38 percent between 1988 and 1992 and have stabilized at approximately 1992 levels. The primary reason, Blum observed, is the 1984 Uniform Drinking Age Act, which required states to raise the drinking age to 21 as a condition of federal funding.

Youth violence is another area, in Blum's view, in which public policy has an important influence. The United States has a higher rate of deaths by firearm among children and youth than the rates of the next 25 industrialized nations combined. Despite an almost 50 percent decline in the nation's overall victimization rate between 1993 and 2005, 3.4 million teens annually are victims of violence. Data from the Youth Risk Behavior Surveillance System (YRBSS) also show that, in 2005, 4.2 percent of male adolescents and nearly 11 percent of females reported having been physically forced to have sex, although this type of violence is often difficult to measure (CDC, 2009). One-third of all firearm deaths among young people are self-inflicted. YRBSS data indicate that, in 2005, 17 percent of youth contemplated suicide and 13 percent said that they had made a suicide plan.[1]

Turning to morbidity, Blum highlighted trends in substance use from the Monitoring the Future survey (http://monitoringthefuture.org). There has been a decline of approximately 20 percent among young people who report having used an illicit substance in the past month: in 2005 that figure was 16 percent, compared with over 19 percent 4 years earlier. Alcohol use has declined from a high in 1979, when more than 70 percent of 12th graders reported having used it in the past 30 days, to just over 40 percent in 2005 (there were similar declines for 8th and 10th graders). Cigarette smoking is at the lowest point since the Monitoring the Future survey began data collection, with 14 percent of 12th graders smoking daily, compared with 24 percent in 1997, for example. In contrast, the use

[1] These data are updated regularly; see http://www.cdc.gov/HealthyYouth/yrbs/index.htm for the most recent statistics [September 2010].

of prescription drugs (e.g., OxyContin, Vicodin) by adolescents is showing an upward trend.

Between 1995 and 2007, there was a steady decline in the percentages of both girls (from 51.7 to 46.8 percent) and boys (from 55.3 percent to 46.0 percent) reporting that they had had sexual intercourse (Abma et al., 2004). These rates parallel declines in the rates of teen pregnancy or having caused a pregnancy (Guttmacher Institute, 2010). The largest decline in having caused a pregnancy was among African-American males. However, these declines have reversed in the past 2 years; in 2006, the teen pregnancy rate increased for the first time in more than a decade, rising by 3 percent, and the teen birth rate increased by 4 percent (Guttmacher Institute, 2010). Blum suggested that the apparent increase in unsafe sex indicated by these numbers is a source of concern in part because young people (in this case defined as ages 15-24) account for nearly half of all sexually transmitted diseases in the United States: 4.6 million cases of human papillomavirus, 1.9 million cases of trichomoniasis, and 1.5 million cases of chlamydia, for example (Weinstock et al., 2004).

Another serious health concern for young people is obesity, which increased threefold between 1991 and 1999. Whereas the increase appears to have slowed, in recent studies 31.9 percent of children and youth were at or above the 85th percentile for body mass index (BMI, a formula for calculating a person's relative weight for their given height). The sharpest increases have been among black and Mexican-American youth. Obesity, a chronic illness that can have profound effects on health as well as social and economic consequences, is likely to be a lifelong problem for those who experience it during adolescence: 80 percent of all young people who are obese on their 18th birthday are likely to remain so throughout their lives. Rates of asthma also increased from the early 1980s through 1995 (with a decline since 1995 that may reflect an altered definition of chronic asthma (Akinbami, 2006).

For Blum, this portrait of the threats to adolescent health underlies the importance of understanding the interrelationships between environmental and individual factors. Adolescents, like younger children, experience high rates of poverty: among all adolescents, nearly 40 percent are either poor or near-poor, and adolescents who are black or Hispanic are twice as likely to be in one of those categories as those who are white. Families living in poverty and in low-income neighborhoods, he pointed out, have fewer financial resources and less social capital (the support of extended family and community networks), while also tending to experience more social disorganization and discrimination—other factors that expose young people to stress and risk. Strong support from and ties to school, family, and community, in contrast, are sources of protection. Individual biological factors, such as brain development (which he noted

to be heavily influenced by the social and physical environments in which a young person lives) and innate temperament, interact with these environmental factors in complex ways. He presented a model (Figure 2-1) to illustrate the way these sources of risk and protection interact, providing a backdrop for detailed discussion of each of these influences.

## RISK-TAKING

As the general portrait indicated, a few areas of risk-taking pose the most serious threats to adolescents: sexual risk-taking, substance use, illegal behavior, and risky driving. Each of these behaviors provides an interesting lens through which to examine questions about the influence of environmental and individual factors, so we explore here the prevalence of each of these behaviors among population subgroups and the developmental course typical for each.

### Sexual Risk-Taking

James J. Jaccard began with a few comments about research on adolescent sexual behavior. He noted that although there are numerous ways

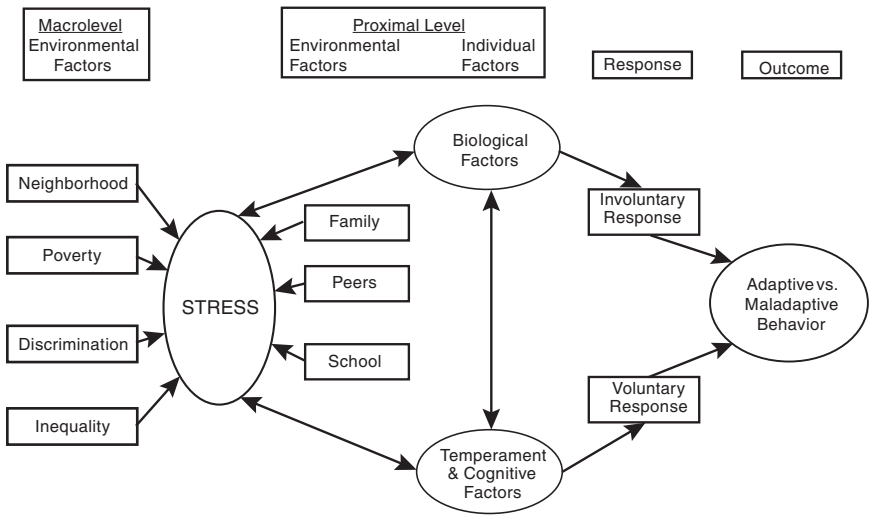


**FIGURE 2-1** A model of risk and protection in adolescence.
SOURCE: Blum and Blum, 2009.

to examine what teenagers do and how their behaviors change over time, researchers studying sexuality—recognizing that some sexual behavior is normative and not necessarily risky—have focused on four outcomes: frequency of sexual intercourse, consistency of condom use, number of partners, and age at first intercourse. Other important outcome variables include infection with HIV and other sexually transmitted diseases, abortion, pregnancy and childbirth, and use of other types of birth control. Jaccard suggested that age at first intercourse might be the most important to track because it is predictive of such risks as unintended pregnancy and sexually transmitted disease

Several meta-analyses have shown that various sexual behaviors have intercorrelations of approximately .35, which is about the same as the intercorrelation among other risk behaviors, such as alcohol and drug use or smoking. For Jaccard, this suggests that unique determinants exist for each of these behaviors that must be understood. Another challenge is that much of the research has focused on individuals—their attitudes, normative pressures that affect them, impulse control, religious influences, and so on. Yet because most of the behavior involves the choices of two individuals, it is important to consider the dyad, or couple (even if the relationship is transitory), to fully understand the decisions and behaviors of interest. Sexual behavior is unlike most other adolescent risk behaviors in this regard, and the field, he suggested, needs better models of dyadic influence and decision making if it is to improve intervention strategies.

**Prevalence**

Jaccard presented data from the YRBSS (CDC, 2009) on the prevalence of sexual risk behaviors that reveal a range of serious public health concerns. More than 2,000 girls ages 15 to 19 become pregnant every day (the annual pregnancy rate is 84 per 1,000). This results in over 1,100 births to girls ages 15-19 each day (an annual birth rate of 40 per 1,000 girls). Among girls ages 14 to 19, 24.5 percent have human papillomavirus, 46.8 percent of high school students have had sexual intercourse, and 14.9 percent have had more than three sex partners. Adolescents attempt to practice safe sex: 61.5 percent reported using a condom the last time they had intercourse, but 30 percent of those reported experiencing a problem or error with its use. The overall effectiveness of the condom as birth control for all ages is 85 percent, and the effectiveness of the birth control pill is 92 percent. Effectiveness rates, however, are significantly lower for adolescents.

Group differences are apparent in these data as well. Jaccard explained that boys take more sexual risks than girls do, noting that they are more

likely to have intercourse during high school and have more partners than girls, while being less likely to say that a condom or other birth control was used the last time they had intercourse. Birth rates are dramatically higher for Hispanic (more than 80 per 1,000) and black (60 per 1,000) girls than for white (just over 25 per 1,000) and Asian girls (just over 15 per 1,000). In other areas, such as number of sexual partners and rates of sexually transmitted disease, black high school students tend to have the highest rates of risk, with Hispanics in the middle and whites at the lower end. There are also regional differences in these data. Pregnancy among girls ages 15 to 19 is most prevalent in the southwestern states. Rates of pregnancy, abortion, and birth for this age group are also significantly higher in the United States than in Sweden, France, Canada, or Great Britain, and Figure 2-2 shows that the United States has a significantly higher birth rate for youth under age 20 than 25 other industrialized nations.

Historical trend data indicate that most sexual risk behaviors began to decline in the early 1990s and then reached a plateau. There is some indication that the declines have actually begun to reverse more recently. Figure 2-3 shows the birth rate to adolescents from 1940 through 2006.

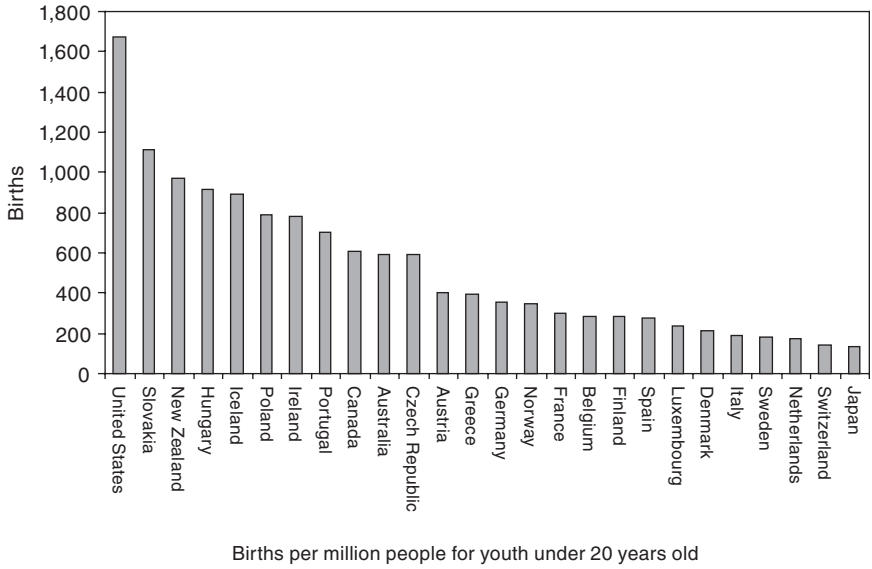


**FIGURE 2-2** Country differences.
SOURCE: Jaccard, 2008; Data from UNICEF Innocenti Research Centre. Available online at http://www.nationmaster.com/graph/hea_tee_pre_percap-health-teenage-pregnancy-per-capita (accessed November 10, 2008).

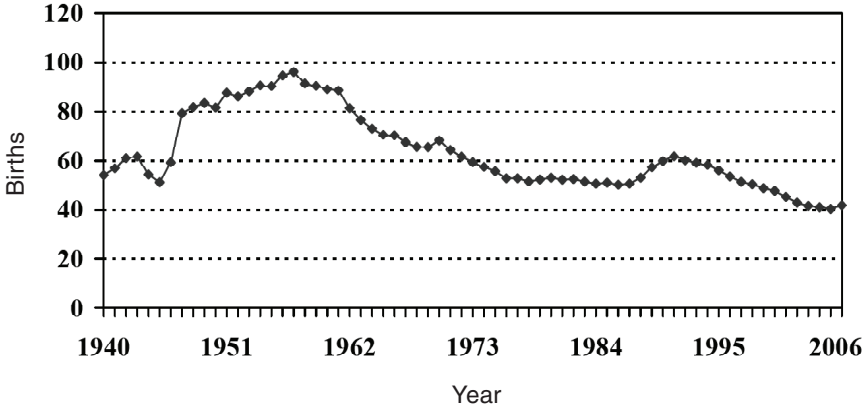


**FIGURE 2-3** Historical trends in adolescent birth rates. Number of births per 1,000 females aged 15-19.
SOURCE: The National Campaign to Prevent Teen and Unplanned Pregnancy, 2008. Available online at http://www.thenationalcampaign.org/resources/pdf/TBR_1940-2006.pdf (accessed November 10, 2008).

The rate reached its peak in 1957 and reached a new low for the period measured in 2000.

Trends are similar for the percentage of high school students who have had sexual intercourse, had three or more partners, and report not using condoms. There has been a slow decline followed by a plateau, but researchers have not yet identified the reason for the plateau, Jaccard explained.

### Developmental Course

The prevalence of sexual activity increases by about 10 percent in each year of the adolescent period, with about 12 percent of 7th graders reporting having had sexual intercourse, while the figure is more than 60 percent for 12th graders. The peak age for reported first sexual intercourse is 16. Again, there are subgroup differences: Hispanic adolescents start out with lower rates than other groups and then show a big jump in 8th grade, for example. Rates of condom use are lowest in middle school. Young people also report increasing numbers of casual sexual partners with each grade, accelerating after 8th grade; the pattern is similar for pregnancies.

All of these factors suggest to Jaccard that the optimal time for intervention is in early middle school, even though most of the research

focuses on high school–age adolescents. That view is reinforced by data showing declines in some of the factors that help protect teenagers that are accompanied by the increase in risk behaviors. Data from the National Longitudinal Study of Adolescent Health (called Add Health) show, for example, that the number of domains in which parents allow their adolescent children to make their own decisions increases steadily from 7th through 12th grade, as parental monitoring decreases (Guilamo-Ramos et al., 2010). Thus, older teenagers generally have more freedom to explore behaviors of which their parents may not approve. From middle school through high school, adolescents perceive their parents as being less warm and affectionate as they get older, and they are also less likely to say that they feel a part of their schools and communities.

Jaccard closed with a few thoughts about the factors that influence adolescents' sexual behavior. He noted that researchers have proposed more than 500 possible variables, and the findings are inconsistent. Some studies found that self-esteem is predictive of particular behaviors, and others found that it is not. Some found ethnic differences, and others did not (Jaccard, 2009). What is missing is a framework that could integrate thinking about the most important explanatory variables (such as personality, mental health, substance use, attitudes, cultural norms, and self-efficacy), contextual factors, such as school and family, as well as the theoretical contributions from biobehavioral research and other fields. This integrated approach would be the platform from which to consider ways to change adolescent behavior.

### Substance Use

Substance use in adolescence encompasses a fairly wide range of behaviors, Laurie Chassin explained. Adolescents vary in what they imbibe, how much, and how frequently, as well as in the extent to which their substance use causes problems. There are also different stages of adolescent substance use, beginning with initiation or experimentation, in which the largest percentage engages. For some, this escalates to regular use, then to heavy or problem use. For most adolescents, substance use is reduced or stopped in early young adulthood, but for others heavy use in adolescence is the beginning of multiple cycles of cessation and relapse.

These variations in behavior are the key to understanding the primary differences between adolescent and adult substance use, Chassin added. Adolescents, for example, are most likely to try or use multiple different substances, which may complicate analysis, while adults more typically use just one or two. Adults are also more likely to imbibe small quantities on more frequent occasions, whereas many adolescents are engaged in a binging pattern, in which they take in very large quantities on fewer occa-

sions. Although for adolescents the occasions may be less frequent, the high quantity means that for them the risks for a variety of consequences are much greater. Figure 2-4 presents data from the National Survey on Drug Use and Health demonstrating this difference.

It is also important to distinguish between substance use and substance use disorder (SUD), which is a clinical diagnosis included in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV). Whereas the term "substance use" simply refers to the consumption of an illicit substance (for adolescents under legal drinking age, this includes alcohol), the term "disorder" refers to a pattern of use associated with impairment in which the individual continues to use one or more substances despite noteworthy life difficulties, such as getting in trouble at school or getting caught driving under the influence. The term disorder also refers to substance dependence, in which the individual uses the substance compulsively despite loss of control and recurring life problems, may develop a tolerance (i.e., require increasing doses to get the same effects), and experience withdrawal symptoms when use is discontinued.

Currently, these disorders are treated separately in the DSM, Chassin explained, yet they also represent points on a continuum of behaviors. Another issue in diagnosis is the question of how well criteria developed for adults work in the diagnosis of adolescents. Adolescents and adults, for example, may develop tolerance to particular substances at different rates, and so they may need to be considered differently in diagnosis.

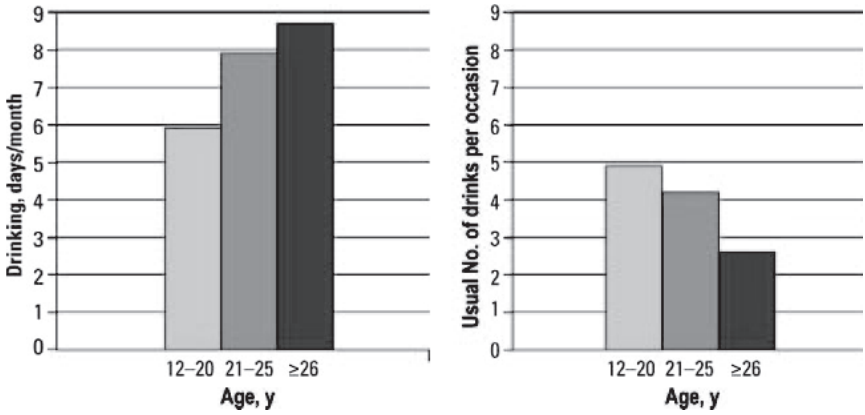


**FIGURE 2-4** Compared to adults, adolescents drink less frequently but in higher quantity.
NOTE: Substance Abuse and Mental Health Services Administration data from the 2005 National Survey on Drug Use and Health.
SOURCE: Masten et al., 2008. Reproduced with permission from *Pediatrics*, Vol. 121, pp. 235-251. Copyright © 2008 by AAP.

Similarly, adolescents may show symptoms of disorder at lower levels of intake than adults. Questions about diagnosis guidelines also relate to questions about the best targets for intervention. Should adults intervene at the first sign of any substance use, or should that decision depend on the child's age or the type of substance? Would it make more sense to intervene only with adolescents who are showing signs of dysfunction related to substance use?

**Prevalence**

A look at some of the data on adolescent substance use provides some context for thinking about these questions. Table 2-1 shows the percentages of young people who have experimented with substances (including alcohol, illicit drugs, and also misuse of prescription drugs) by the 8th, 10th, and 12th grades. Use has fluctuated over time, as Figure 2-5 shows.

Recent data on specific substances show some differences, however. Use of marijuana, amphetamines, Ritalin, methamphetamines, crystal methamphetamines, and steroids are declining, for example, whereas use of cocaine, crack, LSD, other hallucinogens, most prescription drugs (sedatives, OxyContin, Vicodin), and cough syrup is unchanged. Use of alcohol and cigarettes is also steady, but use of ecstasy is increasing. Chassin cautioned that fluctuations in these data are common, as new drugs emerge and new generations of young people discover old ones.

Most substance use among young people does not rise to the level of a clinical problem, but substance use disorders are still a substantial public health problem, as Table 2-2 shows.

**TABLE 2-1** Percentage of Adolescents Reporting Any Use of Substances

| Grade Level | 8th | 10th | 12th |
|---|---|---|---|
| Cigarettes | 22.1 | 34.6 | 46.2 |
| Alcohol | 38.9 | 61.7 | 72.2 |
| Marijuana | 14.2 | 31.0 | 41.8 |
| Any illegal substance other than marijuana | 11.1 | 18.2 | 25.5 |

NOTE: The most recent data on drug use can be found at http://www.nida.nih.gov/drugpages/mtf.html (accessed September 2010) and http://www.oas.samhsa.gov/nhsda.htm (accessed September 2010).
SOURCE: Chassin, 2008. Presentation based on data from Monitoring the Future (data from Johnston et al., 2007).

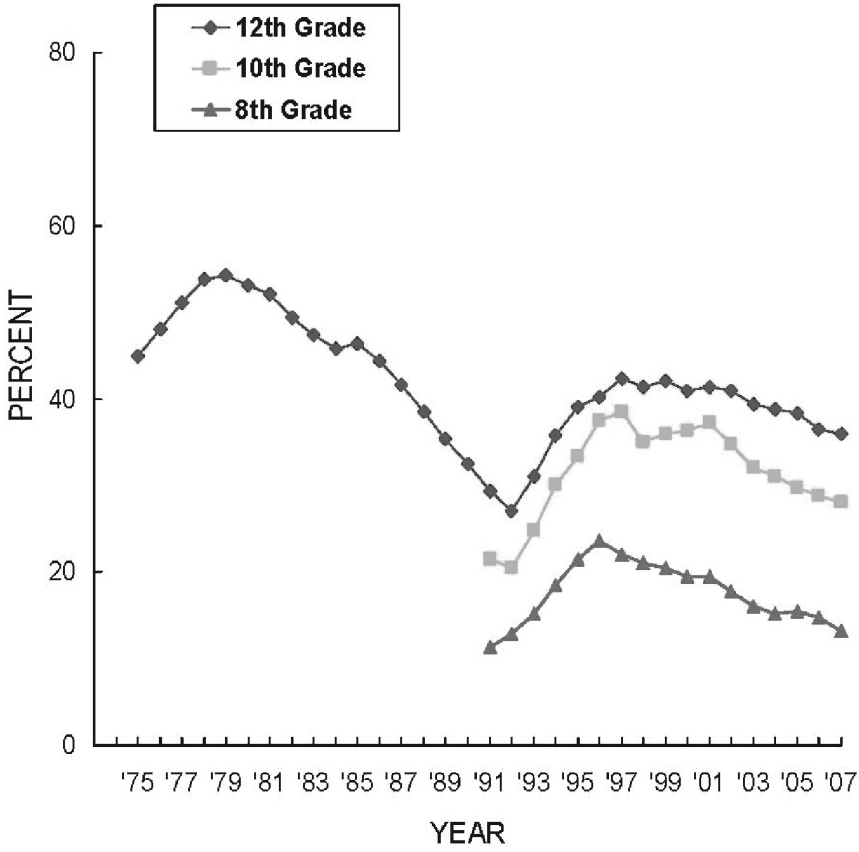


**FIGURE 2-5** Trends in annual prevalence of an illicit drug use index: Grades 8, 10, and 12.
SOURCE: Monitoring the Future Study, Institute for Social Research, University of Michigan, Ann Arbor, MI, 2004. Available online at http://ns.umich.edu/?Releases/2004/Dec04/r122104a (accessed November 1, 2008).

Although researchers have documented demographic variations in substance use, the data can be difficult to interpret, Chassin observed. Some correlations among various demographic factors and substance use are apparent, but there are questions about reporting bias. Much of the data, for example, use school-based samples, and significant differences occur in the rates at which students in different demographic groups drop out of school, so data from those who remain in school are not fully representative. Nevertheless, it is clear that the problem is not confined

**TABLE 2-2** Percentage of Young People Diagnosed with Substance Use Disorder in the Past Year

| Age | 12-17 years | 18 to 25 years | 26 years or older |
|---|---|---|---|
| Alcohol | 2.2 | 7.3 | 2.9 |
| Either alcohol or illicit drug | 3.8 | 11.2 | 3.8 |

SOURCE: Chassin, 2008 (data from Johnston et al., 2008).

to just one or two subgroups, and several differences among subgroups are worth noting.

- Overall, boys use more substances than girls, although the differences vary with the substance. There is some evidence that girls progress through the stages of use more quickly.
- Adolescents from families with low socioeconomic status (SES) are more likely to smoke cigarettes than other adolescents, but they are no more likely to use alcohol or marijuana. Researchers have found some evidence that adolescents who live in poverty or in affluence may have higher rates of substance use than those in between.
- Black adolescents have the lowest use rates, while Hispanics have the highest rates in the lower grades. Because school dropout rates are so high for Hispanics, it may be that their reduced rates in the upper grades reflect their absence from data collection. Trends for white, black, and Hispanic adolescents are shown in Figure 2-6.
- The differences among these three groups are larger for alcohol use, as shown in Figure 2-7.

### Influences and Developmental Course

Apart from possible demographic influences, Chassin identified several interacting influences that appear to increase children's vulnerability to risky substance use. First, children who experience adverse circumstances, such as prenatal exposure to substances, genetic propensity to addiction and disinhibition, and poor parenting, are more likely to have difficulty regulating their behavior, to be impulsive, and to have poor executive functioning. These children are at heightened risk for school failure, are more likely to be excluded from prosocial peer groups, and to associate with deviant groups that promote substance use. This influence she described as proneness to deviance.

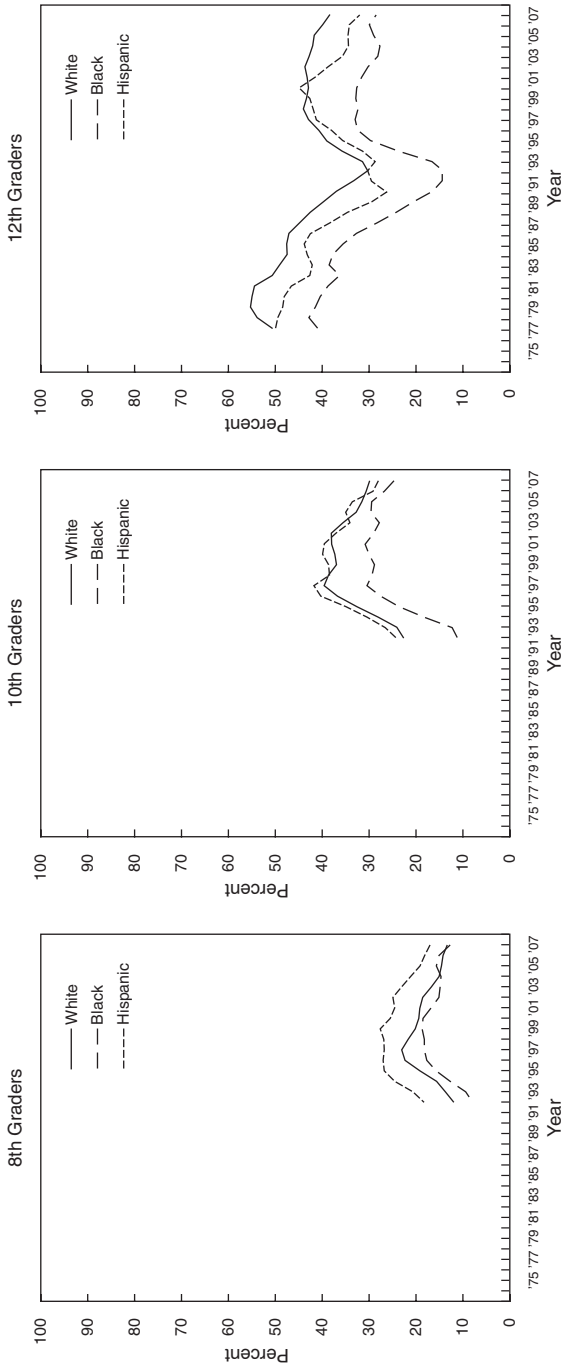


**FIGURE 2-6** Any illicit drug: Trends in annual prevalence by race/ethnicity.
SOURCE: Monitoring the Future Study, Institute for Social Research, University of Michigan, Ann Arbor, MI, 2005. Available online at http://monitoringthefuture.org/pubs/occpapers/occ61.pdf (accessed November 1, 2008).

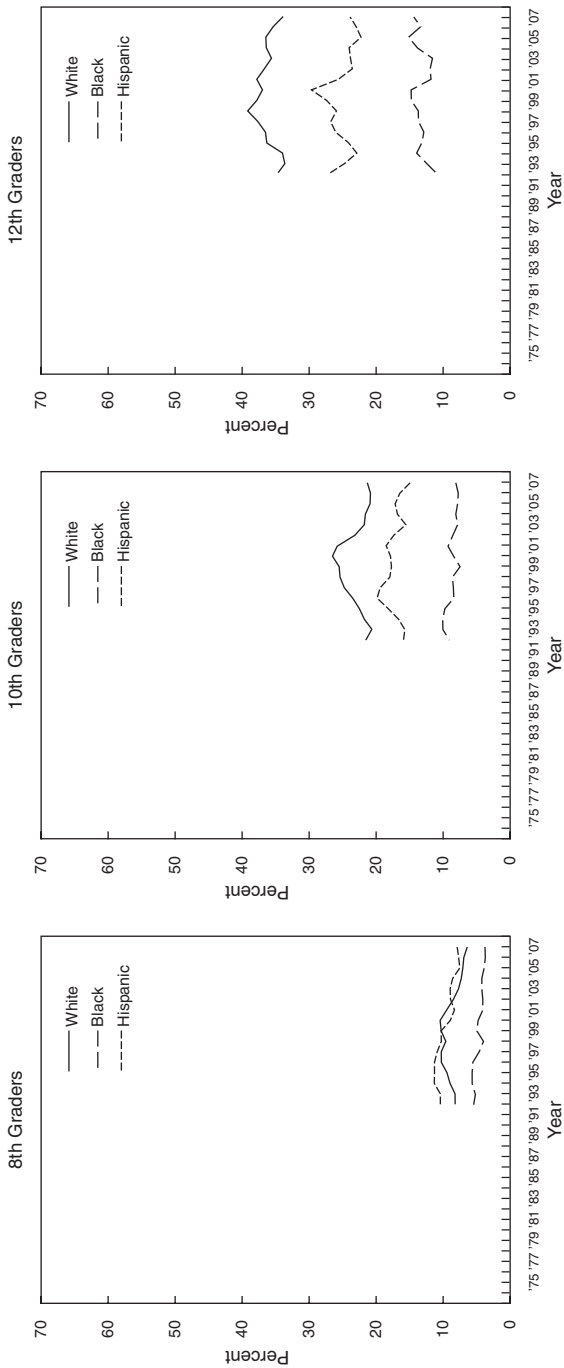


**FIGURE 2-7** Alcohol: Trends in 30-day prevalence of having been drunk by race/ethnicity.
SOURCE: Monitoring the Future Study, Institute for Social Research, University of Michigan, Ann Arbor, MI, 2005. Available online at http://monitoringthefuture.org/pubs/occpapers/occ61.pdf (accessed November 1, 2008).

Another influence, which she referred to as negative affect, reflects many factors, including the combination of genetic propensity, temperament, early environmental adversity, and stress that affects some children as they enter adolescence and produces negative affective states. These adolescents are prone to seek out the mood-enhancing potential of substance use. The third influence, or pathway, to risky substance use is the reinforcing properties of many substances themselves, which may reflect individual differences. Adolescents who are either less sensitive to the negative effects of the substance or who experience greater benefits (such as stress reduction) have greater incentives to use it.

These pathways offer some possible explanations for the patterns in the developmental course of both substance use and substance use disorders. The general pattern is that experimentation begins in early adolescence, with use peaking at the period of transition to adulthood, but there is variation in the age of first use, the speed of progression through the stages, and the persistence of use. Chassin noted that early experimentation with substances is linked to many other factors associated with heightened risk. Adolescents in families with a history of substance abuse, for example, are more likely to use substances early and to be diagnosed with a clinical disorder. They are likely to progress to disorder more quickly than other young people, and their substance use is more persistent. These young people are more likely to find the experience pleasant and more likely to have difficulty with developmentally appropriate transition to adult roles. Looking at alcohol specifically, Chassin noted that the younger an individual is at first use of alcohol, the more likely he or she is to develop dependence.

These data strongly suggest to Chassin the value of intervening with young adolescents to prevent or reduce substance use, although a number of questions still need to be resolved. It is not clear whether early onset of substance use is simply a marker for other risk factors. It is also not yet clear how genetic factors and adversity in the environment of infants and young children may affect adolescents' development, their capacity for self-regulation, and the rewards they perceive from substance use. Adolescents may be more vulnerable than adults to the physical effects of substances, and it is not known whether early substance use affects subsequent psychosocial and physical development.

### Illegal Behavior

As with both sexual behavior and substance use, the illegal behavior adolescents engage in encompasses a wide range of acts, as D. Wayne Osgood explained. Some behavior is illegal (delinquent) only if it is done by an individual below a certain age, and even those behaviors vary a

great deal in their seriousness. He also pointed out overlap with the other risk behaviors. Some sexual activity, for example, is illegal because of the ages of the participants, and of course alcohol use is illegal only under a particular age. Osgood focused on more serious crimes that do not fall into those categories.

**Prevalence**

Law enforcement agencies in the U.S. justice system collect data on reported offenses in two broad categories: violent crimes (homicide, forcible rape, robbery, and aggravated assault) and property crimes (burglary, larceny, motor vehicle theft, and arson). A good deal of additional data are available from self-report studies, in which young people are asked, for example, how many times in the past year they got into a serious fight, took something not belonging to them worth less than $50, or deliberately damaged school property. Using such data, the Monitoring the Future survey (Johnston et al., 2009) shows that 55.3 percent of 18-year-olds had committed at least one of the offenses on the list in the past year. Osgood noted, however, if one uses a long enough list of offenses and a long period of time, that figure could increase to 90 percent because it is the unusual adolescent who never engages in any illegal act—not consuming a single alcoholic drink before age 21, for example, or ever engaging in a prank that results in property damage.

Arrest rates are much lower, totaling 6.6 percent for all categories for youth ages 10 to 17 (and 0.004 percent for murder, 0.25 percent for burglary, 0.8 percent for larceny theft, for example (FBI, 2007). As these data suggest, the most serious and frequent involvement in illegal behavior is concentrated among a small percentage of adolescents. In a study of youth in Philadelphia, for example, Wolfgang and colleagues (1987) found that 6 percent of young men had been arrested five or more times, and that group accounted for more than 50 percent of all arrests among the approximately 10,000 adolescents studied and an even larger share of serious violent crimes. In sum, prevalence of at least some illegal behavior is quite common, but frequent and serious illegal behavior is highly concentrated in a small group.

Prevalence of involvement in the justice system reflects a major domain of consequences of illegal behavior for young people's lives. Of the 6.6 percent of young people arrested in 2006, 8 percent were sent to adult court and 68 percent to juvenile court, Osgood reported. Generally, approximately 25 percent are released and a little more than half are put on probation. Based on data from 1999, Osgood estimates that approximately 117,000 young people are incarcerated in juvenile correc-

tional facilities at any given time (approximately another 4,000 have gone through adult courts and are imprisoned).[2]

Historical trends in juvenile crime differ by type of crime, as Figures 2-8 and 2-9 show. For example, burglary declined steadily from 1980 through 2006, whereas overall property crime was steady from 1980 through the mid-1990s and then declined and violence sharply rose and then declined from 1988 through about 2000. Osgood noted that some parallels occur in trends across offenses, such as the broad declines starting in the mid-1990s, but there is no overall trend for risk-taking behavior. Osgood suggested that trends for specific behaviors can be subject to idiosyncratic influences, such as burglary becoming more dangerous over time as increasing numbers of householders have acquired burglar alarms and firearms. Moreover, trends for some aspects of illegal behavior, such

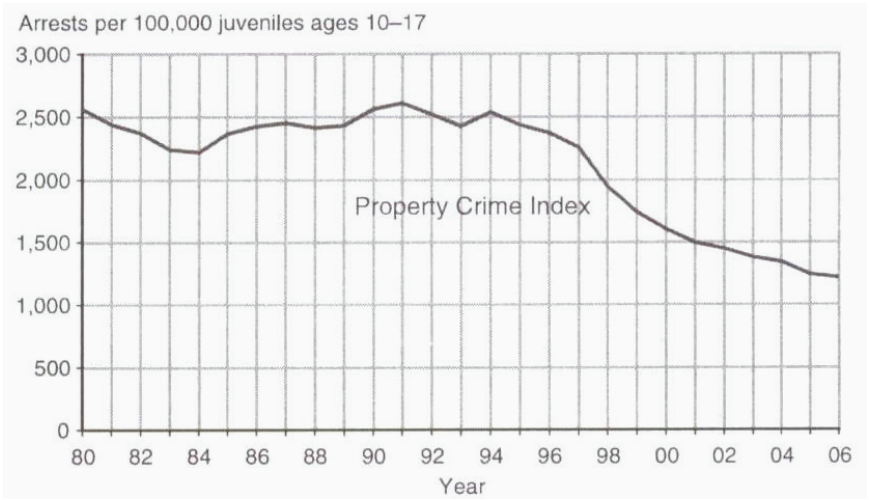


**FIGURE 2-8** Historical trends: Property arrests.
NOTE: Analysis of arrest data from the FBI and population data from the U.S. Census Bureau and the National Center for Health Statistics.
SOURCE: U.S. Department of Justice, Office of Juvenile Justice and Delinquency Prevention. Available online at http://www.ncjrs.gov/pdffiles1/ojjdp/221338.pdf (accessed November 15, 2008).

[2] The most recent data on juveniles in residential placement can be found at http://www.ojjdp.gov/ojstatbb/default.asp [September 2010] and http://www.ojjdp.gov/ojstatbb/cjrp/ [September 2010].

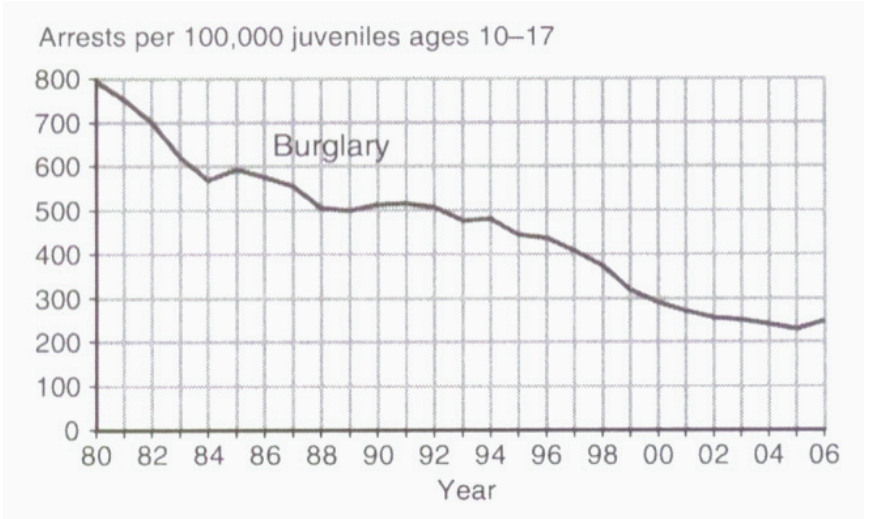


**FIGURE 2-9** Historical trends can vary greatly by offense.
NOTE: Analysis of arrest data from the FBI and population data from the U.S. Census Bureau and the National Center for Health Statistics.
SOURCE: U.S. Department of Justice, Office of Juvenile Justice and Delinquency Prevention. Available online at http://www.ncjrs.gov/pdffiles1/ojjdp/221338.pdf (accessed November 15, 2008).

as incarceration rates, may reflect other factors, such as enforcement policies, besides adolescents' propensity to break the law.

### Developmental Course and Demographic Variations

The peak age for arrests across the life span is about 16, although it varies slightly with the type of crime. Figure 2-10 shows the pattern. Osgood noted that self-report data from the National Youth Survey[3] about involvement with violent crime show a similar pattern, with the peak slightly higher, at age 17. Describing the developmental course of illegal behavior is complicated for a few reasons, however. First, some of the behaviors in question are interpreted differently in different contexts and at different ages. It is not generally disturbing to see young children take objects or physically interfere with other children. By the mid-teen years, however, most children have long outgrown such behaviors, and those

[3] See http://www.colorado.edu/ibs/NYSFS/index.html.

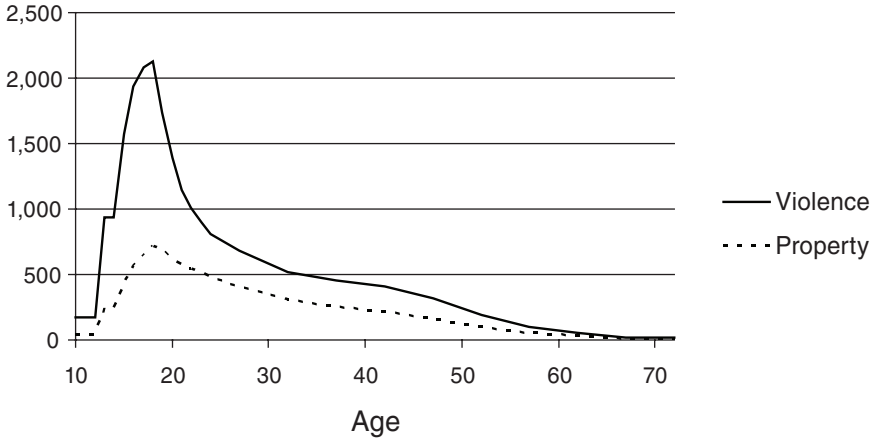


**FIGURE 2-10** Arrests per 100,000 by age, 2008.
SOURCE: Osgood, 2008. Data from 2008 UCR arrest data and current population data from U.S. census. Available at http://www.fbi.gov/ucr/cius2008/index.html (accessed November 10, 2008).

who have not are capable of committing more harmful versions of these acts, which can lead authorities to identify them as delinquent. In general, socialization processes succeed in eliminating these behaviors in most children, but even some toddlers may exhibit behavior that is out of the norm and cause for concern.

Osgood explained that individual differences in behavior are relatively stable over the life course and that an early onset of delinquent behavior tends to be associated with serious, long-term illegal offending. However, although it is rare to see a serious adult offender who had not been involved in delinquent behavior as an adolescent, the reverse is not also true. That is, many adolescents who get into serious trouble move away from it in adulthood. The important question, for Osgood, is identifying processes and experiences that lead some to stop serious illegal behavior when others do not.

Rates of illegal behavior (based on arrest reports) differ quite clearly in relation to some demographic variables (including age, as just discussed), and less so in relation to others. Researchers have documented a large difference between the sexes, with young men engaging in higher rates of illegal behavior. The differences are especially pronounced for more serious crimes: young men account for 60 percent of larceny arrests among adolescents, 76 percent of arrests for aggravated assault, and 91 percent of arrests for robbery. African-American youth are more likely than those in other groups to be arrested, and the difference is greatest

for violence, especially robbery, for which their arrest rates are 10 times higher than other groups. (Osgood noted that arrest rates for Hispanic youth are not well documented).

The data on socioeconomic differences are somewhat ambiguous. Self-reported involvement with illegal activities does not correlate strongly with SES, but justice system outcomes do. In other words, Osgood noted, it appears that low-SES young people may not be significantly more likely to commit crimes, yet they are significantly more likely than other youth to be formally punished. He suggested that young people with greater resources are more likely to have parents who intervene, hire lawyers and counselors, and take responsibility for addressing the problem, all of which will be viewed favorably by judges and probation officers.

Osgood also explored other factors that may be associated with delinquency and identified many of the same ones that correlate with other risky behaviors. Looking at personality, he noted that impulsiveness, difficulty with self-control, and sensation-seeking, as well as a negative emotional state and neuropsychological deficits, have all been established as correlating with delinquency. Youth in families in which there is coercive parenting or abuse or other dysfunctional childrearing are at increased risk of delinquency, whereas parental monitoring and warm interfamily attachments are protective factors. Living in economically disadvantaged circumstances increases risk, as does residential instability. Bonding with school and succeeding academically are protective, and spending unstructured time with delinquent friends has a negative influence.

Osgood also pointed out that the strongest correlates of delinquent behavior are other problem behaviors—risky sex, dangerous driving, substance use—especially when they begin early. However, although risk behaviors may tend to cluster together, there are important differences as well. For Osgood, the most persuasive model for thinking about this is that some influences generally predispose young people to take risks and that other factors determine which specific risks individual young people take. He thinks the general factors will be tied to either of two features that are common to all of these behaviors: the willingness to violate conventional rules and norms for behavior and responsiveness to the appeal of taking exciting risks.

Both of these phenomena appear to be amplified when young people spend unstructured, unsupervised time with their peers, and research has supported the association of this kind of time with a variety of illegal and problem behaviors. Osgood noted that the research on this connection has included qualitative and quantitative methods, and it has found an association in many developed nations as well as in a number of preliterate societies. Opportunities for unstructured socializing increase as adolescents get older and then decrease as they become young adults

with greater responsibilities and less leisure time, which matches neatly the developmental pattern of most risky behavior. Osgood sees this as an especially promising avenue for further research and intervention.

### Risky Driving

The significance of the risks teen drivers pose is apparent in Figure 2-11, which shows the crash rate by age throughout the life span, and Figure 2-12, which shows the learning curve for newly licensed drivers.[4] Teen drivers also pose a threat to others: 45 percent of teenagers ages 13 to 19 who die in vehicle crashes caused by teen drivers are passengers, not drivers. Allan Williams opened his presentation by noting that despite these

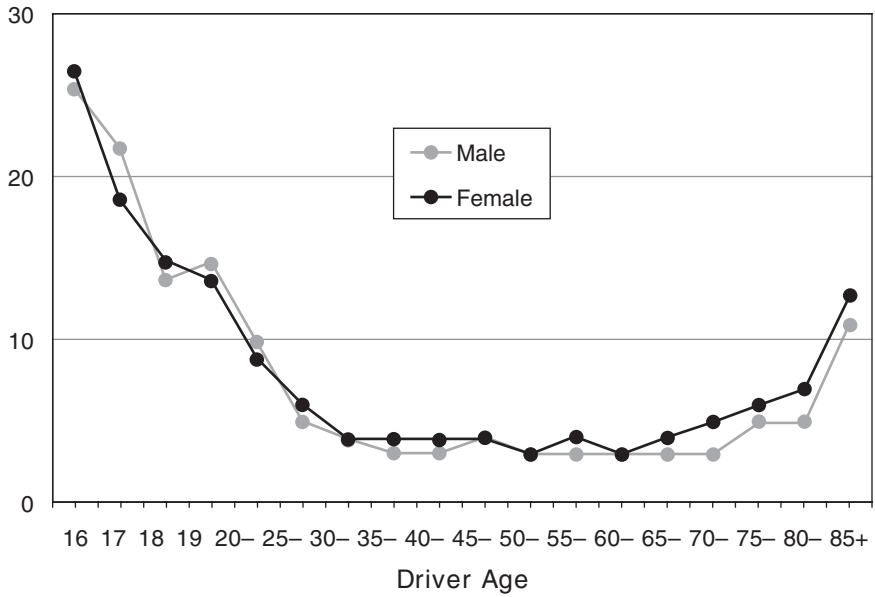


**FIGURE 2-11** Young driver crash risk, crashes per million miles, by driver age, 2001-2002.
SOURCE: IIHS (Insurance Institute for Highway Safety). Licensing systems for young drivers. http://www.iihs.org/laws/graduatedLicenseIntro.aspx (accessed October 10, 2008).

[4] Williams noted that these data, collected in Nova Scotia, show a pattern that is evident all over the world, regardless of how drivers are licensed.

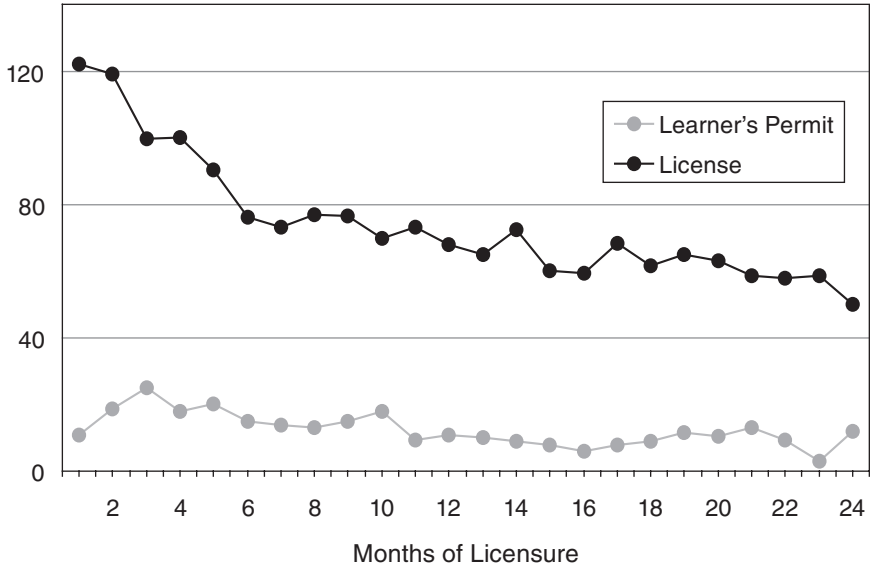


**FIGURE 2-12** Crashes by license status and months of licensure per 10,000 learner/licensed drivers.
SOURCE: IIHS (Insurance Institute for Highway Safety). Licensing systems for young drivers. http://www.iihs.org/laws/graduatedLicenseIntro.aspx (accessed October 10, 2008).

alarming statistics, teen driving has not been as thoroughly researched as other risk behaviors.

The primary question to be answered is why, specifically, the risks are so high for adolescent drivers. The logical first places to look in answering this question are age and inexperience, but, Williams pointed out, it is difficult to distinguish the relative effect of each because they are very highly correlated. Both come into play in making drivers more likely to take risks and less able to detect and respond to hazards. Studies in other countries, where it is more common to license drivers at age 18, suggest that inexperience is a greater risk factor than chronological age, but it is likely that they interact. Observational studies of crashes and violations have shown that adolescent drivers are more likely to speed, tailgate, and leave too small a gap between their vehicle and the one in front, for example. They also lack the experience that helps older drivers perceive that their speed is too great for conditions or take note of a situation in the middle distance that may require responsive action.

Two conditions that exacerbate the already heightened risk for young and inexperienced drivers—driving at night (limited light and

increased fatigue) and driving with peers (increased distractions) in the car—illustrate the way the risks work. More fatal crashes occur at night for all age groups, but the differences are far more pronounced for drivers under age 30, as shown in Figure 2-13. For drivers ages 16 and 17, the risk of crashing increases rapidly with each additional passenger in the vehicle. That effect is present, but much smaller, for drivers ages 18 and 19, but not for older drivers—indeed, the presence of passengers actually makes older drivers slightly safer. For adults, a passenger can help by reading maps or directions or helping to spot a hazard. For teenage drivers, however, particularly males, peer passengers are a distraction and perhaps a motivation to drive too fast or take other risks.

Adolescents driving under the influence of alcohol receive a lot of public attention, particularly in the spring when proms and graduation parties are scheduled. Adolescents who are inexperienced at both driving and drinking are at heightened risk, and Williams noted that adolescents become impaired with lower blood concentrations than adults do. The rate of adolescent crashes involving alcohol, however, has gone down

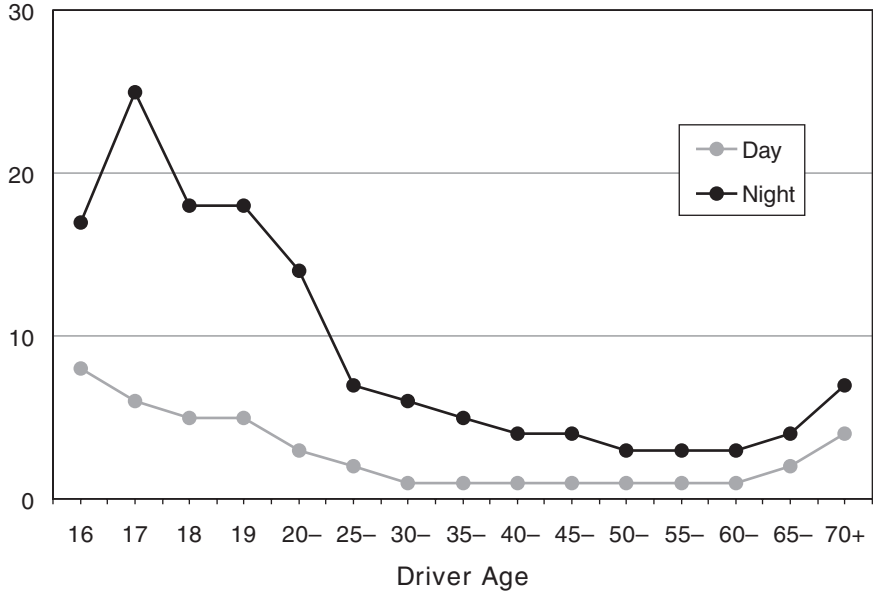


**FIGURE 2-13** Night driving risks, fatal crashes per 100 million miles, by driver age, 2001-2002.
SOURCE: IIHS (Insurance Institute for Highway Safety). Licensing systems for young drivers. http://www.iihs.org/laws/graduatedLicenseIntro.aspx (accessed October 10, 2008).

markedly since the early 1980s, during which time the drinking age was raised to 21 in all 50 states and the District of Columbia. In 1982, 41 percent of fatal crashes among 16- and 17-year-olds involved illegal blood alcohol concentration, whereas in 2007 that figure was 18 percent.

### Graduated Licensing

Another area of improvement is in driver licensing. In Williams' view, the prevailing approach prior to 1995 was not effective. Beginners were taught and tested on the rudiments of driving and then given full driving privileges, typically at age 16. Once licensed, drivers who had large numbers of violations or crashes might be identified and have their privileges restricted in some way. In the last 10 years, all states have adopted some form of graduated licensing. The requirements vary but the essential principle is that beginning drivers are given extended opportunities for supervised practice driving so that they do not encounter high-risk driving situations until they have had significant time behind the wheel. Williams noted that graduated licensing is unlike training that uses driving simulators to provide practice in a completely safe environment; rather, it allows learning drivers on the road so they can amass experience with real-world hazards. Research on simulated driving has thus far used only outcomes measured during the simulated situation, Williams noted, so there is no evidence on whether the skills transfer to real-world driving.

States may vary as to where they draw the line between safety and mobility, but all of the graduated licensing plans have the advantage of delaying full driving privileges while adolescents mature. Most have a learner stage of at least 6 months, during which the beginning driver must log at least 50 hours of parent-supervised driving. During the intermediate stage, new drivers may not be allowed to drive unsupervised at night or to transport passengers while driving unsupervised. Full licensure is delayed until age 17 or 18. The range of requirements is shown in Table 2-3.

**TABLE 2-3** Core Elements of Graduated Licensing as of 2008

| Element | Number of Jurisdictions |
|---|---|
| Learner period of 6 months minimum | 45 |
| At least 30 hours of certified practice driving | 34 |
| Night restrictions | 47 |
| Passenger restrictions | 40 |

SOURCE: Williams, 2008. Data from IIHS (Insurance Institute for Highway Safety).

Many states could do more, Williams suggested, but the benefits have already been dramatic: a 20 to 40 percent overall reduction in crashes in the states and a 42 percent reduction in the nationwide rate of crashes involving 16-year-olds. More significant benefits could come with improved enforcement. Some states are finding that parents are not as compliant as they had hoped and are exploring more stringent penalties and greater police involvement in enforcement.

The question of how to further reduce adolescents' risk from vehicle crashes points to the gaps in understanding of the risk mechanisms that affect driving. Williams noted that the study of driving has generally not drawn on findings from research on adolescent development and that the model for thinking about teen drivers is fairly narrow and simplistic (NRC and IOM, 2007). Policy makers and driving safety researchers have accepted the idea that teenagers are thrill-seekers and have a limited understanding of risks and their consequences without searching for deeper explanations. The result has been a focus on scare tactics designed to heighten adolescents' awareness of risks, which, in Williams' view, have not shown marked success in reducing crash rates.

## MENTAL HEALTH RISKS

The mental health status of adolescents relates in various ways to the discussion of each of these risks. Mental or emotional problems may be among the reasons why young people are attracted to risky behaviors, and these problems in turn may exacerbate the risky behaviors. Various mental health problems are also among the possible negative outcomes of some risk behaviors. Daniel S. Pine provided an overview of what is and is not known about the mental health status of adolescents, and his first point was that some disorders are both common and age-related. In a prospective epidemiological study from the United States of diagnosed depression among boys and girls by age, data show that depression rates begin to increase in the early puberty years and increase across the span of puberty, particularly among girls (Glied and Pine, 2002) (see Figure 2-14). Thus, rates of increase in depression are higher for girls than for boys; the same is true for rates of overanxious disorder, although this disorder is actually more prevalent at ages 10 to 13, as Figure 2-15 shows. By contrast, conduct problems are more prevalent among boys.[5] These disorders are predictive of a range of risk-taking behaviors. Conduct problems are associated with smoking and substance use, vehicle crashes

[5] Conduct disorder refers to an array of behavior problems in children and adolescents, such as defiant or antisocial behavior, rule-breaking, bullying, fighting, etc.

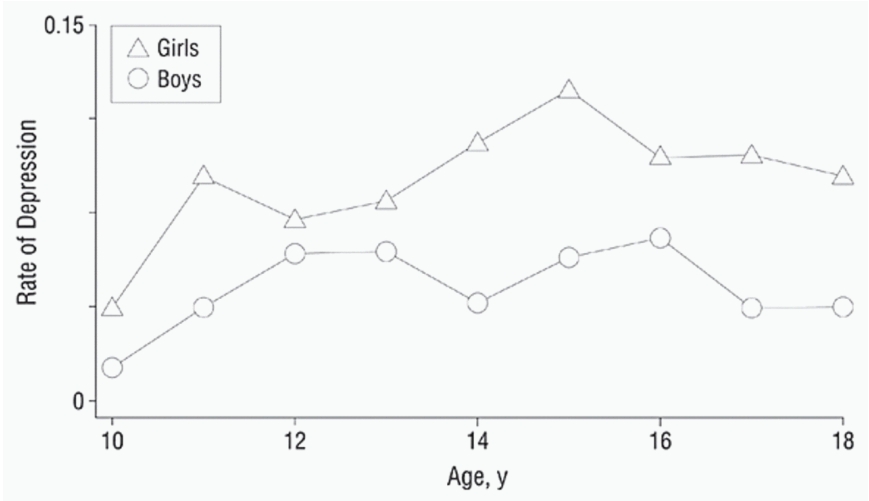


**FIGURE 2-14** Adolescent age and rates of depression.
SOURCE: Gleid and Pine, 2002. Reproduced with permission from *Archives of Pediatrics & Adolescent Medicine*, Vol. 156, pp. 1009-1014. Copyright © 2002 by AMA.

and other impulsive behaviors, and risky sexual behavior. Major depression is predictive of suicide and suicide attempts and possibly substance abuse as well.

In Pine's view, not nearly enough is known about the treatment of these disorders. He noted that early treatment for conduct disorder appears to be more effective than treatment that begins later. More worrisome is the treatment picture for depression. The suicide rate for both boys and girls ages 10 to 19 has declined since the late 1970s, but rates


**FIGURE 2-15** Age-related changes in prevalence.
SOURCE: Pine, 2008. Data from Cohen et al., 1993.

for both sexes began to increase in 2003 (Bridge et al., 2008). The causes behind both these trends remain poorly understood, raising questions about how best to treat children and adolescents who are at risk for suicide. This relates to broader questions about the underlying causes of mental health problems in children and adolescents. In the area of depression, one particularly vexing puzzle is that, although depression is more prevalent among girls, rates of completed suicide are higher among boys. As noted above, another important puzzle is that researchers have not been able to pinpoint the reasons for either the several-decade downward trend or the recent upswing. Some have suggested that suicide rates increased when the utilization rates for antidepressant medications went down, but there is no firm evidence for that explanation.

A related question is how likely mental and emotional disorders are to persist past adolescence, and here, Pine indicated, the picture is mixed. For example, he pointed out that diagnosis rates for anxiety are quite high among adolescents: in one study of adolescent boys, 253 out of 670 study participants had a diagnosed anxiety disorder (Pine et al., 1998). Their disorder was more likely to persist to age 22 among youth with larger numbers of symptoms, but there was no threshold number of symptoms that identified the young people at highest risk. Nevertheless, of the 253 with a diagnosed anxiety disorder in adolescence, 191 no longer had any form of mood or anxiety disorder by age 22. Pine suggested that the pattern is similar for other disorders, including schizophrenia and substance use: although problems are common during adolescence, most young people are resilient and stop showing symptoms by early adulthood. The adolescents with the most persistent problems account for the majority of chronically afflicted adults. Hence, understanding the factors that differentiate adolescents who are resilient from those who manifest persistent problems is of major public health importance. Not only will answers to these questions benefit youth, but they also will dramatically affect understanding of chronic mental illnesses, as they manifest throughout life.

For Pine, this pattern highlights the importance of resilience. He noted that brain research has yielded valuable information about the mechanisms of fear and anxiety that offers promise for research on the relationship between brain activity and various disorders. Since much is known about the neural correlates of fear and anxiety in various mammalian species, the detailed knowledge acquired in research with animals can be readily applied to questions about humans. Pine noted, for example, that research has identified functional differences between adolescents who are anxious but not depressed and those who are depressed, suggesting that many mental health disorders are the result of distinct disruptions or problems in neural circuitry (Beesdo et al., 2009). This issue is addressed in Chapter 3.

For Pine, several important questions cannot yet be answered. At this point, at least from a biological or neuroscience perspective, there is no scientific way to distinguish "normal" adolescents from "abnormal" ones. Some behaviors put adolescents at risk, but the thresholds that are used to distinguish between adolescents whose behavior is abnormal and are therefore in need of services, and those whose behavior does not cross that threshold, are arbitrary. These thresholds are not derived from or associated with particular patterns of brain function that have been observed—currently there is no scientific basis for identifying a threshold at which behaviors cross into a dysfunctional or disordered zone for any particular behavior. Classifying behaviors as normal or abnormal is a judgment that inevitably reflects the context in which the behavior occurs. As a result, identifying a level of risk or type of behavior that is tolerable or problematic is not obvious.

It is similarly difficult to pinpoint the age at which the problems of adolescence begin. There is clear indication that negative experiences in the first years of life can have long-lasting impact; less clear are the optimal times to intervene to prevent risk behaviors in adolescence. It is also difficult to distinguish the problems that are likely to be transient—as the majority are—from those likely to cause lasting harm.

It is also not yet clear how to use new information on neural function. Brain research is likely to offer intriguing ideas for new treatments, which can then be refined and developed using currently available approaches. Nevertheless, Pine thinks that it will be a long time before what has been learned will change the way individual children are diagnosed and treated. Finally, he observed that little is known about the long-term effects of treatment. Some researchers have reported that when early interventions are successful, they can have surprisingly broad effects, yet frustratingly little basis now exists for decisions about when and how to intervene and with which children.

## SUMMARY

The presentations and discussions highlighted key points about the most prevalent adolescent risk behaviors. First is the importance of understanding the interrelationships among the environmental and individual factors that affect adolescent behavior. The familiar cluster of risk factors—living in poverty, dysfunctional family patterns, substance use in the home—appears to be associated with each of the risk behaviors, although the precise mechanisms have not been systematically traced. Impulsiveness, difficulty with self-control, and sensation-seeking—characteristic of all adolescents to some degree, but of some more than others—also seem to be associated with most risk behaviors. Risk behaviors themselves also

tend to cluster together, several participants and discussants noted, with young people who experiment with substance use being more likely to engage in risky sex, for example. However, it is equally important to note that there are significant variations among and between groups of youth (e.g., by culture and ethnicity) in the way risk behaviors cluster and that various risk behaviors have both common and unique correlates.

It seems likely that other variables, such as personality and innate temperament, cultural norms, and brain development, may also play a part in determining how individual adolescents behave, and these factors are discussed in the following chapters. One hypothesis put forward several times was that some young people are predisposed by a range of factors to take more risks than others. It is their own combination of traits and the contexts in which they live that point them toward particular risk behaviors and shape their outcomes. A number of participants cited this view as reason for supporting early interventions that have the potential to counteract risk factors, perhaps even before it is clear which young people will struggle.

# 3

# Biobehavioral Processes

The overview of common risk behaviors presented in Chapter 2 highlights two questions: Why are certain types of risk-taking more prevalent among adolescents than other age groups? And why do some adolescents engage in more risk-taking than others and suffer more negative effects? The research on individual risk behaviors provides strong reasons to think that common factors may cut across multiple problem areas. Findings from several fields offer insights into the biobehavioral processes that influence adolescents and how they may vary among individuals.

## THE DEVELOPING ADOLESCENT BRAIN

One possible explanation for the risks adolescents take is that their brains work differently from those of younger children or adults. The availability of new technologies (structural and functional magnetic resonance imaging and diffusion tensor imaging) has allowed researchers to trace changes in the size and shape of brain structures, to link those changes with behavior and observable development, and even to track emerging connections between brain structures and development (Casey et al., 2005). This research has expanded understanding of the development of different regions of the brain, which are responsible for selected functions, actions, and behaviors, and to draw connections between brain development and behavior. Linda Patia Spear and B. J. Casey both explored developmental processes that occur during this period, each

focusing on different ways that brain development relates to adolescent risk-taking.

### Adolescence Across Species

Developments in the brain relate to important features of adolescence, not only among humans but also among other mammals, Spear explained. The gradual transition from dependence and immaturity to relative independence and maturity is one that virtually all mammalian species experience. Humans and other species need to develop the skills necessary to survive as adults and to reproduce.

During this transition phase, mammals experience many hormonal and physiological changes, such as growth spurts and puberty, and they tend to display certain behaviors that are typical of the age. Spear noted that human behavior and brain function are significantly more complicated than those of other mammals—and also cautioned against interpreting these observed phenomena as evidence of biodeterminism, because many other factors affect human development and behavior. Nevertheless, across species, adolescents tend to show increases in preference for socializing with their peers, which researchers think may be adaptive behavior that helps individuals develop social skills, supports the skills they will need as adults, and helps them prepare to survive without parental protection. Adolescents in a variety of species also show increases in novelty-seeking and risk-taking, which, for humans, often are expressed through the behaviors discussed in Chapter 2. Researchers have posited, however, that the propensity to seek novelty and take risks may be adaptive in several ways. For males in particular, these impulses may improve the odds of reproductive success. They may foster acceptance among peers, and they may help the species avoid inbreeding by making males, females, or both more likely to leave their home territory by the time they are sexually mature, so they can seek mates elsewhere and avoid inbreeding.

The biological changes that occur in mammals also include puberty, a period when a cascade of hormonal activity, beginning with the release of gonadotropin from the hypothalamus gland, culminates in the release of the gonadal hormones estrogen and testosterone. These hormones, in turn, have a variety of effects on the body and on behavior, Spear explained. At the same time, however, equally dramatic changes in the brain are taking place.

### Brain Structures

Spear pointed out that the basic structures of the brain are relatively ancient from an evolutionary perspective. Thus, virtually all mammalian

species share not only these structures, but also the timing of the structural changes that occur in the brain as the individual matures. Researchers have found, for example, a decrease of up to 50 percent in the number of synaptic connections among neurons in different regions of the brain during adolescence. In general, researchers think that an overproduction of synapses occurs early in life, which is then followed by gradual pruning. The pruning that occurs during adolescence is thought to be more selective than earlier pruning—based on a "use it or lose it" principle—and contributes to the fine-tuning of brain connections necessary for adult cognition. It is also possible that this stage of pruning provides an important opportunity for the brain to be molded by the individual's environment.

Researchers have also documented an increase in the death of neurons and their support cells, which is likely to be associated with a decrease in gray matter and an increase in white matter.[1] The white matter is important because it helps quickly connect distant regions of the brain and therefore also supports the emergence of adult-type thinking. This selective pruning of connections among neurons is accompanied by a decline in the brain's need for energy. Spear noted that in general the brain is the "most expensive organ in the body, in terms of energy requirements." The lower demand that comes with a reduced number of synapses and a larger proportion of white matter (which is more efficient than gray matter) is more comparable to an adult brain.

The changes that take place in the adolescent brain are specific to particular regions—those that are most important for modulating behavioral responses to reward and affective behavior. Control over these behaviors is likely to influence risk-taking. The prefrontal cortex, which undergoes significant change during adolescence, is the site of executive control functions that start emerging early in life and continue to develop into adulthood. Spear described these cognitive controls as top-down systems that are critical in allowing the individual to exert control over a range of responses. They help modulate sensitivity to different kinds of rewards, identify the significance of stimuli, and exert control over impulses and emotional and social responses—the bottom-up brain systems.

Casey also highlighted the significance of the fact that development occurs at different rates in different parts of the brain. The development of the prefrontal cortex is gradual and is not complete until well into adulthood. This aspect of brain function has been a focus for many researchers but by itself does not completely explain the behavior patterns adolescents exhibit. The relationship between the prefrontal cortex and

[1] Spear explained that white matter in the brain is made up of collections of axons that are myelinated, that is, insulated by a fatty substance that appears white. It is thought that the myelination enhances transmission of signals across the brain.

the limbic system—the area that supports emotion and many behavioral tendencies, as well as long-term memory—has received increasing attention. The limbic system develops on a steeper curve than the prefrontal cortex, as shown in Figure 3-1, so that the disparity between these two regions is greatest during adolescence. The result can be an imbalance that may favor behaviors driven by emotion and response to incentives over rational decision making. It is this imbalance—not just the protracted development of cognitive control alone—that contributes to the prevalence of risk-taking in adolescents (Casey et al., 2008).

## Risk-Taking

Casey noted that risk-taking is a complex construct that involves more than sensation-seeking and inadequate impulse control—which themselves are often wrongly viewed as indistinguishable. Researchers have found a steady improvement in impulse control from childhood to adulthood, as shown in Figure 3-2, yet risk-taking still increases during adolescence (even though the definition of "risky" is dependent in part on

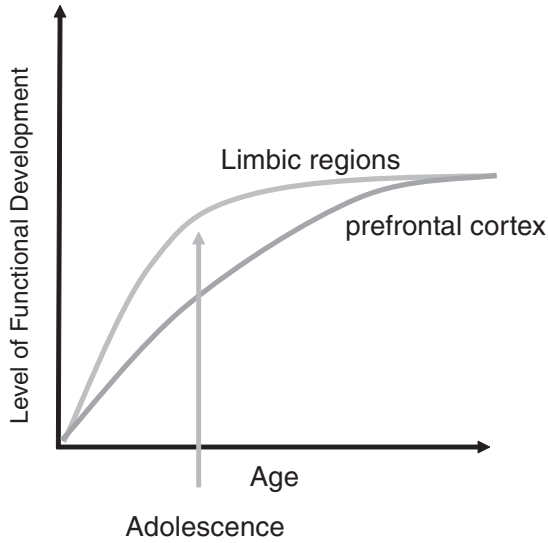


**FIGURE 3-1** Different developmental trajectories.
NOTE: Differential development of limbic subcortical relative to prefrontal control regions leads to imbalance in brain systems that may favor incentive/emotion driven over rational behaviors.
SOURCE: Casey et al., 2008. Reproduced with permission from *Developmental Review*, Vol. 28, pp. 62-77. Copyright © 2008 by Elsevier.

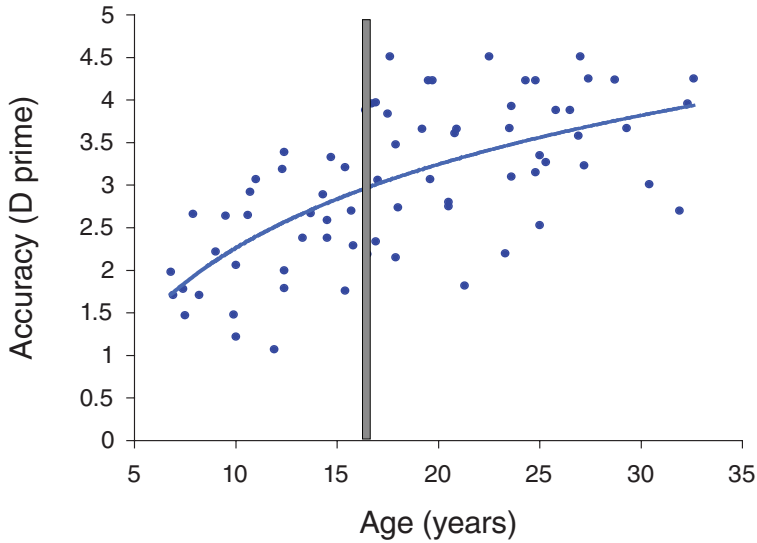


**FIGURE 3-2** Impulse control as a function of age.
SOURCE: Casey et al., 2008. Data were collected as part of a National Institute of Drug Abuse grant no. R01DA018879 to B. J. Casey at Weill Cornell Medical College.

the age of the individual engaged in the behavior). Why? One reason is that other factors, such as emotions and the incentives provided by environmental cues, also affect risk-taking. She pointed to research suggesting that sensitivity to rewards, such as money, food, or peer approval, can influence behavior even when individuals are not conscious of responding to these influences (Galvan et al., 2005). Adolescents and adults may be similarly responsive to potential rewards (a limbic region function), she explained, but adolescents have less control over the urge to seek a reward that may have negative effects (a prefrontal cortex function). Casey suggested that the development of the parts of the brain that respond to rewards (the limbic system) is on a different trajectory from those that may override unwise choices.[2]

Spear noted that a range of studies of specific brain regions has shown the differences in the responses of adult brains and adolescent brains to stimuli, as well as perceptions of risk and reward. For example, adolescents seem more influenced by stressful, exciting, or emotionally charged situations when making decisions. As a result, they may find a variety

[2] See Casey et al. (2008) for a discussion of brain imaging studies related to this point.

of drugs more rewarding than adults do—perceiving more enhanced social facility when under the effects of alcohol, for example. They may also be less sensitive to the adverse effects of these substances; some evidence indicates that they may experience less gross behavioral change in response to intoxication and less hangover after imbibing, for example. This general tendency in adolescents may be exacerbated by certain genetic traits—with the result that an individual who uses substances in early adolescence, when sensitivity to negative effects is lowest and stresses are high, may have heightened susceptibility to later problems because of the action of the alcohol or drug on the developing brain.

Casey pointed out that a variety of differences among individuals—including biological predispositions and differences in the pace of development of different regions of the brain—also influence risk-taking behavior. She noted that researchers have identified differences in the way even young children respond to situations that reward self-control and delayed gratification, for example, and that these differences tend to persist into adulthood (Eigsti et al., 2006; Mischel et al., 1989). At the same time, adolescents differ from adults in their capacity to override their impulses when they are in emotionally charged situations. That is, adolescents may be perfectly able to reason that a decision is not prudent but feel powerless to resist the impulse, whereas when adults make imprudent decisions, it is because they have identified reasons in support of the decision. Casey reported that brain research has associated this trait with an increased activity level in the nucleus accumbens (a region associated with reward, pleasure, and other emotional responses) of the adolescent brain compared with both children and adults. Studies have linked heightened activity in this region to an increased likelihood of taking risks and decreased likelihood of perceiving negative consequences from risks.

The timing of these various changes in the brain means that they play an important role in the experience of adolescence. Spear suggested, however, that a dynamic process occurs in which developing activities in different regions of the brain become more strongly interrelated and linked over time. That is, they do not follow an inevitable sequential pattern—and they are probably influenced by one another and by the experiences the individual has while they are occurring. The adolescent brain reacts differently to stimuli than the adult brain. The combination of exaggerated sensitivity to the rewards offered by many high-risk behaviors, a reduced sensitivity to adverse effects, and the insufficient power of immature frontal cognitive control all contribute to adolescent risk-taking. Since the neural underpinnings of adolescent behavior are likely to vary significantly in the course of adolescence, Spear suggested, it is important to recognize that approaches to managing or preventing

risky behaviors may need to be tailored to different ages. Helping young people find safer ways to explore risks, for example, may work well with younger adolescents, whereas with older ones it may be preferable to help them strengthen their emerging capacity for cognitive control. Casey highlighted the importance of considering interactions among the environmental and genetic factors that may contribute to risk-taking and resilience.

### Discussion

Daniel S. Pine and Elizabeth J. Susman raised a number of questions about the implications of understanding functions of the adolescent brain. Although basic science is many years away from producing diagnostic tests or other tools that would simplify diagnosis or intervention, it does provide the basis for new thinking about adolescent risk-taking. The cross-species research and other studies may enhance understanding of developmental sensitivities from a circuitry-based perspective, which could lead to many other valuable ideas for interventions to test in humans.

Similarly, the insights about the changes in brain responses to rewards that occur during adolescence link well with findings from studies of the peripheral processes related to stress, Susman noted. Research on stress has identified regulation of the stress response—a reduction in the normal physiological stress response—in children who are displaying problem behavior. Because of a reduction in the release of cortisol or other physiological components of the stress system, children who are highly disruptive or show symptoms of conduct disorder have reduced heart rates and other stress responses in stressful situations. In other words, consistent with earlier theories of sensation-seeking (e.g., Zuckerman, 1993), these individuals do not experience the appropriate arousal and reactivity and therefore they engage in risky behavior to somehow increase their reactivity or sense of pleasure. Susman suggested that the developmental changes Spear described could partly account for these differences between adolescents and adults—and this possibility suggests important links between central and peripheral processes of the brain. Additional research is needed to explore such questions as how the timing of puberty might interact with brain development (discussed below) and possible gender differences in the development of the reward system.

## SELF-REGULATION

Although adolescents are physically strong and healthy, their rates of injury and death increase by 200 percent from childhood to late

adolescence. The primary reason, Ronald E. Dahl explained, is the difficulties they have controlling their behavior and emotions. Whether the issue is accidents, homicide, depression, alcohol, substance use, violence, reckless behaviors, eating disorders, or health problems related to risky sexual behaviors, he suggested, the development of self-regulatory processes is key to understanding it.

As Spear explained earlier, adolescence is a time during which humans (and other species) are prone to explore and to seek novelty. The social context, however, has an important influence on how those impulses are acted on. Dahl noted that adolescence itself has changed over the past 150 years, biologically, socially, and culturally. Children are growing faster and to larger adult sizes than ever before, and they are reaching reproductive and physical maturity at earlier ages (Panter-Brick and Worthman, 1999). Adolescence once might have lasted 2 to 4 years; but based upon our understanding of pubertal processes, neurodevelopmental changes, social development, and other elements of adolescent development, it now may last a decade or more. The onset of adolescence, linked to the onset of puberty, is characterized by:

- Increased romantic motivation and interest in sexuality,
- Increased emotional reactivity and intensity,
- Changes in circadian rhythms,
- Increased appetite during periods of rapid growth,
- Increased risk of depression, and
- Increased sensation-seeking.

Dahl used the metaphor of "igniting passions" to capture the tendency for young people to become passionate about their goals and the links between their goals and their social identity.

Emerging empirical evidence suggests specific neurobehavioral changes occurring in the systems of emotion and motivation that help account for these characteristics, Dahl suggested. Looking specifically at sensation-seeking, he noted first that it is important to parse exactly what it means. Is it reward-seeking, a craving for excitement or higher arousal? Is it an urge for novel experiences? Is it a willingness to tolerate stressing sensations in order to be admired and achieve status? Dahl pointed out important differences between sensation-seeking—an appetitive drive, a willingness to take risks to attain novel, varied, and stimulating experiences and feelings—and impulsivity, which he described as a tendency to take quick actions without engaging in careful thought in advance. He noted research indicating that impulsivity follows a more or less linear decline from age 10 to age 30. In contrast, sensation-seeking increases between ages 10 and 15. In general, sensation-seeking seems to reach its peak at the time of puberty, especially in males (Martin et al., 2002; Steinberg, 2008).

Dahl pointed out both individual and developmental differences in the ways humans react to this sort of experience, and he explored the possible explanations. As discussed earlier, the neural systems that govern motivation and emotions are in a dynamic state during adolescence. Cross-cultural studies have supported the notion that adolescents need to learn to master high-intensity situations—to show courage and master fear—in order to prepare for adult responsibilities. Dahl suggested, however, that in contemporary Western society there is a maturation gap. With puberty happening earlier than ever before, sensation-seeking impulses are activated earlier relative to the slow and gradual development of cognitive control and the capacity for self-control. Dahl sees the balance between the affective load (the cluster of factors that increase stress on adolescents) and the sources of regulatory control—both young people's internal capacities and external controls on behavior—as a very delicate one. Figure 3-3 depicts this balance. Many factors can tip the balance in one direction or another: challenges or disadvantages in the family or broader environment, strong support structures in the family, or any of a host of individual differences (discussed further below).

To illustrate the way in which the balance between stresses and regulation can tip, Dahl described the issues surrounding sleep in adolescents.

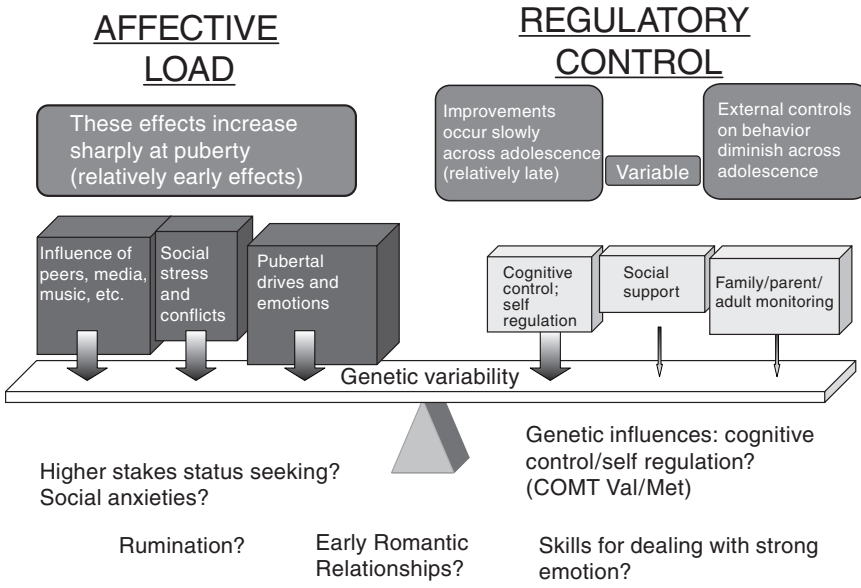


**FIGURE 3-3** Balance between affective load and sources of regulatory control. SOURCE: Dahl, 2009.

At this age, he explained, changes in the circadian rhythms tend to make adolescents prefer to stay up later at night and sleep later in the morning. Because they are experiencing rapid growth and development, they also tend to need more sleep than they had in late childhood. Adolescents in contemporary Western society are also very busy with sports, homework, and many other activities. They have many social and electronic distractions in their lives and in their bedrooms, and they have considerable freedom to select their bedtimes. As a result, Dahl estimates that 30 to 50 percent of U.S. adolescents typically do not get adequate sleep. The consequences can include missed school time; sleepiness and decreased motivation; irritability; and difficulty with self-control of attention, emotion, and behavior. Insufficient sleep can also have direct effects on learning and memory consolidation; affect the metabolism in ways that promote obesity; increase the risk of using alcohol, nicotine, and other substances; and increase the risk of depression. The effects of being moderately sleep-deprived and imbibing moderate amounts of alcohol are about the same, Dahl explained, and together these two factors significantly increase the risk of impaired driving, for example.

More broadly, however, the sleep issue demonstrates how a biological change in adolescence can lead to a spiral of negative effects with potentially very significant consequences. It is the social context that has amplified the problem, he argued. Generations ago, when evening entertainment options and other distractions were far fewer, adolescents' preference for altered sleeping patterns presumably had far less effect on their lives. In the current context, however, the result is more likely to be significant sleep deprivation, which may interact with other small changes that occur during adolescence (e.g., sensation-seeking, emotional volatility). The social context can amplify the effect of these changes because young people may have greater opportunity to take risks. All of this suggests to Dahl that improved understanding of the mechanisms that affect sensation-seeking, cognitive control, and emotional regulation could yield valuable insights for intervention. He stressed that it is important to remember, however, that although adolescence is a period of intensity when the developing sense of self is sculpted by context and experience, it is also a time when adolescents can be idealistic and passionate about positive goals, whether in sports, literature, the arts, or politics and can begin trying to change the world in positive ways.

## PUBERTY AND NEUROENDOCRINE CHANGES

Biologically, puberty is the developmental phase at which humans first become capable of begetting or bearing children, and this development is governed by the brain, as Susman explained. The brain is respon-

sible for reproductive maturation, physical growth, and the behavior changes that are associated with puberty. These changes involve complex processes, and, Susman observed, this means not only that there is room for considerable individual variation, but also that adolescents and their environments influence their own development.

Puberty is initiated and governed by the hypothalamus, the brain structure that controls metabolic processes and secretes neurohormones. As puberty begins, the hypothalamus activates the hypothalamic-pituitary-gonadal axis, which stimulates the release of ovarian and testicular hormones (estrogen and testosterone), and the effects are observable in rapid growth and the development of secondary sexual characteristics. Researchers are not certain exactly what turns on this process, Susman explained, but several factors seem to play a role: genes, neuroendocrine changes, and environmental factors. Obesity in girls, for example, is associated with early puberty; toxic substances in the environment may either delay or precipitate it; and some research has suggested that family influences may even play a role.

Puberty putatively plays an important role in risk-taking. Most risk behaviors are first evident at approximately the ages of 10 to 12 (Ge et al., 2006), when neuroendocrine changes are occurring. Elevated levels of testosterone have been particularly associated with aggressive risk-taking in boys; in girls, elevated testosterone is associated with the tendency to affiliate with deviant peers (Vermeersch et al., 2008). Both testosterone and estrogen are also recognized as having an energizing effect, and thus puberty has been described as a time of awakening to both pleasure and risk. In contemporary Western society, that frequently means experimentation with drugs and sex. Studies in animals have also supported a general association between elevated levels of the gonadal hormones and aggressive behavior (Sato et al., 2008). Researchers have suggested the possibility that individuals who experience puberty unusually early or late have a higher propensity for risk behaviors. Early puberty is a particular risk for girls, although the literature is less conclusive about effects for boys (Negriff and Susman, in press).

Establishing a causal link between hormones and risk-taking has been challenging, however, Susman explained. The practice of treating certain disorders in adolescents with testosterone or estrogen has permitted researchers to examine their effects on aggression, other behavior problems, cognition, and other phenomena. A study using a randomized control design of adolescents with delayed puberty who received hormones showed that some, but not all, of the subjects responded to the treatment, and that some showed increased aggression, although there were differences associated with both gender and dose (Belsky et al., 2007). Other research (Paus et al., 2008) has focused on a possible connection between

the development of white matter in the brain (discussed earlier) and the timing of puberty and risk-taking and has found some support for this connection in males. Tarter and colleagues (2007) have also found that elevated levels of testosterone foster social dominance, which is associated with behavior that violates norms and, in turn, an increased proclivity for substance use.

Susman concluded that there are three converging lines of evidence on puberty that relate to risk-taking. First, puberty is a highly sensitive period for steroid-dependent brain organization. That is, as both Casey and Spear also observed, the brain undergoes significant transition during puberty, which seems to be significantly affected by environmental factors. Second, testosterone levels are quite variable during this stage. And finally, testosterone is linked to dominance, which is related to aggressive behavior, which may in turn also promote risk-taking. Although less attention has focused on the effects of estrogen, Susman noted, it is likely that this hormone also influences risk behaviors.

Susman identified a few implications of these findings for risk prevention. First, if parents understand the ways in which these neuroendocrine changes can affect their children's behavior, they will be better prepared. Because early puberty in girls heightens the risk of pregnancy, for example, parents may need to address issues of sexuality earlier than they might expect. Pregnancy prevention programs, Susman argued, should also target much younger children than they currently do. Programs for 13- and 14-year-olds may be too late. Fourth graders are well into the onset of puberty, and although the younger girls may be at low risk for early pregnancy, they may be at higher risk for not using safe sex practices (e.g., not using condoms). Her final point was that adolescents have a considerable influence on the context in which they are developing—a point that is discussed further in later sections.

## SUMMARY

The physical and biochemical development taking place during adolescence is complex, and the presenters highlighted not only ways that these processes affect behavior, but also ways they may interact with one another and with social influences on behavior. The imbalance between the gradual development of the prefrontal cortex, which, among other things, supports self-control, and the more rapidly developing limbic system, which, in turn, governs appetite and pleasure-seeking, helps to explain why adolescents are prone to seek novelty and take risks. At the same time, as young people reach puberty, they are faced with an array of social pressures as well as neuroendocrine changes that can affect their moods and focus their attention on sexuality and sensation-seeking. The

average age for puberty has declined, and the gap between these developments and the development of the cognitive capacity for self-control is even greater than before. In modern Western cultures, many of the tempting risk behaviors are far less potentially beneficial than those for which humans may originally have adapted.

# 4

# The Psychology of Adolescence

The neurobiological processes that define adolescence and influence risk-taking are complex, and the role they play is emerging as a key factor in adolescent behavior. These processes must be understood in the context of psychological development and social influences. B. Bradford Brown provided an overview of psychosocial development and adolescent risk-taking, and Valerie Reyna explored recent research on reasoning and decision making as it applies to adolescent risk-taking.

## PSYCHOSOCIAL CHANGES

Brown began with the primary psychosocial tasks adolescents must accomplish. Put simply, there are four key tasks:

1. to stand out—to develop an identity and pursue autonomy,
2. to fit in—to find comfortable affiliations and gain acceptance from peers,
3. to measure up—to develop competence and find ways to achieve, and
4. to take hold—to make commitments to particular goals, activities, and beliefs.

He identified two ways in which these basic tasks relate to the risks that adolescents take. First, many risk behaviors can either foster or impede the successful accomplishment of these tasks. Second, adolescents may

turn to risky behaviors to help themselves cope with the failure to succeed in one of these areas.

Brown looked first at the relationship between risk-taking and the development of identity, which has been viewed by some psychologists as primarily an individual psychological process and by others as more of a social process. In the first view, originally associated with the work of Erik Erikson, the task is understood as a process of distancing oneself from the views of others, particularly parents, to form a clear sense of who one is as a person and how one wishes to behave in the world. When that process is successful, individuals are likely to avoid major risk-taking, but for individuals who have a more diffuse state of identity, there may be an association with drug use and other risks. Those who take the second perspective think that individuals draw their sense of self from the social world and that they have a primary interest in the way they are perceived and in how others respond to them. The result may also be a coordinated, secure sense of self, but for individuals who go through this process in a social context in which risk-taking is the norm, they are likely to be more prone to taking risks.[1]

Researchers have identified other components that also play a part in identity formation, such as identification by gender, ethnicity, and sexual orientation. A part of the task for adolescents is to discern the criteria for these possible identities, evaluate them, and decide whether and how to incorporate them into their personal sense of self. This process is a particular challenge for immigrant youth, who often must decipher both the culture of their family and ethnic or national group and the culture into which they have immigrated. Research on immigrant youth has suggested that, in this circumstance, many young people choose either to stick closely with their home culture, conforming to traditional customs and styles of dress and gaining the reputation of a good boy or girl, or to reject that option in favor of a more Americanized identity. The Americanized orientation often means association with risk-taking peers.

The development of autonomy is closely linked to identity formation and is also generally conceptualized primarily as either a psychological or an interpersonal process. Some researchers, Brown explained, have suggested that there is a universal process through which individuals develop healthy autonomy (Kagitcibasi, 2005). If individuals develop a high sense of agency (taking responsibility for their own actions) while retaining close connections with significant adults, they are likely to develop a healthy "autonomous, relational self," which is likely to result in rela-

[1] Brown cited the work of Jay McLeod on inner-city youth as an example of the social process of identity formation (McLeod, 1987).

tively low risk-taking. When this process goes awry, the result is often increased risk-taking. Other researchers have shown that young people who develop autonomy either too early or too late in their development often have poorer outcomes than those who develop it at the same time that their peers do (Dishion et al., 2000; Dornbusch et al., 1990; Feldman and Wood, 1994).

Finally, adolescents spend a lot more time with their peers than younger children do and are more heavily influenced by them than younger children are. The drive for affiliation and acceptance at this stage makes adolescents more open to peer influence and also tends to promote the rapid development of new relationships—with less time spent on negotiation of the basis for the friendship than at other stages of life. Researchers (e.g., Berndt, 1979; Brown et al., 1986) have identified a linear pattern that associates age and openness to peer influence, with a peak of openness to antisocial influences at about 9th grade. Openness to both neutral and prosocial influences is higher at every stage. Less is known about the reasons underlying the trajectory of openness to influence, although Brown noted that it seems likely to be related to the neurobiological developments discussed above.

Some evidence suggests that adolescents are most susceptible to peer influence in the early stages of new relationships or just prior to the development of a new relationship. Risk behaviors are also correlated with several more specific kinds of social situations, including romantic relationships that develop early in adolescence, association with older peers or permissive peer groups, romantic or sexual relationships with older partners, and lax adult supervision. What this suggests, for Brown, is that, apart from the cognitive and biological processes that affect adolescents' behavior, it is important to understand the meaning that adolescents attach to risky behaviors in the social context in which they encounter them. If teenagers perceive, for example, that risky driving makes them more attractive or that engaging in unprotected sex makes them appear more faithful—those images may be important to their personal identity—within their peer group, they may decide to engage in those behaviors despite awareness of the risks.

This reality highlights the importance of developing social competence, another of the key tasks of adolescence. The capacity to engage effectively in social relationships is very important both for developing identity and for gaining acceptance from desired peer groups. Two skills are of particular importance for developing social competence: impulse control and the regulation of emotions. Individual adolescents who control their impulses very effectively are likely to have a very different pattern of social relationships than individuals who do not—and they are less likely to manifest aggressive behavior (Cairns et al., 1989). Consequently,

many other individuals will tend to avoid impulsive adolescents, leaving them with a peer group made up of other aggressive individuals. Such peer groups tend to be less stable than others. The pattern is similar with emotion regulation—adolescents who are not successful at it struggle to form stable peer relationships. The last key task, developing commitments, is a protective factor; for example, religious and civic involvement is associated with low rates of deviance and therefore less involvement in many of the risky behaviors.

Brown highlighted the importance of viewing these developing competencies together. Deficits in social skills or social competence, for example, help to establish an adolescent's reputation, his or her identity in a peer group as an aggressive and unpredictable person. This reputation directs the adolescent to peers who share some of these deficits, thereby intensifying the social pressures to which the adolescent is exposed. It is this coalescence of forces that have more influence on risk-taking than any of the factors alone. At the same time, however, these same factors can be a positive influence as well. A prosocial identity, healthy autonomy, and relationships with prosocial peers, facilitated by strong social skills are all likely to protect individuals from risk.

Robert Wm. Blum also stressed the importance of individual traits and skills that can help adolescents navigate adolescence and protect them from risk. These include values, goals, and positive orientation and affiliations—factors likely to be built in a positive family and community context—as well as the development of effective skills for coping with anxiety, stress, and adversity. It appears, he suggested, that innate personality traits, such as resilience, play an important role, but that the development of social competence is also learned.

Brown suggested that it is more likely that psychosocial tasks encourage risk than that they discourage it. The key tasks of adolescence challenge an individual to explore possible identities and fashion a comfortable social identity, to try to gain acceptance into groups, and to develop the skills to navigate romantic relationships. These tasks require new skills, and all require some level of risk-taking to reap what are likely to be very positive rewards. The individuals who do not engage in those sorts of risks get left behind. He cautioned against overlooking the value of some kinds of risk-taking and the extent to which adults actually encourage risk-taking.

Brown closed with a look at important questions about psychosocial influences that remain open. How much cultural variability is there in the "normative scripts," or expected pathways, for the accomplishment of the key psychosocial tasks of adolescence? How do social contexts affect the accomplishment of these psychosocial tasks? What are the connections between these psychosocial tasks and the bio-cognitive-neural

developments researchers have identified? Brown suggested that the most fruitful research approaches would coordinate findings related to individual behavior, social processes, and internal processes of development.

## ADOLESCENT REASONING

Each of the factors already discussed ultimately affects adolescents' risk-taking by influencing the decisions they make. Researchers have also examined decision making itself. Reyna provided an overview of classic thinking about decision making, some new thinking, and research on the differences between the decision making of adults and adolescents.

### Perspectives

In what Reyna described as the classic view of decision making, the mind operates much like a computer. That is, the most successful decision makers process more information more precisely. They "compute" a decision by estimating risks precisely, weighing potential rewards, and then acting based on the balance between them. The capacity to reason in this way improves as individuals mature. This general, classic view encompasses several different specific models, some of which incorporate the processing of such factors as social norms, self-efficacy, and perceived control over outcomes (for an overview of these models, see Reyna and Rivers, 2008). Reyna also mentioned a range of other theories, such as information processing, behavioral decision making, the theory of planned behavior, and prototype willingness. Noting evidence for the classic model, she suggested that although it can account for a significant portion of the variance in real-life risk-taking, it does not adequately account for the increased risk-taking of adolescents.

Surely, many of the decisions adolescents make are not reasoned or intentional, she said. As mentioned earlier, emotion, altered sensitivity to rewards, and increased impulsivity appear to play a role in adolescents' decisions. The developmental differences in brain processing discussed earlier also need to be accounted for in a conceptual picture of adolescents' decision making. Impulsivity has been shown to decrease steadily with maturity, when the ability to delay gratification increases. These capacities, however, do not fully account for adolescent risk-taking, either singly or together.

Moreover, some empirical evidence contradicts the classic view, Reyna observed. Studies of responses to what economists call a standard gamble—a situation in which subjects are asked to choose between a guaranteed $100 and the chance to win $200, at the risk of winning nothing—for example, have shown that adults tend to choose the certain

$100 (Reyna and Ellis, 1994). What is surprising, she said, is that it is children who respond the most rationally, in a classic economic sense, to this choice by assessing the risk quantitatively. The older people are, the more likely it is that they will respond in a more qualitative way. They use what she called "gist-based" intuition to make their choice, which leads them to avoid the risk (Reyna, 2008; see below).

In addition, studies of the effect that perception of risk has on the likelihood of risk-taking have yielded some counterintuitive results. Most of the time, increased perception of risk decreases the likelihood that an individual will take the risk (a negative relationship), but sometimes the opposite effect is evident (Mills et al., 2008). There is a positive relationship between risk perception and risk-taking when adolescents are cued to remember their actual behavior: risk-takers perceive their risk as high, and nonrisk-takers perceive their risk as low.

### Gist-Based Reasoning

The finding that adults tend to rely more on their intuitive reactions—or the gist of the situation—has been incorporated into what Reyna and colleagues have labeled the "fuzzy trace" theory (Reyna and Brainerd, 1995; Reyna, 2004). In this view, decision-making processes change from childhood to adolescence and from adolescence to adulthood. As in the classic theory, knowledge, acquired through both education and experience, is understood to play a part in decision making, but other factors are also explicitly identified. The way in which individuals perceive and understand a situation—how they represent it to themselves—and the way they retrieve relevant information from memory and apply it to their decisions also play an important part. Representation is central because decisions depend on how individuals subjectively perceive reality, not on reality itself. Furthermore, the kind of representation that is used to make a decision changes the nature of the decision process (e.g., from verbatim-based analysis of details to gist-based global thinking; see below). Thus, the individual makes a decision by integrating what he or she perceives with retrieved memories or knowledge, a variable and uncertain process.

Many public health interventions proceed from the premise that if adolescents knew of and understood a risk, they would not take it. Yet, Reyna explained, many studies have shown that not only are adolescents well aware of prevalent risks, but they also actually overestimate the risks of developing HIV or lung cancer or getting into a vehicle crash (see, e.g., Fischhoff et al., 2009; Millstein and Halpern-Felsher, 2002; Reyna and Farley, 2006). Figure 4-1 shows how 12th graders' changing perception of the risk of smoking marijuana tracks compared with their actual use

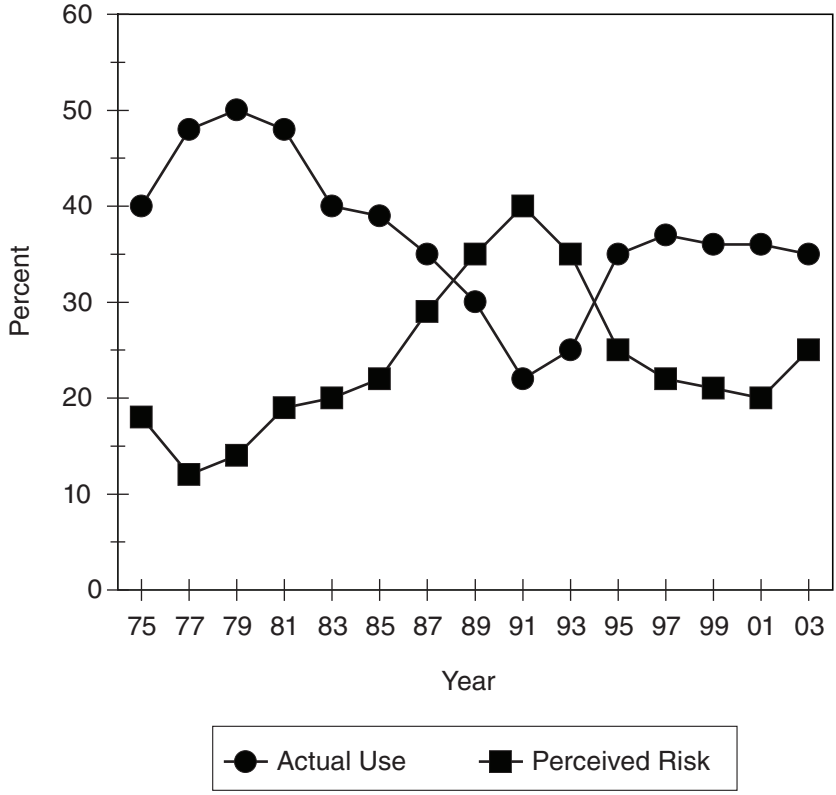


**FIGURE 4-1** Twelfth graders perceived risk and actual use of marijuana over time.
SOURCE: Reyna and Farley, 2006. Reproduced with permission from *Psychological Science in the Public Interest*, Vol. 7, pp. 44. Copyright © 2006 by Sage Publications.

over the past few decades—demonstrating that the two are related as if decisions were being made rationally (higher risk perceptions, lower risk-taking). It is a myth that teenagers do not understand the risks of prevalent behaviors—or believe they are invulnerable—Reyna observed. Numerous studies have also shown that risk-taking could be predicted based on adolescents' perceptions of the risks and benefits of the behavior, which suggests that impulsiveness does not easily account for it (Reyna and Farley, 2006). Adolescents act despite awareness of risks. The key is that, although adolescents overestimate many risks, they often also rate the potential benefits as very high—and thus the perceived benefits outweigh the perceived risks.

What complicates this kind of decision making, in Reyna's view, is that individuals tend to have two, sometimes conflicting, versions of reality in their minds, and this is the essence of fuzzy trace theory. First, there is the gist-based representation of reality—the quick take on or summary of what is essential about something the individual has experienced or observed. That version of events may be in conflict with what she calls the verbatim, or more literal, representation of reality. The gist representation reflects the meaning of the event to the individual and hence also reflects culture, personality, and personal history. Studies of these types of thinking suggest that the more education and experience people acquire, the more likely they are to rely on their sense of the gist of the situation in making decisions (Reyna and Lloyd, 2006). Verbatim thinking is more specific and relates to thinking about and remembering specific facts or situations in detail. Because young people lack experience, they tend to base risky decisions on verbatim details rather than on the gist of the situation.

The knowledge that adults bring to a gist-based decision helps them put new information or situations in context. Because adults focus on gist rather than details, the effects of context can sometimes be paradoxical. For example, Fagerlin and colleagues (2005) showed that women who first estimated their risk of breast cancer (overestimating it as 46 percent), perceived the true value of 13 percent as lower than women who did not make an initial estimate. The perception of 13 percent varied depending on whether it was interpreted in the context of 46 percent; the verbatim representation of risk was identical for both groups (literally 13 percent), but the gist of the risk differed. Women who make initial risk estimates also show reduced interest in screening tests to detect breast cancer. Thus, highlighting the true level of risk (as is typically done in public health messages) can backfire if individuals overestimate that risk, as adolescents often do. In other words, it is the gist of the risk, or the meaning of the information in context, that is critical. This point was also demonstrated in a study of high school students' ratings of the benefits and risks of sexual intercourse (Reyna, 2008; Reyna and Adam, 2003). The adolescents' perceptions of risks and benefits varied with their psychosocial context, as reflected in effects of gender, age, and cultural background.

The effect of context can also be seen in the way that memories and impressions are triggered when a particular decision needs to be made. Reyna explained that when one changes the memory cue, or type of question that is asked, people retrieve different sorts of memories and thus answer similar questions in contradictory ways (Brainerd and Reyna, 2005; Mills et al., 2008). In general, when verbatim-type memories (e.g., of lonely Saturday nights, when the risk of pregnancy or sexually transmitted disease was very low) are triggered, risk perceptions reflect those memories. Alternatively, if gist-type memories (e.g., of general knowledge

about potentially catastrophic consequences of unprotected sex) are activated, the same individual might have an entirely different perception of personal risk. Values and other principles that people endorse are also stored in long-term memory, but they influence choices only when they are retrieved and applied in the decision context. Research has shown that simple values and principles, what Reyna called gist principles, such as "avoid risk" or "better safe than sorry," guide decision making, especially for adolescents who avoid unhealthy risks (Reyna, 2008). However, most adolescents engage in what Reyna called dual processing, that is, they engage in both verbatim thinking and gist thinking, making their decisions vulnerable to the sorts of contextual cues they receive when faced with a risky choice.

Survey studies in which adolescents are questioned about their thinking show that they engage in both gist-based and verbatim-based reasoning, but as they age they are less likely to ponder explicit trade-offs and more likely to apply gist-based reasoning, which tends to make them increasingly risk-averse for gains (Reyna and Farley, 2006). She likened the trade-off thinking to a Russian roulette scenario, in which the adolescent may reason that if the reward is high enough the risk would be worthwhile, whereas an adult would be more likely to intuitively recognize that the size of the reward is irrelevant when the risk is catastrophic.

Preschool-age children are the most quantitative when it comes to reasoning about a decision; studies show that they will take greater risks for greater rewards and will also scale back their risk tolerance if the reward is reduced. They also change their risk-taking when the level of risk changes. By adulthood, decision making is predominantly gist-based, which, Reyna suggested, is broadly consistent with the thinning of the gray matter and the pruning of synapses discussed in Chapter 3. That is, the selective pruning has reduced the number of connections in the brain, facilitating quicker, focused processing and allowing the individual to make many decisions with less deliberation and weighing of risks and benefits.

## SUMMARY

Examination of the psychosocial aspects of adolescent development and insights about adolescent reasoning further filled in the picture of how and why adolescents take risks. Much of the primary work of adolescence—including developing an identity, building competence, and gaining acceptance from peers—requires some degree of risk-taking. These tasks also help to explain why adolescents' perspective on risky behavior may be very different from that of adults—a point that may provide useful guidance for those crafting messages and developing

interventions designed to discourage youth from taking risks. At the same time, adolescents process decisions related to risk quite differently from the way adults do. That is, not only are they attuned to different goals than adults, but they also think differently, transitioning between verbatim-based analyses of risk-reward trade-offs to gist-based intuitions about the essential bottom line of risky decisions. Experience, context, and culture shape the gist representations and the retrieval of values that are central to healthy decision making. Although the thinning of gray matter and the pruning of synapses discussed in Chapter 3 might seem to reduce processing power, theoretical mechanisms emphasizing streamlined gist-based processing suggest that pruning might be important in developing the capacity to make sound decisions.

# 5

# The Influence of Environment

The workshop discussions of biobehavioral and psychological perspectives on adolescent risk behavior alluded repeatedly to the importance of the cultural and social contexts in which young people develop. Presenters described research on the ways family, peers, schools, communities, and media and technology influence adolescent behavior and risk-taking.

## FAMILY

There are strong reasons to think that families, and their economic circumstances in particular, influence both parents' and children's emotions and behaviors, Rand D. Conger explained. He described some of the evidence for these effects, the specific processes involved, and some of the implications for intervention. Nancy A. Gonzales described the relationship between family influences and particular risk behaviors, as well as interventions that have been developed to alter these influences.

### Effects of Economic Distress

The social causation model, Conger explained, provides a framework for considering the way in which economic disadvantage and social conditions affect family functioning and the ways that children develop.

Recent studies have provided evidence that economic factors influence families. Costello and colleagues (2003), for example, found that chil-

dren whose families were lifted out of poverty when a gambling casino opened on an Indian reservation showed improvement in both psychiatric symptoms and conduct problems. Specifically, this study found that externalizing signs, including such behavior disorders as conduct disorder, improved, but that families' improved economic circumstances did not affect the rate of internalizing psychiatric problems, such as depression. The researchers concluded that the improvements came about in part because of improved parenting practices. Experimental studies, such as the New Hope study (Huston et al., 2003), have also shown that interventions that increased employment and reduced poverty resulted in similar improvements.

Researchers have described three primary models for thinking about how economic factors influence families: the family stress model, the investment model, and the interactionist model. Research on the family stress model goes back to the 1930s, Conger said, and has since been well replicated using many samples from diverse backgrounds. It is based on evidence from both human and animal studies that punishing experiences, such as economic pressure,[1] exacerbate negative affect, which can take many forms, such as despondency, depression, anger, or aggression (Berkowitz, 1969). These sorts of emotions can disrupt family relationships. The effect of the hardship depends on the way it affects daily life—in other words, the emotional response of the family and the individual are what determines the psychological effect of the event. When parents become depressed, angry, and sullen with one another and have increased conflict, the result is often harsh and inconsistent parenting or withdrawal. For adolescents, that can mean increases in risky behavior and less development of the sorts of competencies that protect them from those risks. Conger observed that other sorts of distress may also affect families in the same way. That is, when stress and challenge are high for parents, they generally have an increase in emotional and behavioral problems, which in turn affect family functioning and increase risks for children.

The model, which is consistent with findings from numerous studies (Conger et al., 2010; Conger and Conger, 2008; Conger and Donnellan, 2007), is illustrated in Figure 5-1. Some interventions based on this model have focused on improving families' economic circumstances. However, although the downward spiral can occur very quickly, such interven-

[1] Conger noted that family income is not a reliable measure of hardship because even families with high incomes may face severe economic challenges, for example, if a medical calamity occurs in a family with inadequate health insurance. Thus, researchers consider other factors, such as negative financial events, sudden economic demands, or sudden changes in income.

tions work much more slowly. Thus, in Conger's view, interventions that reduce the harm during the economic transition are also needed. Promising targets include:

- Reducing parental distress,
- Reducing parental conflict and relationship difficulties,
- Promoting effective parenting, and
- Incorporating the children's perspectives, that is, encouraging them to feel that they are part of the solution to the family's difficulties.

While these approaches appear to hold promise, Conger identified areas in which further research is needed. For example, not enough is known about potentially lasting effects of hardship experienced by young children and how they might affect adolescent behavior and risk-taking. The role of self-regulatory and personality processes, which can play a protective role, could also be better understood.

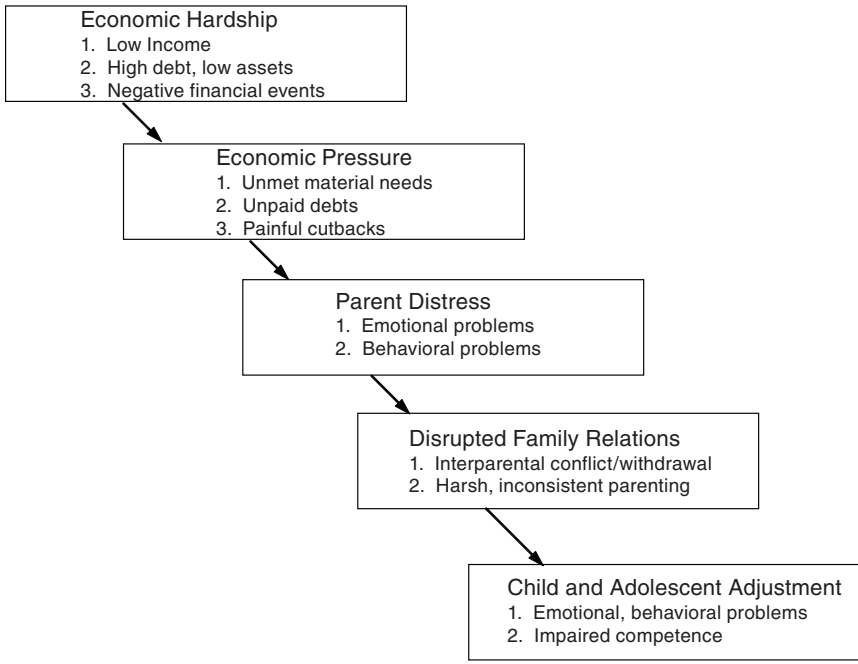


**FIGURE 5-1** The family stress model of economic hardship.
SOURCE: Conger and Conger, 2008. Reproduced with permission from Sage Publications. Copyright © 2008 by Sage.

### Influences and Interventions

Gonzales focused in greater detail on the ways in which families influence adolescent risk behavior and effective interventions. Effective parenting, she explained (nurturing, supportive parenting that includes clear and consistent discipline), can prevent negative behaviors and also promote prosocial behaviors and values. It also helps children develop various competencies that are also protective. Parental monitoring and supervision may prevent children from associating with deviant peers. High levels of family conflict and poor communication skills disrupt parenting and family relations, reduce children's emotional security, and reinforce the use of aggression and interpersonal hostility. Family members may model risk behaviors and deviance or effective emotional and social skills, and they may also endow their children with genes that predispose them to certain risks (e.g., substance abuse).

Thus, most family interventions are attempts to change one or more of these processes, and a variety of evidence from cross-sectional, longitudinal, and experimental prevention trials has yielded support for several conclusions (NRC and IOM, 2009):

- Parents who form warm relationships with their children and have minimal conflict with them, provide adequate monitoring and supervision, and do not provide models of drug use can protect youth from developing substance use disorders.
- Lack of strong positive relationships with parents increases involvement with deviant peers, which increases adolescents' risk for a variety of problems, including precocious transitions, such as early pregnancy, premature independence from parents, and school dropout.
- Parental monitoring and positive parental relationships have been linked with later sexual debut, fewer sexual partners, and increased condom use.

Many social risk factors have been shown to increase the likelihood that adolescents will engage in risk behaviors as well as to disrupt parenting and family processes. Thus, parenting and family processes are the most common targets of interventions for families experiencing adversity, such as economic hardship; parental divorce, death, or mental illness; or parental criminal activity.

Research has shown that these core processes work the same way across many racial and ethnic groups; where cultural differences are evident, they reveal differences in the magnitude of the effect. Core family values, expectations, and goals, however, do vary across ethnic groups, and these differences must be taken into account when implementing

family interventions, Gonzales said. Different risks as well as protective family resources are common in different groups, and these can also be addressed through culturally tailored interventions. Two examples of such programs are the Strong African-American Families Program[2] and the Familias Unidas Program.[3] Both have reduced early onset of substance use and sexual intercourse, as well as problem behaviors.

Although the evidence for the effectiveness of interventions that target these processes is strong, the challenge is to identify and reach the families that need them. Gonzales used the ecological transactional framework, shown in Figure 5-2, to illustrate the array of influences that affect adolescents. She explained that the family plays a central role in negotiating these influences and has the potential to help protect the adolescent or the reverse. Families vary, for example, in the extent to which they encourage and support education, monitor and manage peer activities,

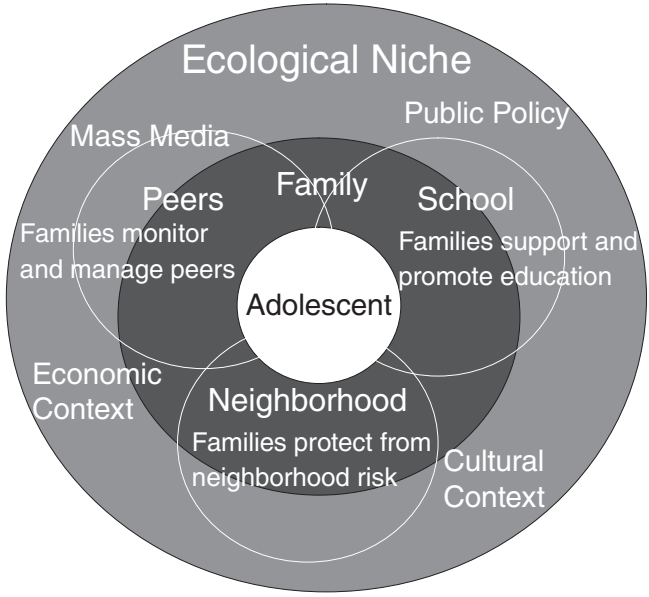


**FIGURE 5-2** Ecological transactional framework.
SOURCE: Gonzales, 2009.

[2] See http://www.cfr.uga.edu/saaf1.
[3] See http://www.familias-unidas.org.

and so forth. Different neighborhoods present different sets of risks and require different strategies.

Prevention researchers distinguish among universal interventions (delivered to all members of a population), selective interventions (delivered to segments of a population identified as being at high risk for a particular outcome), and indicated interventions (delivered to individuals already showing signs of a particular risk). Some interventions operate across these levels, depending on need and risk. Interventions may also focus on a range of ages. Those that focus on young children tend to have comparatively stronger effects, Gonzales observed, because younger children are more malleable. It is often possible to have broader impact on a range of risks with early intervention. Home visits to new mothers, designed to instill positive parent-child interactions from the beginning, is an early intervention that has shown promise. Effects for this approach include reduced physical abuse, aggression, and harsh parenting, as well as reduced antisocial behavior (a precursor to many problem behaviors) in children. The effects are strongest for families in the greatest adversity. Research to document the long-term effects on adolescent behavior, however, has been limited.

Interventions also target stages of transition across development, each of which may present not only new risks, but also new opportunities for influencing outcomes. That is, a developmental turning point may be a place where a negative trajectory is established or an opportunity for adolescents to develop new skills. Many middle school interventions are designed around this idea, Gonzales noted. This is an important stage, Gonzales said, because it is when many risk behaviors are initiated and adolescents face many new challenges, including puberty and the growing importance of peer groups. The Strengthening Families intervention, for example—a universal intervention that addresses the parenting skills of individuals with children ages 10 to 14—has shown success in reducing conduct problems and affiliation with antisocial peers.[4] Another example of an early intervention is the Raising Healthy Children program, an elementary school-based intervention designed to improve family bonding with the school while also building children's competencies for resisting risk (Catalano et al., 2003).

Intervening later in adolescence is more challenging because negative trajectories are often well established by then. One approach that has had success is multisystemic therapy for youth with serious behavior problems (Henggeler et al., 2002). This is a very intensive individualized intervention that focuses on strengthening parenting and family relations

[4] See http://www.strengtheningfamiliesprogram.org.

(working with families in their homes) and also on removing youth from deviant peer groups, improving their school and work performance, and developing social networks. Evaluations have shown long-term reductions in rates of criminal offending, recidivism, rearrest, and out-of-home placement.

Looking across the literature, Gonzales concluded that meta-analyses and numerous randomized controlled trials have demonstrated strong empirical support for interventions designed to improve parenting and family functioning. These interventions demonstrate effects on many problem behaviors and produce lasting benefits in many cases for ethnically diverse families. Evidence suggests that interventions that simultaneously address risk across contexts may be necessary, particularly at the later ages and also when implemented with youth in low-income neighborhoods and families. The relatively few economic analyses that have been conducted consistently show that benefits outweigh the costs of these interventions.

Research is needed, in Gonzales's view, to explore how these interventions can be integrated and sustained on a larger scale and how they can be made accessible to parents who have restrictions on their time and mobility.

## PEERS

The influence of peers is similarly complex, as Mitchell J. Prinstein and Kenneth A. Dodge demonstrated.

### Influences and Interventions

Prinstein began by explaining that, in general, the research literature on peer influence and the interventions related to it are less mature than those on families. A topic that has received considerable research attention is the strong association between adolescents' attitudes and behaviors and those of their peers. Two possible explanations for this association have emerged. One possible explanation for adolescents' tendency to belong to homogeneous peer groups is that they select individuals who are already similar to themselves. The other is that, when an individual socializes with particular people, he or she tends to adopt the behaviors or traits they have. Researchers who have explored this question have largely concluded that in most cases both effects are important (Dishion and Owen, 2002; Hall and Valente, 2007; Kandel, 1978; Popp et al., 2008), Prinstein explained.

Researchers in this area have focused primarily on a few behaviors. Figure 5-3 illustrates the degree of support that exists for the influence of

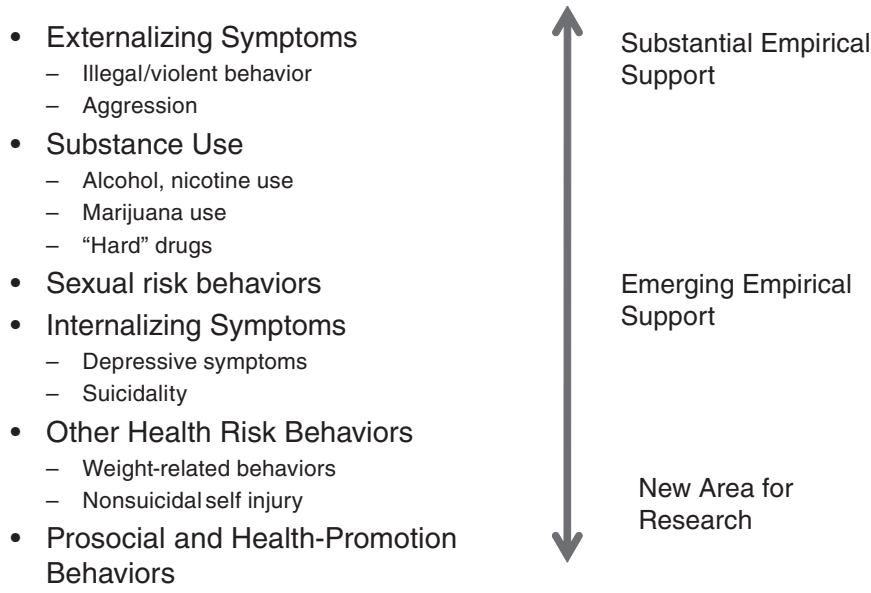


**FIGURE 5-3** What behaviors are influenced by peers?
SOURCE: Prinstein, 2009.

peers on different problem and risk behaviors. He noted that several very important areas have received very little attention, such as weight-related behaviors and damaging behaviors, such as self-cutting.

Furthermore, almost all of the research has focused on the influence of adolescents' best friends. While the best friendship does seem to be an important influence, emerging evidence indicates that other peers also play an important role. Adolescents are quite likely to emulate the behavior of popular peers. They have a strong investment in social comparison and reflected appraisal and with meeting the demands of those considered the most popular in their peer group. Prinstein noted the important distinction between adolescents who are well liked and those who are identified as popular, the latter signifying those who are at the top of a dominance hierarchy. It is the dominant individuals who seem to be the most influential, particularly with regard to high-risk behaviors. They tend to be both aggressive and more than usually prone to those behaviors. Moreover, it is rare for friendship dyads to occur in isolation; more typically they occur within a friendship network or clique. These social patterns are very difficult to study, he added, because they evolve so rapidly. Even those who do not interact with one another within the

peer crowd might feel the need to adopt the attitudes or behaviors of the crowd with which they would like to associate.

The influence of romantic partners has also just begun to receive attention, and Prinstein commented that researchers have not always been careful to distinguish these different sorts of peer relationships. Further research is also needed to illuminate the ways adolescents negotiate these complex relationships—how they decide whom to heed among the many possible sources of influence. A facet of that question is that of nonconformity. Adolescents who choose not to conform to the attitudes and behaviors of their peers are under the illusion that their behavior is therefore free of peer influence. But, in fact, by adopting the opposite behaviors, they are still very much cognizant of and influenced by the social norms of their peer group, although they might not realize that their behavior is being influenced by those perceived norms.

Prinstein mentioned strong theoretical reasons to think that times of transition, such as puberty, school transitions, and certain stages of friendships, appear to be key times when peer influence is strongest. These are times when adolescents tend to be particularly sensitive to peer feedback as a source of understanding of their own identity. Adopting the behaviors of those with whom one would like to be friends is a strategy for seeking the relationship. Few researchers have done empirical work in this area or on the question of how peer influence works. Possibilities include explicit peer pressure and social mimicry, and researchers have also proposed an identity-based theory in which it is adolescents' own perceptions of the behavior in which their peers engage that is the dominant factor in decisions to adopt that behavior.

Related to that possibility is emerging evidence that aggressive and rejected youth, who already have a range of risk factors, also seem to have a difficult time accurately estimating the behaviors of their peers. Youth who have already engaged in a particular behavior also tend to assume that they are in the majority and that others are engaging in similar risk behaviors.

Another possible mechanism for negative peer influence is a process called deviancy training, in which specific types of interactions within friendship dyads may reinforce talk about deviant behaviors. Such talk is strongly associated with subsequent engagement in that behavior. When neither member of a pair of friends has engaged in deviant behavior, laughter and other support usually follows discussion of normative (nondeviant) behaviors. In pairs of friends who have both engaged in a deviant behavior, however, laughter and other encouragement follows talk of rule-breaking. This tendency for adolescents to positively reinforce talk about deviant acts is a very powerful indicator of their long-term likelihood of engaging in the behavior.

Some researchers have shed light on the question of which young people are most susceptible to peer influence. High levels of social anxiety or low levels of self-esteem tend to make adolescents more likely to adopt the perceived behaviors of their peers, as are those who have been rejected. Poor family relationships make adolescents more likely to attract and affiliate with deviant peers and to adopt their attitudes. This is another area in which further research is needed, Prinstein observed.

### Deviant Peer Groups

The primary public policy approach to deviant adolescents in the United States today is to aggregate them with other deviant adolescents, Dodge pointed out. Mental health providers offer group therapy and residential treatment to a significant portion of patients. The public education system is increasingly likely to segregate youth with behavior and other problems through academic tracking, special education, in-school suspension, and alternative schools. Youth who end up in the juvenile justice system are placed in training schools, boot camps, or incarcerated, in each case together with other deviant youth. Although there are some potential benefits to interventions that occur in the context of peer groups, there are also very significant adverse effects.

Peers can be a source of reward, satisfaction, and identity development. Meta-analyses, however, have shown that interventions that are effective with individuals are significantly less so when administered to peer groups, as shown in Table 5-1. Research identified here, on programs that treat delinquency and antisocial behavior, shows that in some cases the effect is not just a decrement in the effect but an adverse effect. If the peer group is composed exclusively of deviant youth, there is even greater decrement, as shown in Figure 5-4.

In a study of high-risk boys who were randomly assigned either to a summer peer group camp or to a control group, researchers showed that boys who were placed in the camp for two summers had significantly worse 30-year outcomes than the control subjects (McCord, 1992). Another study (Dishion and Andrews, 1995) showed similar results: high-risk 11- to 14-year-olds were randomly assigned to peer group intervention, family intervention, or a control. Those in the peer group intervention had the worst outcomes, and it was those who were initially only modestly deviant who had the worst outcomes. Another study, Dodge said, showed that although deviant boys in all-deviant groups got worse, deviant boys in mixed groups improved (Feldman et al., 1983).

Similar effects are evident in naturally occurring contexts, such as schools. The growing practice of using in-school suspension to punish students for infractions is one example. Students typically are placed

**TABLE 5-1** Interventions Are Less Effective When Administered to Peer Groups

| | Administration | | |
|---|---|---|---|
| | Individual | Group | Decrement (%) |
| Juvenile justice (Lipsey, 2006) | .10 | .07 | (30) |
| Court counseling (Lipsey, 2006) | .12 | .08 | (33) |
| Child mental health (Weitz et al., 1987) | 1.04 | .62 | (40) |
| Child mental health (Weitz et al., 1995) | .63 | .50 | (21) |
| School social skills (Ang and Hughes, 2002) | .78 | .55 | (30) |

SOURCE: Ken Dodge presentation.

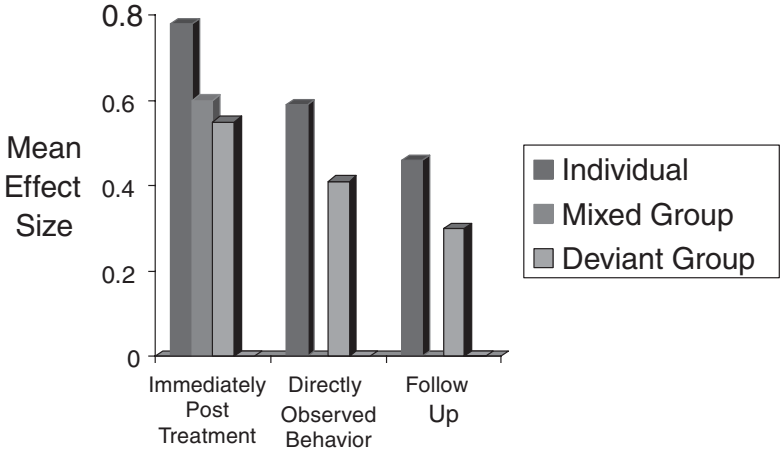


**FIGURE 5-4** All-deviant peer groups worsen outcomes beyond mixed peer groups: Meta-analysis of social skills training interventions.
SOURCE: Dodge, 2009. Data from Ang and Hughes, 2002.

in a classroom with others who have committed infractions. They are not allowed to associate with other students and are often supervised throughout the day by an inexperienced teacher. One study showed that 6th graders in North Carolina placed in this setting had twice the risk of subsequently being suspended in the next year for drug use, compared with other suspended youth (Vigdor, 2008). Another study, of adolescents incarcerated in Florida, showed that those placed in cells with peers convicted of drug-related crimes had a significantly higher likelihood of subsequently being arrested for a drug-related crime themselves than youth placed in other cells (Bayer et al., 2009). The effects are similar for sex offenses, assault, larceny, and burglary.

A similar effect is evident with school placement and grade retention. Children who attend a 6th grade that is part of a middle school, and thus associate with older peers, are more likely to be suspended, have double the rate of violence, and have worse test scores than their peers who attend 6th grade in an elementary school (Cook et al., 2008). Similarly, youth who are instructed in classrooms in which 20 percent of the students had been retained have significantly higher retention rates.

Researchers have found some evidence that these peer influences are reciprocal (Boxer et al., 2006; Lavallee et al., 2006; Multisite Violence Prevention Project, 2008). That is, for example, children in groups in which the majority are aggressive will become more so, and children in groups in which the majority are not aggressive will become less so. The general tendency is for groups to homogenize, but there are several moderators that may either increase or mitigate adverse effects.

The influence of deviant peers is likely to be greater when they are slightly older and more deviant and when it is likely that the peers will interact outside the intervention setting. Similarly, participants who are in early adolescence and are already moderately deviant but are not yet committed to deviant behavior are the most susceptible to deviant peer influence. However, moderators that minimize deviant peer influence include experienced and well-trained leaders and constant monitoring; use of behavioral approaches, such as positive reward structures; highly structured time; the promotion of a cultural norm of nondeviance; and a short duration.

Dodge closed with several ideas regarding interventions for deviant youth. First, he thinks that ineffective programs, placements, and treatments that aggregate deviant peers should be avoided if possible. These include residential schools, boot camps, midnight basketball, and nonstructured after-school programs. Second, he thinks that effective alternatives include individual therapies (such as functional family therapy, multisystemic therapy, and multidimensional treatment foster care), therapeutic courts, individualized early prevention programs (such as the High/Scope Perry Preschool Project, Fast Track, and Positive Behavior Intervention and Sup-

port), and programs that offer structure for a general youth population (such as 4H, Boys and Girls Clubs, Scouts, and religious activities), job corps and individual skills training, and efforts to disperse gangs.

When deviant peers are treated together, a number of measures can minimize the negative peer influence. Dodge recommended not placing the most susceptible youth (slightly delinquent early adolescents) in such settings and not placing youth with older, more deviant peers. The factors mentioned above—structured time, monitoring, and short duration—are also important. Finally, he urged that practitioners, program administrators, and policy makers document such placements and evaluate their impacts. The record should include a description of the placement environment, a description of the individuals treated or included, and rigorously designed evaluation.

## SCHOOL

School is typically the largest and most important institution with which young people are involved, and it is a primary context for their development, Stephanie Jones observed. She, Sandra Graham, and Douglas Kirby provided three perspectives on the ways school influences adolescent risk behavior. Jones provided an overview of the many aspects of school that may play a role. Schools have broad structural characteristics that vary (such as the socioeconomic status of the population they serve, their size and the ratio of teachers to students, school and classroom size, and student and teacher mobility). She explained they also have microcontexts (classrooms, hallway interactions, cafeteria, bathrooms) and microsystems or networks (among particular sets of peers or teachers and other staff) that influence the experiences an individual has at school, often profoundly. Each of these settings and networks may have distinct characteristics and varying behavioral norms.

Each of these factors interacts and contributes to the experience an individual has at school, in terms of his or her feelings of connectedness to school, perception of safety and general climate, the quality of the relationships he or she forms, and so forth. Jones suggested that these factors have an effect on risk-taking and also on the development of both problems and competencies. Yet because the character and composition of groups fluctuate rapidly and many of the other features may be in flux in the course of a school year, they are very difficult to research. Some research has been able to establish links between structural characteristics of schools and behavioral outcomes, she observed (Astor et al., 2004a, 2004b).

Less attention has focused on the microcontexts and microsystems, and Jones explained that it has been difficult to disentangle the effects of the characteristics students and adults bring to particular schools from the

context of the schools themselves. Large-sample studies using multilevel designs would make it possible to examine the intersection of these various factors more carefully, she said. Some promising factors to examine, she added, include patterns of social organization within schools, student monitoring, and behavior management strategies.

Schools currently use a wide array of strategies to change social and behavioral outcomes for their students, Jones explained. These include efforts to improve teachers' instructional skills—although few focus on their behavior management skills, improving security and surveillance, counseling, or instructional programs. Other approaches include efforts to improve the overall school climate and policies designed to address social structures and relationships. Few interventions address the character of settings within the school. In general, these school-based interventions appear to be effective at reducing alcohol and drug use, dropout rates, and absence and other conduct problems, although effect sizes vary depending on the age of the students and other factors (see, e.g., Durlak et al., 2010). Overall, effect sizes are modest, however.

Methodological issues have hampered research in this area thus far, Jones said. In order to develop more empirical evidence, large samples of schools and short- and long-term longitudinal data covering elementary and middle school would be needed. At present, the field lacks reliable and valid measures of settings, and theoretical modeling of the school environment has not been firmly established.[5]

### Racial and Ethnic Composition

Noting that there are innumerable ways in which school may influence adolescents' risk-taking, Graham focused on the role of racial and ethnic diversity as a contextual influence on psychosocial risk. This is an important topic, she noted, in part because the demographic composition of the K-12 population has changed and is continuing to change so rapidly, as shown in Table 5-2. Despite these changes, Graham said, the public schools are more racially segregated now than they have been in the last 40 years. The typical white student today attends a school that is 80 percent white, while the typical African-American or Hispanic student attends a school in which two-thirds or more of the students are of their own ethnicity, as illustrated in Figure 5-5. The inner-city schools represented in the figure tended to be in areas of highly concentrated poverty and to have few resources compared with other schools. At the same

[5] The Add Health Study housed at the University of North Carolina collects longitudinal data on the school experiences of teenagers and their later outcomes (http://www.cpc.unc.edu/projects/addhealth/data [September 2010].

**TABLE 5-2** Changing Demographics of the K-12 Population in the United States (percentage)

| | 1968 | 1998 | 2008 |
|---|---|---|---|
| White | 80 | 67 | 57 |
| African American | 14 | 17 | 17 |
| Hispanic | 5 | 14 | 20 |
| Asian/Other | 1 | 5 | 6 |

SOURCE: Sandra Graham presentation (data from NCES [National Center for Educational Statistics], 2008).

tine, Graham noted, the Supreme Court's decision in the 2000 *Meredith v. Jefferson County Board of Education* case indicated that it did not recognize diversity as a compelling interest for K-12 schools (as it has for postsecondary institutions). Thus, she said, it is important that developmental psychologists be prepared to make the case for why racial and ethnic diversity are important advantages for school communities.

Graham identified four specific ways in which a school's racial and ethnic composition may influence adolescents' psychosocial development, using data from a longitudinal study of middle and high school students' psychosocial adjustment (the Peer Relations Project[6]). These four ways are peer victimization, school transition, discrimination, and the achievement gap. The first, peer victimization, involves cases in which there is an imbalance of power among young people and the minority group is subjected to psychological, verbal, or physical abuse, such as hitting, name calling, racial slurs, and social exclusion. National surveys indicate that 70 percent of middle and high school students report that they have been bullied at some point (20 to 40 percent within the current school year). In any given classroom, Graham explained, 5 to 15 percent of students are likely to be chronic victims, and 5 to 10 percent are likely to be chronic bullies. Young people ages 8 to 15 report that they are more concerned about emotional maltreatment and social cruelty than they are about anything else, including their academic achievement. It is in part for these reasons that the American Medical Association has designated peer victimization as a public health concern, Graham explained.[7]

As part of the Peer Relations Project, researchers investigated the hypothesis that peer victimization may be reduced in schools that are racially and ethnically diverse, because there is more likely to be a balance

[6] See http://www.gseis.ucla.edu/faculty/graham/peerproject/pvp-index.htm.

[7] For more information on peer victimization, see http://www.findyouthinfo.gov/topic_bullying.shtml (accessed September 2010).

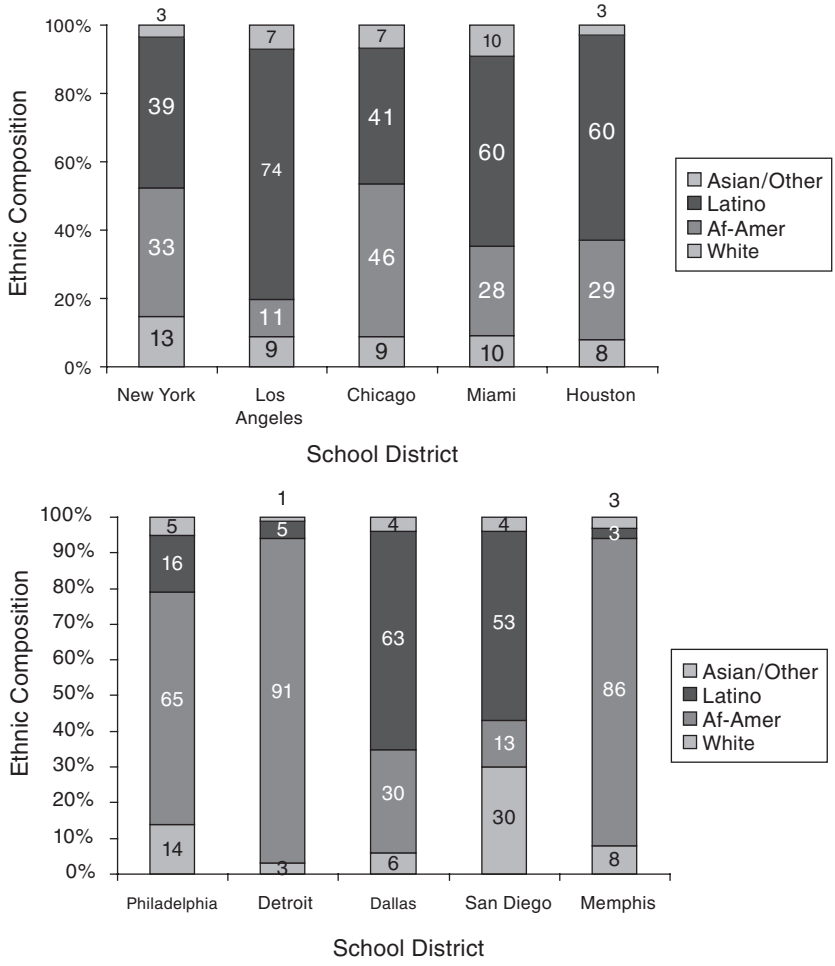


**FIGURE 5-5** Ethnic composition of the five largest central city school districts. SOURCE: Graham, 2009. Data from National Center for Educational Statistics. Washington, DC.

of power among groups in those circumstances, by working with schools in the Los Angeles Unified School District. They classified the diversity of 99 classrooms in 11 middle schools using the Simpson Index (a tool used by sociologists, demographers, and ethologists to measure the relative representation of different groups). The results indicated that students do indeed feel less vulnerable in diverse schools, Graham explained. More specifically, the researchers found that as diversity increased, all students

(not just members of minority groups) were less likely to feel victimized, perceived their school as safer, felt less lonely, and had greater self-esteem. In Graham's view, the results suggest that diversity may buffer some of the normative challenges of early adolescence.

Second, the transition from middle to high school is a time of particular challenge for adolescents, especially if the racial composition of the new school context differs from their previous one. This transition generally involves moving to a larger school and negotiating new relationships with teachers and peers. Adolescents tend to feel more anxious and lonely while they are making this transition, and their academic achievement tends to decline. Here again, the Peer Relations Project researchers examined whether school diversity affects this experience. Looking at Los Angeles schools, they examined the experiences of students who moved to high schools that were either significantly more or less diverse than their middle schools. They found that students transitioning to a school in which their own group was less well represented felt less of a sense of belonging. Even in schools that were diverse overall, the presence of a critical mass of peers of a student's own ethnicity made adjustment easier.

The third way a school's racial and ethnic composition may influence adolescents' psychosocial development is through overt racial and ethnic discrimination. Discrimination has a detrimental effect on adolescents' mental health and academic motivation and probably their achievement as well, Graham pointed out. She reported empirical evidence that discrimination increases during the first 2 years of high school, is more commonly experienced by boys than girls, and is more common in diverse schools than in nondiverse schools (but experienced by groups not well represented in the diverse schools). At the same time, however, ethnic diversity among the teachers in a school may buffer the effects of discrimination.

Finally, Graham and her colleagues point out that the racial and ethnic composition of a school may have psychosocial effects on the students who then may underperform or disengage from school. They examined whether there are psychosocial factors related to worldviews about race and ethnicity that could help to explain the persistent achievement gap between African-American and Hispanic students and their peers evident on the National Assessment of Educational Progress and other measures. After examining a variety of attitudes and perceptions that could affect academic achievement, they found that a subset of students (approximately 10 percent) have very negative worldviews that may be significant. They think the school rules are unfair, that the discipline is harsh, and that the racial climate is negative. They do not trust the authority figures in school, and they experience racial discrimination. The researchers concluded both that these worldviews are partly shaped by the ethnic

composition of schools and that they seem likely to influence academic motivation and achievement.

It is clear, in Graham's view, that the study of school diversity can improve understanding of the role that racial and ethnic disparities play in both psychosocial and academic outcomes. She advocates reframing the question to ask how, rather than whether, school diversity promotes healthy development and researching both the benefits and the challenges of diversity.

### Sexual Behavior and Schools

Kirby focused on the ways in which school experiences affect adolescents' sexual behavior, drawing on analysis of the research regarding risk and protective factors and the effectiveness of various interventions (Kirby, 2008, 2007; Kirby et al., 2005). First, he noted, although schools seem to be a primary avenue for reaching adolescents, few general school characteristics appear to have much relation to sexual behavior, when other factors are controlled. One reason is that a variety of factors tend to cluster together, so when some are controlled, effects for others will not be evident. For example, a school with a percentage of students receiving free or reduced-price lunch is likely to have students who engage in more sexual risk-taking than other students, but when the poverty level of the family or the community is controlled, the relationship disappears. The one school factor that did emerge as significant, he noted, was connectedness to school. Young people who feel connected to their schools initiate sex at a later age, and those who are also performing well academically also have fewer sexual partners, are more likely to use safe sex practices, and are less likely to get pregnant.

Many studies have also explored the effectiveness of various interventions, and Kirby focused on those designed to provide education about avoiding pregnancy, sexually transmitted diseases, and HIV. He noted that although millions of dollars have been spent on such programs over the past few decades and teen pregnancy rates have declined, it is still the case that 30 percent of all girls become pregnant before they turn 20 and 38 percent of 14- to 19-year-old girls who have had sex have a sexually transmitted disease. Kirby examined experimental or quasi-experimental studies of curriculum-based programs for middle and high school youth and found 48 that met certain criteria for design and other features (described in Kirby, 2008). The studies included both programs that emphasize abstinence and programs that do that and also encourage the use of condoms and contraception. Overall, the results (shown in Table 5-3) indicate that such programs do not actually encourage sexual behavior but may in fact result in youth delaying sexual initiation. He

**TABLE 5-3** Number of Programs with Indicated Effects on Sexual Behaviors (U.S. only)

| | Abstinence Programs (N=9) | Comprehensive Sex & STD/HIV Education Programs (N=48) |
|---|---|---|
| **Initiation of Sex** | | |
| Delayed initiation | 2 | 15 |
| Had no significant impact | 7 | 17 |
| Hastened initiation | 0 | 0 |
| **Frequency of Sex** | | |
| Decreased frequency | 2 | 6 |
| Had no significant impact | 4 | 15 |
| Increased frequency | 0 | 0 |
| **Number of sexual partners** | | |
| Decreased number | 1 | 11 |
| Had no significant impact | 4 | 12 |
| Increased number | 0 | 1 |

SOURCE: Kirby, 2008. Reproduced with permission from *Sexuality Research and Social Policy*, Vol. 5, No. 3. Copyright © 2008 by Springer.

noted modest evidence that abstinence-only programs may have limited beneficial effect, as well as evidence that programs designed to encourage condom use and avoid other risks can be successful. More than two-thirds of the programs had a positive effect on one or more of the risk behaviors, which Kirby characterized as remarkable success.

Kirby concluded that the mixed message of promoting both abstinence and safe sex practices is not confusing to young people and that the programs can be effective with multiple groups: males, females, all major racial and ethnic groups, those who have had sex, those who have not, and youth in both advantaged and disadvantaged communities. The studies indicate that these programs can be replicated (with faithful implementation) and point to program characteristics that appear to be effective. In general, Kirby explained, the most effective programs addressed numerous risk and protective factors that affect sexual behavior. Successful programs that focused on abstinence tended to cover:

- knowledge of pregnancy (biological),
- perception of risk,
- values,
- perception of peer norms about sex,

- self-efficacy to refuse sex,
- intentions to engage in sexual behavior, and
- communication with parents or others.

Programs that focus on encouraging condom or contraceptive use incorporate many of the same features but also include knowledge and attitudes related to condoms and contraceptives. Successful strategies include assigning students to talk with their parents about specific topics. Strategies that do not work include promoting values without talking directly about sex, not giving a clear message about behavior, focusing primarily on technical knowledge, and targeting the curriculum to students who are very impulsive and are high sensation-seekers.

Kirby closed with the observation that this sort of education is not a complete solution. It reduces risk by one-third—a success rate he considers significant, in the context of the many, many influences pushing in the other direction. Ways to bring about even more substantial changes are not yet evident.

## COMMUNITY

The communities in which young people live can also have important influences on their development, for good or ill, as both Tama Leventhal and Deborah Gorman-Smith discussed. Both noted that the words "community" and "neighborhood" can be used interchangeably in the discussions of influence and that the definition is not a very precise one. The neighborhood is an important context, Leventhal explained, because it is the place where a wide array of peer and other social interactions take place and where adolescents have access to institutional resources. The structural characteristics of a neighborhood, including its economic status, housing quality, and the availability of resources, are important, Gorman-Smith said. So, too, are the social processes that occur in the neighborhood context, as well as the interactions between community characteristics and other influences, such as peers, family, and schools. Researchers tend to use census units (either the neighborhood, approximately 3,000 to 8,000 people, or the block, from 500 to 3,000 people), although, Leventhal noted, many do not define the term when they survey people about their neighborhoods.

Gorman-Smith noted that much of the research on neighborhood effects has focused not on individual development, but on the neighborhood characteristics that are associated with crime or other negative phenomena. Leventhal described some of the nonexperimental research on links between the sociodemographic character of the neighborhoods where young people live and their engagement in risk behaviors, which

is of two sorts. First are post hoc studies, in which existing data sets (usually census data), which provide demographic information, such as racial and ethnic composition and residential instability for a particular point in time, are linked with more detailed information about particular families or individuals who lived in the neighborhood at the time for which data are available. Alternatively, a priori studies are designed to collect data that sample a wide range of neighborhoods or certain types of neighborhoods. In Leventhal's view, this approach is a more reliable method of estimating neighborhood effects, in part because it makes possible multilevel and longitudinal analyses. One example is the Project on Human Development in Chicago Neighborhoods,[8] which combined data on children and families with community survey data, interviews with residents, and observations.

Looking across these sorts of studies, Leventhal noted that even with controls for child and family background characteristics and other factors, there is significant evidence for a connection between socioeconomic status and risk behavior. Living in an affluent neighborhood where the residents are college-educated professionals is associated with advantages for adolescents' academic achievement, although more so for adolescent boys than for girls. Living in a neighborhood with low socioeconomic status confers risks to adolescents in terms of a host of behavioral, social, and emotional problems. Living in a poor neighborhood also places adolescents at risk for early childbearing and related sexual risk behaviors. In short, there is something about living in a poor neighborhood that places adolescents at risk for engaging in a wide range of risk behaviors.

Leventhal cautioned that because neighborhood residence is not random, the same characteristics may lead families to particular neighborhoods as well as predispose their children to particular outcomes. Moreover, she stressed that neighborhood influences are modest compared with the influence of parent income, parent education, and other family influences.

Researchers have also employed experimental designs to try to address the selection problems with nonexperimental studies. Studies of residential mobility, Leventhal explained, provide the opportunity to observe outcomes for families who are randomly assigned either to receive support in moving to a lower poverty neighborhood or not, although they do not specifically target adolescent risk behaviors. One example is the Gautreaux program,[9] an effort to desegregate Chicago's public housing that began in 1976. Initial studies of the program's effect (after 10 years) showed that young people who moved to the suburbs were more likely than those who

[8] See http://www.icpsr.umich.edu/icpsrweb/PHDCN.
[9] See http://www.northwestern.edu/ipr/publications/Gautreaux.html.

stayed in the poor, urban neighborhoods to graduate from high school, attend college, and be employed and had higher wages. Yet studies of longer term effects were more mixed, showing, for example, that although boys who moved out were less likely to be arrested or convicted for drug offenses than those who stayed, girls who moved were more likely to be convicted of criminal offenses than their peers who stayed.

Another example is the Moving to Opportunity program,[10] in which 4,000 families were randomly assigned either to receive a housing voucher that would support them in moving to private housing in a low-poverty urban (not suburban, as in the Gautreaux program) neighborhood or not (there was also a third group that received somewhat different benefits). This study also showed somewhat mixed results, with significantly more positive effects for girls than for boys, as well as a number of areas in which there were no effects, positive or negative (delinquency, sexual behaviors, achievement, and physical health).

Leventhal explored the theoretical frameworks that might explain the influence of neighborhoods. First, she suggested, it is likely that neighborhood structure could have both direct and indirect effects on adolescent risk behavior, but it is also likely that there are specific intermediary mechanisms, such as social processes. Thus, one model for linking neighborhood structure to adolescent outcomes is the institutional resources model, or the hypothesis that young people are influenced by the quality, quantity, diversity, and affordability of neighborhood resources (e.g., schools, health and social services, recreational and social programs, employment opportunities). A second model posits that the "norms and collective efficacy" characteristic of a neighborhood are the primary source of influence. That is, a neighborhood's collective capacity to work together for common goals and to reinforce prosocial (that is, positive behavior that demonstrates concern for others and constructive goals) norms and values can reduce threats to residents, such as violence and the availability of illicit substances. The third model focuses on the relationships and ties in the neighborhood and highlights the role of families. This model suggests that neighborhood disadvantage contributes to family stress and economic hardship, which, in turn, can have negative consequences on parental well-being, parenting, and adolescent outcomes.

Gorman-Smith also touched on theoretical issues, identifying four similar mechanisms through which community influences young people: social connection and support, social norms, informal social control, and routine activities. She noted that although there is reason to think that the social organization of a neighborhood is important, the census-level data

[10] See http://portal.hud.gov/portal/page/portal/HUD/programdescription/mto.

are not an ideal tool for investigating this complex construct. She showed data from several small studies of neighborhood social organizations showing that concentrated disadvantage and the social organization of neighborhoods are only mildly correlated (Gorman-Smith and Reardon, 2008). That is, neighborhoods with comparable poverty levels had very different levels of social organization, and those with less poverty did not necessarily have better social organization than those with more poverty. The important question not easily answered, she suggested, is how some neighborhoods develop social supports and others do not.

Like Leventhal, Gorman-Smith has found that living in a disadvantaged neighborhood may be associated with many poor outcomes for youth, including delinquency, violence, substance use, lower academic achievement, problems with social competence, and mental health problems. The association with violence may be the most studied of these links, she suggested, but the research has not clearly illuminated the reasons why some young people are affected so much more seriously than others. Although some data suggest that different aspects of neighborhoods have independent effects, it seems likely that the effects interact, a situation that presents a difficult research challenge.

Emerging research suggests a role for social and recreational resources in the link between low socioeconomic neighborhood status and adolescent risk behaviors. Leventhal explained, however, that the evidence for the relationship-and-ties model is much more mixed. The most compelling evidence currently available is for the social norms and collective efficacy model. These factors seem to play a strong role in the link between neighborhood poverty and adolescent delinquency and sexual risk behavior. The strength of that evidence, she suggested, highlights the value of community-level supervision and monitoring of youth.

Gorman-Smith also discussed interventions, noting that there have been three primary approaches to keeping communities intact (as opposed to changing their demographic composition). One is to work with individuals and families to manage or cope with the stresses of living in a disadvantaged neighborhood. An example is the SAFE Children program (Schools and Family Education) (Gorman-Smith et al., 2007), which provides families whose children go to school together with support in building networks of social support.[11] Another approach is to develop community coalitions or partnerships to address specific social problems in a neighborhood. A third approach is to focus on economic development to improve neighborhood conditions, for example, through business

[11] See http://casat.unr.edu/bestpractices/view.php?program=107#desc (accessed September 2010).

development. Although research on neighborhood effects on adolescent development has produced mixed results, it may be due to the limited nature of this research to date. Most of the research has focused on census data to define disadvantage and poverty, but this may be too limiting a conceptualization of neighborhood. More attention to factors other than information found in census data may be necessary to more fully understand how neighborhood context may influence adolescent development. These data may include information about crime, community businesses and organizations, social factors such as perceptions of fear, or adult monitoring. In addition, Leventhal noted, it may be necessary to examine mediating factors that may help explain neighborhood effects and moderating effects that neighborhoods may have to either exacerbate the negative effects of other risks or enhance the positive effects of adolescent assets and resources. Most of the research to date has focused on the direct or main effects of neighborhoods.

## MEDIA AND TECHNOLOGY

Among the environmental influences that affect teenagers' development, perhaps the most difficult to study is the wide, fast-evolving array of media and technologies that are part of their lives. Any list of the sorts of devices and programming to which young people may have access is likely to be at least somewhat outdated within months, but researchers have begun actively exploring both the effects of media on adolescent behavior and ways of structuring both their interactions with it and interventions designed to address media-related problems, as Michael Rich, Jane D. Brown, and Blair Johnson explained.

Rich began with the point that media—that is, modes of electronic communication and entertainment—are portable, ubiquitous, and integrated into virtually all aspects of adolescents' lives. He presented some data on media use and its effects, cautioning that the field has not been well funded and that much of the data are cross-sectional and based on self-reports. He focused on data from the Center on Media and Child Health related to the links between media consumption and adolescent sexuality.[12]

First, he described current patterns of use. On average, 8- to 18-year-olds use media actively for 6 hours and 21 minutes of every day, often using multiple media at the same time (Roberts et al., 2005). Because nearly a quarter of teenagers use two or more media at the same time, they may be cumulatively exposed to more than 8.5 hours of content per day. Researchers have been able to determine little about teenagers' fore-

[12] See http://cmch.typepad.com/ (accessed May 2010).

ground and background attention to this media use or other specific questions about its impact, but there is some information about its content. During the 2001-2002 television season, 71 percent of programs included sexual content, with an average of 6.1 such scenes per hour. Among programs directed at teenagers, 82 percent included sexual talk and two-thirds included sexual behavior (4 percent portrayed sexual intercourse) (Farrar et al., 2003). In a survey, 75 percent of college students reported that they were first exposed to sex in the media when they were minors, and 15 percent had persistent imagery and thoughts related to that exposure. In 1996, more than two-thirds of movies released that year portrayed sexual behavior, and Rich indicated that the percentage has increased each year since (Cantor et al., 2003).

Internet access, now widely promoted even for very young children through toy-related game websites designed as part of product promotion campaigns and the like, has introduced a new source of influence with complex implications. In 2007, there were 44 million Internet users under the age of 18, and 47 percent of 8- to 18-year-olds went online every day (Roberts et al., 2005). Average use was 1 hour per day, although some reported being online as long as 10 to 14 hours per day. And 42 percent had clicked on pornographic sites; 4 percent had been asked for sexual pictures of themselves by someone they did not know (Wolak et al., 2007). Rich cautioned that all of these figures have probably grown since 2007. Usage of social networking sites has also grown exponentially, and Rich noted that recent data suggest that 90,000 of the 110 million users of MySpace are registered sex offenders ("90,000 Sex Offenders Axed in MySpace Clean-Up," 2010).

While sexual predation by adults is actually quite rare, other kinds of influence may also cause concern. Rich described weblogs created by teens who have chosen anorexia nervosa and bulimia as a lifestyle and post tips for others who would like to adopt it to live life as an extremely thin person. Social isolation related to social networking usage, cyber bullying, and sexting (sending sexual images or text via cell phone) are all new problems for adults to understand and address. Text and images transmitted electronically may in some cases be impossible to expunge, and because the legal code related to the Internet is in its infancy, young people may face serious lasting consequences from a single impulsive act. A total of 70 percent of adolescents have been exposed to pornography on the Internet, and two-thirds of college students report that they consider doing so acceptable (Rideout et al., 2005).

What are the effects of this exposure? A number of studies, Rich indicated, have shown that the more sexual content young people have seen on television, the more likely they are to initiate sexual activity (Collins et al., 2004). As one example, in one study, 12- to 14-year-olds exposed to

sexuality in television, movies, music, and magazines were more than twice as likely than those not exposed to have sex by age 16 (Brown et al., 2006). Another study showed that 6- to 8-year-olds who watched adult programming were significantly more likely than those who did not to engage in sex by ages 12 to 14 (Delgado et al., 2009). Another showed that youth whose parents limited television to less than 2 hours per day had half the rate of sexual initiation as those whose parents spoke to their children about not having sex but did not limit their viewing (Ashby et al., 2006).

### Theoretical Perspectives

Researchers with several theoretical perspectives have examined possible links between media exposure and changes in sexual attitudes and behaviors, Rich observed. Social learning theory, which has also been applied in the study of media violence, suggests that when individuals see a behavior portrayed in a positive way, they have a tendency to imitate and adopt it. Cultivation theory suggests a slightly different explanation, that what individuals see on television supersedes their own perceptions of the real world around them. Thus, if the social norm on television is extremely prevalent sexuality, individuals who watch the programming begin to think that it is the social norm and believe sexuality is more prevalent than it actually is. A third theoretical model posits that adolescents use media as part of their individuation process. They use their preferences for programming or music to convey messages about their social identity, in the same way that their choices of clothing and peer groups do.

Rich sees media use as so pervasive as to be both a public health and environmental health issue. "It is like the air they breathe, the water they drink, the food they eat. They are neutral. They are not malignant. They are not bad. But they are very powerful. They can be used to do great good or, used thoughtlessly, they can harm," he suggested.

Johnson focused on the value of applying contemporary persuasion theory to the use of media strategies to influence adolescent behavior. He acknowledged that researchers have not fully explored this approach, so his discussion was largely theoretical. Researchers have posited at least five different current persuasion theories, he explained, although they converge on several significant points.[13] One is that there is a trade-off between what he called effortful and noneffortful thinking. That is, when

[13] Models include the information processing model (McGuire, 1968), the heuristic systematic model (Chaiken, 1980), the unimodel (Kruglanski and Thompson, 1999), the cognition in persuasion model (Albarracín, 2002), and the elaboration likelihood model (Petty and Cacioppo, 1986).

the recipient of a message is highly motivated to expend effort processing it and is well able to grasp the content, there is the potential for the information to alter attitudes, and the content of the message makes a significant difference in the outcome. However, for a recipient whose motivation and ability are low and who is thinking in a relatively shallow fashion, it is the incidental features in which the message is enveloped that may matter more. Thus, for example, marketers tend to rely heavily on peripheral cues that require very little attention to process in developing advertisements. These advertisements succeed because they are repeated over and over, so the message can be imprinted without any effort on the part of the recipient. Johnson pointed out that children and adolescents are most likely to process in a shallow way and to be receptive to peripheral cues, such as strategies that invoke emotional responses.

Several other factors are likely to affect the way individuals process information, and these change in the course of development. Strong attitudes or habits (likely to become more entrenched with age), skepticism (which increases with education), and links to peer groups whose attitudes and behavior may be in opposition to a message all tend to make individuals more resistant to messages that seem discrepant in some way. Thus, Johnson explained, it would be logical to expect that media effects would vary with developmental stage. For preadolescent children, emotional and other nonverbal cues are likely to be most powerful. At that stage, children behave more impulsively than they do later, and the influence of both peers and family are strong. They are open-minded and not terribly skeptical. By early adolescence, the power of emotional cues decreases somewhat, and peer influence becomes stronger. At this stage, young people may be more responsive to content-rich messages. Late adolescents begin to resemble adults in their processing. While still responsive to emotional and nonverbal cues (as all adults can be), young people at this stage have strong attitudes and are capable of defending them. Johnson, however, cautioned that this hypothesis has not been clearly verified with empirical research.

Researchers have demonstrated the influence that media can have on adolescent health, Johnson said. The results of a meta-analysis of health promotion interventions done through 2003 demonstrated a number of significant effects on changes, as shown in Table 5-4 (Johnson et al., 2010).

Johnson added, however, that the meta-analysis also showed that effect sizes for health promotion efforts (looking not just at media campaigns) are generally much smaller for children and youth than for adults, as Figure 5-6 shows (Johnson et al., 2010). He concluded that many factors influence the outcomes. When adolescents are given intensive skills training and supplied with the resources to change their behavior (e.g.,

**TABLE 5-4** How Much Can Interventions Improve Adolescent Health? Health Promotion Interventions' Effects on Behavior

| Behavior | *k* of studies | *M* age of sample | *d*+ |
|---|---|---|---|
| Abstinence (Silva, 2002) | 12 | 14 | 0.044 |
| Pregnancy rates (DiCenso, 2002) | 30 | 14.79 | 0.050 |
| Pregnancy rates, sexual behavior, birth control use (Guyatt et al., 2000) | 30 | 14.82 | -0.027 |
| Condom use (Johnson et al., 2003) | 42 | 15 | 0.073 |
| Frequency of sexual encounters (Johnson et al., 2003) | 38 | 15.1 | 0.049 |
| Unprotected intercourse (Mullen et al., 2002) | 13 | 15.46 | 0.19 |
| Number of sexual partners (Mullen et al., 2002) | 8 | 15.75 | 0.29 |

NOTE: Mean effect sizes (d+) are positive for differences that favor health promotion in the treatment group (usually relative to a control group) and are expressed as the standardized mean difference effect size. Two meta-anaylses having only two studies are omitted.
SOURCE: Johnson, 2009. Data from Johnson et al., 2010.

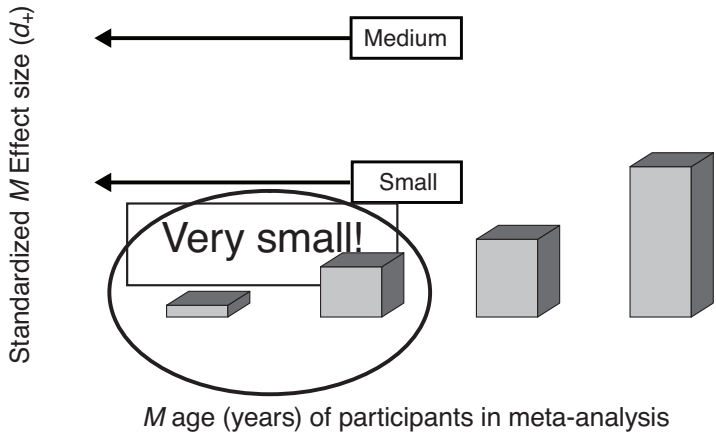


**FIGURE 5-6** Age in meta-analyses of health promotion literatures.
SOURCE: Johnson, 2009. Data from Johnson et al., 2010.

given condoms), effect sizes were significantly greater than when they were just the targets of an education campaign. Looking more broadly, he reinforced the theme present in many of the workshop discussions that family, community, peer, and other influences all affect the way adolescents process and respond to public health interventions and messages. At the same time, negative media influences are very powerful—Johnson pointed out that tobacco companies have $20 to use in marketing their product for every $1 states have to use on prevention efforts. Nevertheless, as a 1998 Florida antismoking campaign demonstrated, media campaigns can be effective (Sly et al., 2001). Evaluation of the "Truth Campaign" indicated that it reduced the number of smokers in the state by 29,000, was shown to prevent adolescents from smoking debut, and may have affected young people who do take up smoking by making them more conscious of how often and how much they smoke (CDC, 1999; Sly et al., 2001).

### Interventions

Brown picked up on the potential for media to be used as a positive force in young people's lives, focusing on three media-based strategies.[14] Perhaps the most familiar to many people is the use of social marketing approaches for media campaigns. Borrowing some of the expert advertising strategies from the world of commerce, public health experts have targeted large audiences with specific messages, presented in the media used by those audiences. Such messages are usually designed to achieve clear goals, such as increasing knowledge or changing specific attitudes or behaviors. However, Brown explained, social marketers typically do not have the resources to sustain these messages for long periods or repeat them, in the way that commercial marketers can—that saturation coverage may be an important component in the success of commercial marketing. Meta-analysis of the effectiveness of social marketing campaigns has shown that, on average, 4 to 8 percent of those exposed to a social marketing campaign change their behavior (Derzon and Lipsey, 2002; Snyder and Hamilton, 2002). This may sound small, she acknowledged, but media campaigns can reach many more young people than a school- or community-based program could.

Brown also noted that media campaigns are good at raising awareness of problems but more successful at changing behavior when combined with other measures. She likened them to air support for a military

[14] Much of Brown's presentation was based on reports from the National Campaign to Prevent Teen and Unplanned Pregnancy (Brown, 2008).

ground campaign. In Montana, for example, a program saturated the media with a message about the harmful effects of methamphetamine use at the same time that law enforcement efforts targeted the problem; the effect was a significant decline in use. More generally, in Brown's view, media campaigns are most successful when they:

- are guided by theory, such as a model of health behavior or social learning.
- target a clearly defined, engaged audience.
- are presented through multiple channels (or saturate a single, well-chosen channel).
- stimulate the target audience to communicate about the issue.
- are sustained over time.
- are presented in an environment that supports the desired outcome in other ways (e.g., including water or lower fat snacks in vending machines at school at the same time a media campaign to promote their use is launched).

Brown described a television campaign developed by researchers at the University of Kentucky that promoted safer sexual practices. Based on a model of the targeted behaviors (which indicated that they should target older adolescents who were highly sensation-seeking and prone to impulsive decision making), the program consisted of public service announcements that saturated particular channels over 21 months. The advertisements were designed using fast cuts and loud music to appeal to the target audience. Data about adolescents' condom use were collected in the target city and a control city in which there were no such advertisements, and the researchers estimated that there was a 13 percent increase in the practice of safe sex in the targeted city (Zimmerman et al., 2007).

Researchers have also begun to use new media to reach adolescents, although this approach has been less thoroughly studied. Examples include providing public health messages or answers to individual adolescents' questions via text messaging, interactive CD-ROMs, and DVDs providing information about sexually transmitted diseases, HIV prevention, and the like, which are available in pediatricians' offices, schools, and websites designed as peer communities that can provide information.

Most media campaigns are expensive, Brown noted, and researchers have not perfected the art of devising effective messages. It can also be difficult to evaluate the effectiveness of such campaigns, particularly when they are conducted on a national level, where so many competing influences may affect young people's thinking and behavior. She also acknowledged that the results can be unpredictable and that a campaign

could have undesirable unanticipated consequences, such as introducing some young people to a behavior they had not previously considered.

A second approach is to embed public health messages in entertainment programming, which, Brown explained, may produce less resistance in target audiences. An example is a collaboration between the National Campaign to Prevent Teen and Unplanned Pregnancy and the magazine *Seventeen*, to develop an article called "Why Are So Many Girls Still Getting Pregnant?" (Kuster, 2008). The article included interviews with girls about their views and information about ways to avoid pregnancy. Celebrities whom adolescents view as what Brown called "super-peers" can also play a useful role. Adolescents tend to admire and want to imitate role models they see in the media, so involving a rap star, for example, in a public service campaign can make the message much more palatable to the young people who admire him or her. Challenges to this approach include identifying sympathetic media producers willing to produce such messages, the difficulty of controlling messages once a celebrity takes on the role, and sustaining the message over time. Moreover, as with media campaigns, Brown explained, it is very difficult to evaluate the effectiveness of these messages.

Promoting media literacy is the third strategy Brown identified for helping adolescents understand public health topics.[15] It can be very valuable to educate adolescents to be more critical users of media, for example, by asking them to keep journals about their reactions to what they see or to engage them in discussion of spoof advertising designed to help them discern hidden messages, in her view. When adolescents can deconstruct the content in what they see, it is easier for them to analyze and adjust their own media diet. They may also be encouraged to create their own media and to respond actively to what they see. Brown pointed out that there has been little evaluation of this sort of education, and schools and educators have been somewhat reluctant to take it on. Schools have not been encouraged to view media literacy as an important educational goal, nor have teachers been trained to address this topic.[16]

## SUMMARY

The experience of adolescence is complicated by a variety of influences that can have both positive and negative effects. A range of research has

[15] Brown identified two sources for more information about media literacy: the American Coalition for Media Education (www.acmecoalition.org) and the National Association for Media Literacy Education (www.amlainfo.org [accessed May 2010]).

[16] The Centers for Disease Control and Prevention offers health standards for youth, which include indicators for media literacy; see http://www.cdc.gov/healthyyouth/sher/standards/ (accessed September 2010).

shown that economic hardship is associated with dysfunctional families and with a range of difficulties for adolescents, including risk-taking. This sort of stress is likely to have a negative effect on parenting, yet positive parenting can also profoundly affect outcomes for young people. Adolescents also tend both to seek out peers like themselves and to become more like the peers with whom they associate—and here, too, the net effect may be positive or negative, although the precise mechanisms of these fluid relationships have not been systematically traced.

Similarly, strong bonds with teachers and peers at school can be a positive influence, but many characteristics of middle and high school are not conducive to the development of such bonds. Communities also may have structural characteristics that are supportive of positive adolescent development—such as social networks and resources for young people—but research has not yet answered specific questions about how schools and communities can develop more favorable structures and cultures. Finally, the rapidly expanding universe of media devices and venues is having a profound influence on the experience of adolescence, with effects that include evolving norms for many behaviors—and particularly a loosening of sexual attitudes and an increase in sexual activity. At the same time, the media provide a potentially powerful tool for influencing young people in a positive direction.

Interventions that address these influences may target broad populations or specific families and individuals who have shown signs of distress. Many focus on key transition points; like the presenters on specific risk behaviors, the presenters on external influences also stressed the value of targeting the youngest adolescents before problems become more firmly established.

# 6

# Looking to the Future

The study of risk has generally been partitioned into separate research categories—divided both by subject (particular types of behaviors) and by academic discipline—committee chair Laurence Steinberg pointed out. Yet the fundamental question about adolescent risk-taking is whether certain processes and theoretical understanding cut across these different domains. This broader question raises more specific questions about how best to integrate ideas, technologies, and data that have emerged from these individual domains. This set of questions is of great importance for two reasons. First, there are strong reasons to think that there are reciprocal dynamics among the many processes that affect adolescents' behavior and risk-taking, so focusing on any one by itself will not lead to full understanding and is less likely to yield effective interventions. Second, understanding of reciprocal dynamics can support prudent decisions about policy and programming investments in a climate of limited resources.

The information and perspectives presented at the three workshops covered a wide array of research and theoretical perspectives on adolescent risk-taking. Differences in approach were evident, for example between those who would focus on making sure young people come through adolescence alive, not pregnant, and not in jail, on one hand, and those who would focus on actively promoting positive outcomes, such as high school graduation and healthy emotional development, on the other. The workshop discussions were not designed as a means of resolving tensions or conclusively answering the many pressing questions about adolescent risk-taking. They did, however, reveal a number of important themes that can

be described as two distinct types. Presenters and discussants across the three workshops identified propositions with reasonably strong support (and associated questions), of which a number have important practical implications. The presentations and discussions were also replete with both broad and specific recommendations for further research hypothesis testing/development, data collection, and application of findings. This chapter summarizes these key themes and associated research questions.

## MESSAGES AND QUESTIONS

### Problem Behaviors Are Correlated

J. David Hawkins and Kathryn Monahan were asked to reflect on the covariance of problem behaviors in adolescence and to highlight its implications. They noted, for example, that delinquency is positively correlated with defiance, truancy, school misbehavior, problem sexual behavior, academic failure, high school dropout, teenage pregnancy, violence, and risky driving. And substance use is positively correlated with early initiation of sexual behavior, low contraceptive use, delinquency, academic failure, violence, and risky driving. Both delinquency and substance use are also correlated with problem health behaviors related to dieting (anorexia), exercise, and wearing a seat belt.

The covariance is stronger during adolescence than at earlier or later developmental stages, they explained. The developmental pattern of problem behavior is shown in Figure 6-1. Problem behaviors tend to

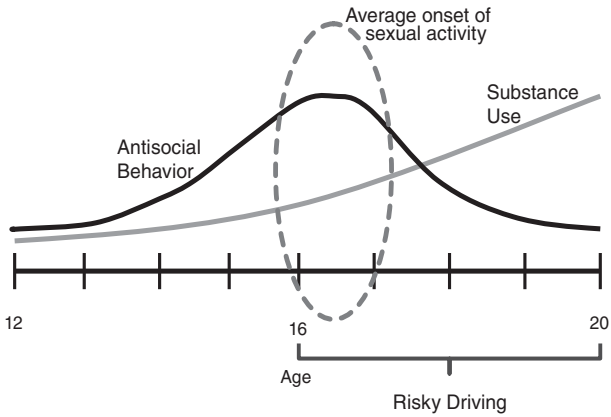


**FIGURE 6-1** Developmental pattern of problem behavior across adolescence.
SOURCE: Hawkins and Monahan, 2009.

follow a developmental trajectory, for example when minor delinquency is followed by alcohol and cigarette use, which, in turn, is followed by marijuana use and serious delinquency and, ultimately, the use of other illicit drugs (Elliott, 1994).

Another link among problem behaviors is that an array of both risk and protective factors influence many mental, emotional, and behavioral problems. Table 6-1 shows links between a number of risk factors and behaviors.

At the same time, individual characteristics, such as high intelligence, self-confidence, and social and other competencies, offer protection. Other

**TABLE 6-1** Risk Factors for Adolescent Problem Behaviors

| Risk Factors | Substance Abuse | Delinquency | Teen Pregnancy | School Dropout | Violence | Depression and Anxiety |
|---|---|---|---|---|---|---|
| **Community** | | | | | | |
| Availability of drugs | ✔ | | | | ✔ | |
| Availability of firearms | | ✔ | | | ✔ | |
| Community laws and norms favorable toward drug use, firearms, and crime | ✔ | ✔ | | | ✔ | |
| Media portrayals of violence | | | | | ✔ | |
| Transitions and mobility | ✔ | ✔ | | ✔ | | ✔ |
| Low neighborhood attachment and community disorganization | ✔ | ✔ | | | ✔ | |
| Extreme economic deprivation | ✔ | ✔ | ✔ | ✔ | ✔ | |
| **Family** | | | | | | |
| Family history of the problem behavior | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |

**TABLE 6-1** Continued

| Risk Factors | Substance Abuse | Delinquency | Teen Pregnancy | School Dropout | Violence | Depression and Anxiety |
|---|---|---|---|---|---|---|
| Family management problems | ✔ | ✔ | ✔ | ✔ | ✔ | |
| Family conflict | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Favorable parental attitudes and involvement in the problem behavior | ✔ | ✔ | | | ✔ | |
| **School** | | | | | | |
| Academic failure beginning in late elementary school | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Lack of commitment to school | ✔ | ✔ | ✔ | ✔ | ✔ | |
| **Individual/Peer** | | | | | | |
| Early and persistent antisocial behavior | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Alienation and rebelliousness | ✔ | ✔ | | ✔ | | |
| Friends who engage in the problem behavior | ✔ | ✔ | ✔ | ✔ | ✔ | |
| Favorable attitude toward the problem behavior | ✔ | ✔ | ✔ | ✔ | | |
| Early initiation of the problem behavior | ✔ | ✔ | ✔ | ✔ | ✔ | |
| Constitutional factors | ✔ | ✔ | | | ✔ | ✔ |

SOURCE: Hawkins and Monahan presentation (data from Brooke-Weiss et al., 2008).

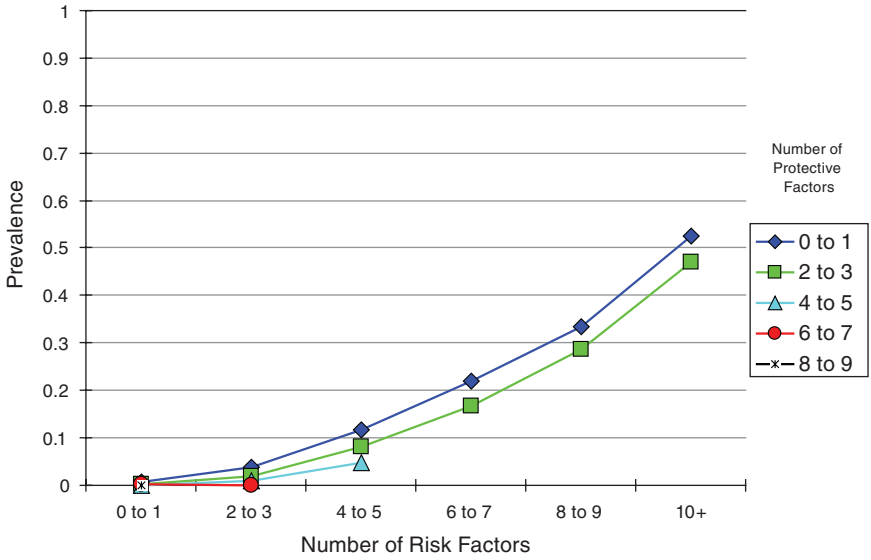


**FIGURE 6-2** Developmental pattern of problem behavior across adolescence.
NOTE: Figure created by J. D. Hawkins and K. Monahan for paper presented at 2009 IOM workshop on social and environmental influences and adolescent risk behavior, Washington, DC.
SOURCE: Hawkins and Monahan, 2009. Data from Pollard et al., 1999.

protective factors include social and environmental opportunities, such as prosocial activities and influences; bonding with positive peers, adults, and institutions; and clear standards for healthy behavior. Both the risk and protective factors have been shown to have consistent effects across culture, race, and sex. However, both vary in the strength of their effect in the course of development. Peers, for example, have the greatest influence on antisocial or problem behaviors during adolescence, whereas other factors are influential earlier or later. Moreover, cumulative exposure to multiple risks intensifies their effects, and, as might be expected, in a climate of high levels of risk, protective factors seem to be less efficacious, as Figure 6-2 illustrates. Similarly, cumulative exposure to multiple resources may intensify their positive effects on healthy adolescent development (Newcomb and Felix-Ortiz, 1992; Oman et al., 2004; Ostaszewski and Zimmerman, 2006; Sameroff et al., 1998).

Hawkins and Monahan pointed out some of the primary implications of these findings:

- Interventions should begin early—at the developmental point by which particular risk factors have been found to predict subsequent problem behaviors.
- Interventions should focus on the risk and protective factors that have been shown to influence numerous problem behaviors.[1]
- Interventions should focus on risk reduction and improved protection of the populations exposed to the greatest cumulative risk.

This picture of the correlation among risk behaviors also points to the importance of basic research on causal mechanisms. Participants highlighted the need for laboratory research, particularly continued progress in understanding brain development, and work that integrates findings from disparate fields. Integrating disparate research will also require theoretical examination of the quality of different sorts of evidence from a range of disciplines, as well as the means of connecting disparate evidence to theoretical models.

James J. Jaccard noted that meta-analyses of the correlations among adolescent problem behaviors have found that the average correlation between behaviors is typically .35. This suggests, he observed, that although some determinants are shared across problem behaviors, each also has unique determinants. This underscores the importance of intervention approaches that address both the unique determinants of the risk behavior being targeted and common determinants that operate across risk behaviors.

### Common Mechanisms of Influence Underlie Certain Risk-Taking Behaviors

The workshop presenters described a number of phenomena that all adolescents share to a greater or lesser degree, including facets of brain development and biological processes, as well as social and developmental challenges, despite cultural variations. The interactions among these shared mechanisms and sources of individual variation in risk-taking are not yet fully understood, however. Moreover, because research indicates that there are unique determinants for many risk behaviors—despite covariance among them—questions about how best to target intervention resources are difficult to answer. A related issue is the consistent but not fully explained finding that, even among target populations of individuals with high levels of risk factors, only a subset typically encounters severe problems.

[1] Examples of such interventions include Communities That Care, early childhood education, the Good Behavior Game, Guiding Good Choices, Incredible Years, life skills training, Nurse Family Partnerships, and the Seattle Social Development Project.

The evidence for common mechanisms poses a challenge for the design of interventions because it is very difficult to integrate very disparate kinds of thinking (e.g., about brain function, psychosocial processes, and community influences) into a single program. Yet, as one discussant observed, if one area is overlooked, the intervention may misfire for surprising reasons. Public service announcements that present a message grounded in sound research on the causes of a particular behavior, for example, may be ineffective because they trigger the wrong sort of reasoning or target the wrong age group.

Thus, in addition to the kinds of basic research mentioned above, participants cited the importance of further investigating the determinants of risk behaviors and how they might be altered. Similarly, work is needed to better translate improved understanding of biological processes into understanding of behavior.

### A Range of Preventive Interventions Can Reduce Harm

Adolescence is a time of heightened risk-taking because of biological and other factors, so a key goal for this period is to reduce the harm of risk-taking. Many interventions have already proved to be relatively effective, although the magnitude of the effect can be improved. Discussant Laurie Chassin highlighted the fact that many of the presentations provided evidence that interventions can do that, in a cost-effective manner, across multiple outcomes. Although there can be a tension between a focus on universal, policy-based intervention and the goal of targeting particular risk factors and high-risk populations, she pointed out that these are not mutually exclusive or competing approaches intellectually, scientifically, or theoretically. They are simply approaches to different elements of the interactive systems that encourage or deter risk-taking. Indeed, she said, it is very important to address both community-level factors and individual factors because both are clearly very influential. The approaches are of several kinds, as discussed below.

#### Public Policy Approaches

Harold D. Holder was asked to discuss the public policy interventions that have proved to be effective at reducing harm. He identified the 1975 federal policy of linking state aid to minimum age requirements for drinking and the purchase of alcohol as the most significant public health policy of the last 40 years, noting that the National Highway and Transportation Safety Agency estimates that more than 25,000 deaths have been prevented since it was enacted (NHTSA, 2008). For him, this suggests that broad-based public policies, particularly those aimed at communities and

neighborhoods, which are designed to restrict access to a risk (another example would be an increased tax on beer) are particularly cost-effective and beneficial interventions. In part because they generally do not require annual funding for staff and program maintenance, they offer the possibility of long-term effects for less cost than other sorts of programs.

In general, he observed, adolescents' problem behaviors are not simply the actions of troubled or high-risk individuals, but the product of complex social, cultural, and economic factors in a community. Thus, interventions designed primarily to educate individuals have not proven, on their own, to be as effective as other approaches. Such programs raise awareness and public support and may reinforce other strategies, but they are unlikely to be effective alone. Furthermore, the identification of risk factors is not enough to support the development of an effective intervention. Some risk factors, such as gender, ethnicity, or family income, cannot be altered by a program. Effective public health prevention or public policy, then, is not usually based on individual risk factors alone, but on an assessment of the overall system in which harm occurs.

As discussed earlier, public health interventions may be universal (community-wide), indicated (targeting high-risk groups), or targeted (for those with identified problems). The research literature is filled with solid evidence for the effectiveness of population-level or universal strategies, including a minimum age for drinking and tobacco purchase, increased retail prices for tobacco and alcohol, graduated driving license and zero-tolerance policies for driving infractions, and limitations on the density and location of alcohol and tobacco outlets and their hours and days of operation. Some evidence has supported the benefits of a number of policies in the indicated category, such as reducing handgun availability, reducing the social availability of tobacco and alcohol, placing restrictions on public drinking and smoking, and reducing the retail and social availability of illicit drugs—but further replication is needed. Other strategies, in the targeted category, have shown promise but have not been adequately examined, including housing vouchers to stimulate geographic upward mobility, access to condoms and sexual counseling, alcohol detection for auto ignition, and the use of genetics to identify a risk for alcohol or drug dependence. Current approaches based on threats or punishments, such as drug busts, have not proven to be effective at substantially reducing use of alcohol or tobacco.

In Holder's view, the state of the evidence suggests that population-level strategies have the greatest potential to prevent a wide range of problems, but he cautioned that they should be supplemented with targeted approaches for the subgroup of the population with multiple, and more serious, problems.

### Influencing Sexual Behavior

Douglas Kirby discussed research on ways of influencing adolescents' sexual behavior. He reviewed results from a wide range of studies of risk and protective factors for sexual activity, as well as the outcomes for a number of interventions designed to decrease unintended pregnancies and sexually transmitted diseases (STDs). He reported that there is little evidence of positive effects for abstinence-only programs, and some are not effective. He noted that HIV education programs do not seem to increase sexual activity and some may delay first intercourse, reduce the number of sexual partners, or increase condom or contraception use. Some may accomplish all three of those goals, and, overall, they can reduce sexual risk by roughly one-third. These programs tend to be effective across gender and racial/ethnic groups and to be particularly effective with disadvantaged youth. A number of characteristics are important to their success, such as promoting overall knowledge about sexual issues, pregnancy, STDs, and HIV and encouraging communication with parents about sex, condoms, or contraception. A number of other features clearly did not work, such as not talking about sex directly, not giving a clear message about behavior, and focusing primarily on knowledge.

From this picture, participants and discussants indicated that research support is still needed for practical and policy decisions. For example, the discussion highlighted the importance of analyzing the degree of evidence needed to support policy decisions and benefit-cost analyses, including investigation of the comparative scope and costs of targeted versus universal interventions. Universal, indicated, and targeted interventions appear to have important roles to play, but their effects would be likely to be magnified if they were integrated to support one another, participants suggested. Translational research that can support the adaptation of promising ideas on larger scales and in different contexts and to be sustained over time will be an important way of refining understanding of the effects of different sorts of approaches.

## The Environmental Context Is Very Important

The presentations demonstrated that family, peers, schools, communities, and the larger culture—specifically media—all influence adolescents in important ways. In general, it seems that the more specifically the context is defined, the more clearly the influences can be seen, in part because of the influences of individual factors. Thus, three different members of a deviant peer group in similarly disadvantaged circumstances may have three different reactions to the possibility of taking a particular risk. Discussants suggested that if interventions were more clearly mapped in

terms of precisely which activities were designed to promote which skills or development (e.g., literacy skills, attention, social and emotional skills), it would be easier to evaluate their results.

Among the issues that merit further investigation is the role of gender, including how the effects of puberty and social context may differ for boys and girls. Participants also saw high value in continuing to investigate issues related to contemporary media culture, including new media and technological changes and the implications of these media on interventions, as well as the ways adolescents use media to shape their own lives. Participants saw an urgent need to anticipate future technological developments and how they will affect adolescents, as well as means of communicating with them. Discussants also noted a need to reconsider current theoretical models of many aspects of adolescent behavior in light of the influences of new media.

### There Is Support for Intervening Early in Adolescence or Even Before

Although adolescence is a distinct phase of life, in which young people are subject to many pressures and challenges both internal and external that they had not previously experienced, many of the factors that predispose them to problem behaviors are evident much earlier. Moreover, research findings suggest that it is easier to mitigate risks with younger children and that the effects can be lasting. Middle school appears to be a prime target for interventions, although the timing of hormonal and pubertal changes suggests that interventions related to sexuality may need to begin even earlier. Several speakers suggested that the optimal timing depends in part on the risk being targeted and the nature of the intervention. An intervention based on modifying teacher behavior and improving bonding with school, for example, might work better if it begins early and lasts longer. Interventions that specifically target driving or other behaviors that rarely affect younger adolescents may work better if they are applied closer to the initiation point.

Nevertheless, participants highlighted the importance of further work to understand the nature of, influences on, and prevention of risk-taking at different stages of development, particularly stages in the adolescent decade.

### Protective Factors Are Also Important

Several discussants noted that adolescence is not a disease and that an important aspect of risk prevention is the building of scaffolding that can support young people as they navigate challenges in the home, the

school, and the community. The sensation-seeking and exploration that are typical of adolescents may lead them into risk, but they are also the source of many positive choices and behaviors. A variety of evidence seems to support the proposition that it is possible to alter parents' behavior and that doing so affects outcomes for adolescents. Nevertheless, this is another area in which research is needed to support the development of effective interventions.

## CONCLUDING THOUGHTS

The three workshops were designed to bring together a wide range of research and perspectives to understand the complexities and multiple influences of adolescent development. Sorting through this information clearly indicates that researchers have made very significant progress in identifying the factors that influence adolescent risk-taking, and it also highlights the powerful potential of pursuing the clearly apparent links among different sorts of influences. The indications of reciprocal dynamics among brain development, pubertal changes, psychological traits and development, and contextual factors are compelling. Researchers and others concerned with adolescent risk-taking and with promoting healthy development have reached a point of great potential. The integration across disciplines that is beginning can support clear decisions about how best to invest the funds available for prevention and health promotion intervention. At no time in the history of the study of adolescence and risk-taking has there been a better opportunity for scientists to collaborate across disciplines to uncover the causes of risk-taking as well as to develop innovative interventions. As noted in the discussions, each field has an array of facts to contribute to the understanding of the causes of risk-taking, but disciplines rarely integrate their knowledge to produce innovative new theoretical perspectives and preventive interventions. Emerging research holds significant promise for supporting the design, implementation, and evaluation of programs for adolescents—and further integration promises to amplify the value of work in each field.

In reviewing the presentations and discussions, the committee identified several themes that can organize thinking about the complex determinants of adolescent problem behavior as identified in the workshops. Specifically, three levels of explanatory constructs were consistently evoked across presentations. First, there were the immediate or proximal determinants of particular risk behaviors that are directly tied to the content of the behavior. For example, for sexual behavior, such variables included adolescents' beliefs about the advantages and disadvantages of engaging in sexual intercourse, perceived norms about having sex, and attitudes toward having sex. Numerous theories addressing behavior-specific

determinants of risk behavior were identified across the workshops (e.g., Fishbein and Ajzen's theory of planned behavior, Bandura's social learning theory, the health belief model).

A second level of explanatory variables, mid-level determinants, are more general constructs that do not refer to a given risk behavior, but, as the workshop participants stressed, have been found to affect a host of risk behaviors. These include such variables as depression, sensation-seeking, impulsivity, goals, aptitudes, altruism, intelligence, and school performance, to name a few.

The third level of explanatory variables includes contextual and distal (e.g., demographic) determinants, such as the contexts of school, work, neighborhoods, religion, family, ethnicity, the media, and government policies. Although there is a tendency to view these classes of determinants as ranging from proximal to distal, the workshops clearly showed that they interact with one another in complex ways to shape adolescent behavior. Biological variables (e.g., brain development and other biological processes) have a unique role in this scheme in that, ultimately, almost all of them affect adolescent behavior. At the same time, the biological changes that adolescents experience (e.g., as a result of maturation) shape the kinds of beliefs and attitudes they hold, their goals and personalities, and how they navigate and select the contexts in which they interact. The workshops highlighted the complex ways in which these different levels of determinants and variables influence adolescent problem behaviors.

Another important theme that emerged from the workshops is that it is not enough to identify the determinants of adolescent behavior. Once these determinants are known, it is important to develop effective intervention strategies to either change the determinants or minimize or accentuate their influence. The vast majority of research discussed in the workshops focused on identifying the determinants of adolescent behavior, with much less attention to the extant scientific knowledge base for changing them. This reflects the state of the field more generally. The workshops did address relatively effective interventions that have reduced adolescent problem behaviors, as well as the determinants on which those interventions were based. However, much less attention was given to the scientific principles on which the designers of these interventions based their designs—the structures they believed would bring about change in the targeted determinants (mediators) of adolescent behavior. The presentations by Kirby, on the core ingredients of effective programs, and by Blair Johnson, on principles of persuasion that can be used in effective message design, are examples of applying the underlying science to program design.

In conclusion, the science of adolescence continues to progress in identifying the determinants of adolescent behavior; in mapping the complex

interplay between those determinants; and in clarifying the emergence and changes of these determinants through childhood, adolescence, and early adulthood. The field has made progress in integrating knowledge about the role of biology in all of these processes and in identifying core scientific principles on which to base the design of developmentally appropriate interventions for changing these determinants. Thus, it plays an important role in improving the lives of individual adolescents and their families, even as it continues to wrestle with challenging questions.

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# Appendix A

# Workshop on Individual Processes

**AGENDA**

November 20, 2008

9:00 am **Welcome and Introductions**
Rosemary Chalk, Director, Board on Children, Youth, and Families

Laurence Steinberg, Ph.D., Department of Psychology, Temple University

Melissa Pardue, Associate Deputy Secretary, U.S. Department of Health and Human Services (formerly Deputy Assistant Secretary for Human Services Policy, Office of the Assistant Secretary for Planning and Evaluation)

Stan Koutstaal, Director, Abstinence Division, Family and Youth Services Bureau, Administration for Children and Families

Kevin Conway, Deputy Director, Division of Epidemiology, Services and Prevention Research, National Institute on Drug Abuse

9:30 am **Trends in Adolescent Health**
Robert Wm. Blum, M.D., M.P.H., Ph.D., Department of Population, Family, and Reproductive Health, Bloomberg School of Public Health, Johns Hopkins University

Discussion and Q & A
Laurence Steinberg

10:30 am **Adolescent Risk Behaviors**

What we know about:
- Nature
- Prevalence
- Historical trends
- Developmental course
- Demographic variations

Sexual Risk-Taking
James J. Jaccard, Ph.D., Department of Psychology, Florida International University

Substance Use
Laurie Chassin, Ph.D., Department of Psychology, Arizona State University

Criminal Behavior
D. Wayne Osgood, Ph.D., Department of Sociology, The Pennsylvania State University

Risky Driving
Allan Williams, Ph.D., Insurance Institute for Highway Safety (Retired)

Discussion and Q & A
Laurence Steinberg

1:15 pm **Adolescent Mental Health Outcomes**

What we know about:
- Nature
- Historical trends
- Demographic variations
- Links to risky behavior

Daniel S. Pine, Ph.D., Division of Intramural Research Programs, National Institute of Mental Health

Discussion and Q & A
Laurence Steinberg

2:00 pm **Biological, Cognitive, and Psychosocial Development in Adolescence**

- What do we know about biological, cognitive, and psychosocial influences on adolescent risk behavior?
- To what extent does context (e.g., family, peers, school, neighborhood) relate to or affect these individual processes?
- How does our understanding of individual development in adolescence inform adolescent risk prevention and intervention?

Puberty and Neuroendocrine Changes in Adolescence
Elizabeth J. Susman, Ph.D., College of Health and Human Development, The Pennsylvania State University

Adolescent Brain Development
B. J. Casey, Ph.D., Sackler Institute for Developmental Psychobiology, Weill Medical College of Cornell University

Development and Decision-Making in Adolescence
Valerie Reyna, Ph.D., College of Human Ecology, Cornell University

Psychosocial Development in Adolescence
B. Bradford Brown, Ph.D., Department of Educational Psychology, University of Wisconsin

Discussion and Q & A
Marc A. Zimmerman, Ph.D., School of Public Health, University of Michigan
Laurence Steinberg

4:15 pm **Next Steps**
Laurence Steinberg

4:30 pm **Adjourn**

**PARTICIPANTS**

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Anne Badgley, Heritage Community Services
Jon Berg, Pal-Tech, Inc.
James Bjork, Division on Clinical Neuroscience and Behavioral Research, National Institute on Drug Abuse, National Institutes of Health (NIH)
Wendy Braund, Office of Disease Prevention and Health Promotion, HHS
Barbara Broman, Office of the Assistant Secretary for Planning and Evaluation, HHS
Seth Chamberlain, Administration for Children and Families, HHS
Kevin Conway, National Institute on Drug Abuse
Margo Cowtun, Bloomberg School of Public Health, Johns Hopkins University
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Valerie Huber, National Abstinence Education Association
Karen Huss, National Institute of Nursing Research
Alison Hyra, Federal Human Services, The Lewin Group
Evelyn Kappeler, Office of Population Affairs, HHS
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Lisa Trivits, Office of the Assistant Secretary for Planning and Evaluation, HHS
Diana Tyson, Office of the Assistant Secretary for Planning and Evaluation, HHS
Allan Williams, Insurance Institute for Highway Safety (Retired)

# Appendix B

# Workshop on Social and Environmental Influences

**AGENDA**

May 28, 2009

9:00 am **Welcome and Overview of the Day**
Rosemary Chalk, Board on Children, Youth, and Families

Laurence Steinberg, Ph.D., Department of Psychology, Temple University

9:15 am **Environmental Influences on Biobehavioral Processes**

*Committee Member Facilitator*
B. J. Casey, Ph.D., Sackler Institute for Developmental Psychobiology, Weill Medical College of Cornell University

*Presenter*
Ronald E. Dahl, M.D., Psychiatry and Pediatrics, School of Medicine, Department of Psychology, University of Pittsburgh

- What are the influences of neurobiology on adolescent risk behavior?

- What are the implications of this knowledge for prevention, health promotion, and treatment interventions?

Discussion and Q & A

10:15 am **Family and Sibling Influences and Interventions**

*Committee Member Facilitator*
Laurence Steinberg

*Presenters*
Rand D. Conger, Ph.D., Psychology, Human Development and Family Studies, The Family Research Group, University of California, Davis

Nancy A. Gonzales, Ph.D., Department of Psychology, Program for Prevention Research, Arizona State University

- What do we know about family influences on adolescent risk behavior?
- How can this knowledge inform family-based prevention, health promotion, and treatment interventions with adolescents?

Discussion and Q & A

11:30 pm **Peer Influences and Interventions**

*Committee Member Facilitator*
B. Bradford Brown, Ph.D., Department of Educational Psychology, University of Wisconsin

*Presenters*
Mitchell J. Prinstein, Ph.D., Department of Psychology, University of North Carolina at Chapel Hill

Kenneth A. Dodge, Ph.D., William McDougall Professor of Public Policy Studies; Professor of Psychology and Neuroscience; and Director, Center for Child and Family Policy, Duke University

- What do we know about peer influences on adolescent risk behavior?

- How can this knowledge inform peer-based prevention, health promotion, and treatment interventions with adolescents?

Discussion and Q & A

1:30 pm **School Influences and Interventions**

*Committee Member Facilitator*
Robert Wm. Blum M.D., M.P.H., Ph.D., Department of Population, Family, and Reproductive Health, Bloomberg School of Public Health, Johns Hopkins University

*Presenters*
Sandra Graham, Ph.D., Psychological Studies in Education, University of California, Los Angeles

Douglas Kirby, Ph.D., ETR Associates

- What do we know about school influences on adolescent risk behavior?
- How can this knowledge inform school-based prevention, health promotion, and treatment interventions with adolescents?

Discussion and Q & A

2:30 pm **Community Influences and Interventions**

*Committee Member Facilitator*
D. Wayne Osgood, Ph.D., Department of Sociology, The Pennsylvania State University

*Presenters*
Tama Leventhal, Ph.D., Eliot-Pearson Department of Child Development, Tufts University

Harold D. Holder, Ph.D., Senior Research Scientist, Prevention Research Center, Pacific Institute for Research and Evaluation, Berkeley, California

- What do we know about community influences on adolescent risk behavior?

- How can this knowledge inform community-based prevention, health promotion, and treatment interventions with adolescents?

Discussion and Q & A

3:45 pm **Media and Technology Influences and Interventions**

*Committee Member Facilitator*
James J. Jaccard, Ph.D., Department of Psychology, Florida International University

*Presenters*
Michael Rich, M.D., M.P.H., Center on Media and Child Health, Video Intervention/Prevention Assessment, Harvard School of Public Health

Jane D. Brown, Ph.D., School of Journalism and Mass Communication, University of North Carolina at Chapel Hill

- What do we know about media and technology influences on adolescent risk behavior?
- How can this knowledge inform media- and technology-based prevention, health promotion, and treatment interventions with adolescents?

Discussion and Q & A

4:45 pm **Closing Remarks**

Laurence Steinberg

5:00 pm **Continued Discussion and Informal Networking**

5:45 pm **Adjourn**

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Paula Wilkinson Smith, Lifeways, Inc.

# Appendix C

# Workshop on Integrating Findings Across Domains of Influence

**AGENDA**

December 14, 2009

8:45 am **Welcome and Overview of the Day**
Rosemary Chalk, *Director*, Board on Children, Youth, and Families

Laurence Steinberg, Ph.D., Temple University (*Committee Chair*)

9:00 am **Adolescent Behavior, Risk-Taking, and Public Policy**

J. David Hawkins, Ph.D., University of Washington

Kathryn Monahan, Ph.D., University of Washington

Harold Holder, Ph.D., Prevention Research Center of the Pacific Institute for Research and Evaluation

- What is known about the nature and scope of co-occurring problems in adolescent risk behavior?
- What is known about the developmental specificity of this covariation?

- How can broad-scale public policy prevent adolescent risk behavior?

*Committee Discussants*
Laurie Chassin, Ph.D., Arizona State University
Robert Wm. Blum, M.D., M.P.H., Ph.D., Johns Hopkins University

Discussion and Q & A

10:00 am **The Biology of Adolescent Risk Behavior**

Linda Patia Spear, Ph.D., Binghamton University

- How is our understanding of adolescent behavior informed by consideration of the biology of adolescence?
- To what extent and in what ways is risky behavior biologically driven, and how does consideration of the biology of adolescent development inform our understanding of adolescent risk behavior, individual differences in these behaviors, and their consequences?

*Committee Discussants*
B. J. Casey, Ph.D., Weill Medical College of Cornell University
Daniel S. Pine, M.D., National Institute of Mental Health
Elizabeth J. Susman, Ph.D., The Pennsylvania State University

Discussion and Q & A

11:00 am **Contextual Influences on Adolescent Risk Behavior**

*Family and Peers*
Kenneth A. Dodge, Ph.D., Duke University
Nancy A. Gonzales, Ph.D., Arizona State University

*School*
Stephanie Jones, Ph.D., Harvard Graduate School of Education

*Community*
Deborah Gorman-Smith, Ph.D., Chapin Hall at the University of Chicago

*Mass Media*
Blair Johnson, Ph.D., The University of Connecticut

- What key mechanisms or features of these influences uniquely affect adolescent risk behavior?
- Can changes in certain contextual factors in these contexts reduce or prevent risky behavior?
- What are the most salient proximal and distal factors in these contexts that affect risk taking in adolescence?

*Committee Discussants*
B. Bradford Brown, Ph.D., University of Wisconsin
James J. Jaccard, Ph.D., Florida International University
Marc A. Zimmerman, Ph.D., University of Michigan

Discussion and Q & A

1:45 pm **Discussion: Integration in the Science of Adolescence**

*Committee Facilitators*
Laurence Steinberg
Marc A. Zimmerman, Ph.D., University of Michigan

- What overarching lessons about the genesis of risky behavior in adolescence can be gleaned from the morning's presentations? How can we integrate knowledge across levels and domains of influence?
- What are important next steps in the science agenda? What is not known and needs to be known? Should our approach to the study of adolescent risk behavior change, and if so, in what ways?
- What are the implications of what has been presented today for interventions?

Discussion and Q & A

3:30 pm **Closing Remarks and Next Steps**

Laurence Steinberg
Jennifer Appleton Gootman, Board on Children, Youth, and Families *(Study Director)*

4:00 pm **Adjourn**

## PARTICIPANTS

Tasha Akitobi, National Association of County and City Health Officials
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Jon Berg, Pal-Tech, Inc.
Cheryl Anne Boyce, Division of Clinical Neuroscience and Behaviorial Research, National Institute on Drug Abuse, National Institutes of Health (NIH)
Barbara Broman, Office of the Assistant Secretary for Planning and Evaluation, (HHS)
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