

Covariance of Problem Behaviors in Adolescence

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Covariance of Problem Behaviors in Adolescence

Adolescents engage in a number of problem behaviors, including reckless driving, antisocial and criminal behavior (Farrington, 2009; Piquero, Farrington, & Blumstein, 2003), alcohol use (Johnston, O'Malley, Bachman, & Schulenberg, 2009), drug use (Chassin, Hussong, & Beltran, 2009), and risky sexual behavior (Sundet, Magnus, Kvaalem, Broonesby, & Bakkenteig, 1989). The prevalence of these problem behaviors during adolescence is quite high. In the United States about 17% of adolescents meet diagnostic criteria for mental, emotional, and behavioral disorders. Six million young people receive treatment services annually for mental, emotional, or behavioral problems. These problems affect one in five families and cost \$247 million annually (National Research Council and Institute of Medicine, 2009). Motor vehicle crashes remain the number one cause of death among youth ages 15 - 20 (Santelli, Lowry, Brener, & Robin, 2000). For both official arrest records and self-reported delinquency, involvement in antisocial behavior peaks in the mid to late teenage years. In 2008, 1,171,365 juveniles were arrested in the United States (Federal Bureau of Investigation, 2009, table 35). That same year, data from the Monitoring the Future national school-based survey showed that, among 12th graders, 47% had used some illicit drug in their lifetime, 72% had consumed alcohol, and 20% were current smokers (Johnston, O'Malley, Bachman, & Schulenberg, 2009). Approximately half of all sexually transmitted infections occur between the ages of 15 and 24, and 20% - 30% of adolescents report not using a condom or other contraceptive the last time they had sexual intercourse (Hoeffferth, 1990; Santelli, Lowry, Brener, & Robin, 2000). In 2006, nearly 750,000 girls between the ages of 15 and 19 become pregnant, a 3% increase in teen pregnancy since 2005 (Alan Guttmacher Institute, 2010). Notably, the majority of teen pregnancies are unplanned (Henshaw, 1998).

The widespread prevalence of problem behaviors during adolescence is troubling because these behaviors can have concurrent and long-term consequences for youth development, including failure to complete high school, underemployment, incarceration, long-term substance abuse, sexually transmitted infections (STI), and unplanned parenthood. While many youths navigate adolescence without negative consequences of problem behaviors, problem behaviors become chronic for others, increasing the likelihood of adversity in multiple domains including physical health, life expectancy, psychosocial adjustment, and successful transition to adulthood (Lindberg, Boggess, & Williams, 2000). Indeed, adolescence is marked by greater involvement in problem behaviors than either earlier or later developmental periods and problem behaviors tend to co-occur in adolescence compared to earlier and later developmental periods (Gillmore et al., 1991; McGee & Newcomb, 1992). The developmental patterning of problem behaviors during adolescence across multiple problem behaviors has led some to suggest that these various behaviors represent a syndrome of “problem behaviors” (Jessor & Jessor, 1977).

This paper provides an illustrative review of research on covariation in problem behaviors during adolescence. First, we highlight the extant literature on the covariance of problem behaviors. Second, we discuss the developmental specificity of this covariation. Next, we examine factors that predict multiple types of problem behaviors as well as specific types of problem behavior. In general, research indicates that covariance of problem behaviors peaks during adolescence and that a number of risk factors are common or shared predictors of different types of problem behaviors. These data suggest that prevention policies and programs that focus on reducing shared risk factors for problem behaviors should diminish multiple types of adolescent problem behaviors.

Covariance of Problem Behaviors

Jessor's problem behavior theory (Jessor & Jessor, 1977; Jessor et al., 2003) suggests that problem behaviors during adolescence are highly correlated and that these separate behaviors are indicators of a syndrome of adolescent problem behavior indicative of a more general lifestyle (Jessor, 1987a). Empirical evidence supports the proposition that involvement in one type of problem behavior is often correlated with other problem behaviors (National Research Council and Institute of Medicine, 2009). Delinquency is highly correlated with defiance, truancy, school misbehavior, problem sexual behavior, academic failure, drop out, teenage pregnancy, and violence (Donovan & Jessor, 1985; Delbert S Elliott, Huizinga, & Menard, 1989; D. S. Elliott & Morse, 1986, March; Farrington, 2009; Jessor & Jessor, 1977; Johnston, O'Malley, Bachman, & Schulenberg, 2009; Michael D. Newcomb et al., 2002; Resnick et al., 1997; Zabin, Hardy, Smith, & Hirsch, 1986), both in the United States (Barone et al., 1995) and internationally (Fergusson, Horwood, & Lynskey, 1994). Delinquency and drug use are also linked to reckless driving in adolescence (Osgood, Johnston, O'Malley, & Bachman, 1988). Substance use in adolescence is highly related to early initiation of sexual activity (Bentler & Newcomb, 1986; Donovan & Jessor, 1985; D. S. Elliott & Morse, 1986, March; Zabin, Hardy, Smith, & Hirsch, 1986), risky sexual behavior (Duncan, Strycker, & Duncan, 1999; Fortenberry, 1995; Guo et al., 2002; Leigh & Stall, 1993), and low educational performance (Bachman, O'Malley, & Johnston, 1978; Jessor, 1987a; Smith & Fogg, 1978). Bingham and Crockett (1996) found that risky sexual behavior (multiple sexual partners and failure to use condoms) was highly correlated with antisocial behavior, cigarette smoking, alcohol use, and illicit drug use among adolescents (Bingham & Crockett, 1996). Early onset of sexual intercourse is associated with lower likelihood of contraceptive use (Coker, 2009) and greater number of sexual partners during

adolescence (Durbin, DiClemente, Siegel, & Krasnovsky, 1993). In general, correlations among problem behaviors are high. For example, one recent study found that among eighth-grade students, delinquency was correlated with substance use and sexual behavior ($r = .90$ and $r = .38$, respectively; $p < .05$), and that substance use and sexual behavior were also correlated ($r = .48$; $p < .05$). Moreover, academic failure in the 12th grade is moderately correlated with 8th grade delinquency, substance use, and sexual behavior (r 's $.16$ to $.37$; $p < .05$) (Huang, White, Kosterman, Catalano, & Hawkins, 2001).

Problem behaviors covary over time as well. For example, trajectories of alcohol and cigarette use correlate with trajectories of marijuana use, delinquency, and academic problems across adolescence. A study of 1,000 youth aged 11 to 17 followed annually for 5 years found that the mean level of alcohol use was correlated with levels of marijuana use and delinquency ($r = .69$ and $r = .16$, respectively; $p < .05$), and that increases in alcohol use were highly correlated with increases in marijuana use and delinquency over time ($r = .66$ and $r = .49$, respectively, $p < .05$). Levels of marijuana use and delinquency were also related ($r = .62$, $p < .05$), as well as the slope of marijuana use and delinquency over time ($r = .47$). Notably, alcohol use, marijuana use, and delinquency were also related to academic problems: greater substance use or delinquency was associated with more academic problems (r 's $.03$ -. $.24$, $p < .05$), and increases in substance use or delinquency were linked with increases in academic problems over time (r 's $.31$ -. $.36$, $p < .05$) (Duncan, Duncan, & Strycker, 2000). Using a longitudinal sample of 808 community youth, Huang and colleagues (2001) found that aggressive behavior and alcohol use were correlated concurrently across time (i.e., age 14 aggression and alcohol use $r = .55$; age 15 aggression and alcohol use $r = .44$; age 16 aggression and alcohol use $r = .37$; and age 14 aggression and alcohol use $r = .37$). Furthermore, aggression and alcohol use were correlated over time. For example,

alcohol use at age 14 was significantly correlated with subsequent aggression at age 15 ($r = .36$), age 16 ($r = .24$), and age 17 ($r = .21$) (Huang, White, Kosterman, Catalano, & Hawkins, 2001). In a study of 257 youth followed for a year and a half (range 14 - 17 years at baseline), similar correlations were noted between alcohol use and other substances over time, but findings also were extended to substance use. Level of alcohol use was correlated with risky sexual behavior ($r = .24$; $p < .05$), but rate in change of alcohol use was unrelated to changes in risky sexual behavior. However, increases in cigarette use were related to increases in risky sexual behavior ($r = .43$, $p < .05$) (Duncan, Strycker, & Duncan, 1999). Thus, in general, there is evidence of a strong correlation between various types of problem behavior in adolescence.

In Jessor's original conception of problem behavior syndrome theory, all problem behaviors were proposed to be manifestations of a single underlying first-order trait or factor. To fully test Jessor's problem behavior theory, some have sought to determine whether the correlation among problem behaviors in adolescence can be accounted for by a single, first-order latent construct, which would imply that the same underlying factor accounts for all problem behaviors. Jessor and colleagues reported that a single first-order latent factor accounted for the positive intercorrelations among problem behaviors in both adolescence and early adulthood (Donovan & Jessor, 1985; Donovan, Jessor, & Costa, 1988). In a meta-analysis of studies on various forms of antisocial behavior, Loeber and Schmalting (1985) also found that various forms of antisocial behavior could be accounted for by a single dimension. Other studies have also found that the covariation among diverse behaviors, including educational underachievement, delinquent behavior, substance use, and sexual behavior, can be adequately modeled by a single higher order factor (Cooper, Wood, Orcutt, & Albino, 2003; Duncan, Duncan, & Strycker, 2000).

The early findings on general problem behavior syndrome used simple, single indicators of each problem behavior (Donovan & Jessor, 1985; Donovan, Jessor, & Costa, 1988). Other investigators using more detailed and complete assessments of various types of problem behavior found that a single first-order solution provided a relatively poor fit compared to second-order latent factor models¹ (McGee & Newcomb, 1992; Michael D. Newcomb et al., 2002). When a second-order latent factor was introduced, there was again evidence for a general underlying construct shared by all types of problem behavior included in these studies. In addition, the results suggested that problem behaviors are more strongly related within domain (e.g., various delinquent acts are more correlated with each other than they are with substance use), though at a higher level, the second order, all are related. When a second-order latent factor is introduced to account for general problem behavior, many of these studies find excellent fit across problem behaviors. That is, various domains of problem behavior are found to load onto a larger general problem behavior factor across a wide variety of behaviors including school trouble, drug use, sexual activity, delinquency, risky health behaviors, and academic performance (McGee & Newcomb, 1992; Michael D. Newcomb et al., 2002; Petridou et al., 1997). Notably, this general problem behavior factor does not appear to vary across ethnicity, sex, or age from ages 12 to 17 (Petridou et al., 1997). While earlier studies (i.e., Donovan & Jessor, 1985; Donovan, Jessor, & Costa, 1988) with fewer indicators of problem behaviors lacked the ability to capture both the unique and shared aspects of problem behaviors, more recent studies with multiple indicators of different types of problem behaviors indicate that various domains of problem behaviors cluster

¹ Chi-square difference tests indicated significantly better fit for a second-order solution; Fit statistics across final models: CFI > .93, NFI > .91, RMSEA < .07.

together and are generally well captured by a single higher order factor, providing evidence for a problem behavior syndrome.

Finally, the examination of covariance among problem behavior has been extended beyond externalizing types of problem behavior (e.g., delinquency, drug use, risky sexual behavior) to other health-related behaviors. Problem behaviors including delinquency and substance use are modestly correlated with health behaviors, including dieting, exercise, regular sleep, and seatbelt use in junior high (r 's = -.17 to -.37) and high school (r 's = -.19 to -.35) (Donovan, Jessor, & Costa, 1991). Some studies have found that disordered eating is associated with other problem behaviors. Among females followed annually from early to late adolescence, increases in substance abuse, eating disorder, and antisocial behavior were all associated. Initial levels of substance use and antisocial behavior predicted increases in each other – while initial levels of eating disorder predicted increases in substance abuse problems (Measelle, Stice, & Hogansen, 2006). However, the correlation between behavior problems like delinquency and health-related behaviors (dieting, lack of exercise, and safety behaviors) is noticeably weaker than the association between delinquency and substance use (Donovan, Jessor, & Costa, 1991; Measelle, Stice, & Hogansen, 2006).

Although a preponderance of evidence suggests that problem behaviors such as delinquency, substance use, and risky sexual behavior (early sexual behavior, condom use, number of sexual partners) are components a general syndrome of problem behavior in adolescence, some have cautioned against overstating the case for a single problem behavior syndrome (Farrell, Sullivan, Esposito, Meyer, & Valois, 2005; McCord, 1990; Resnicow, Ross-Gaddy, & Vaughan, 1995; Willoughby, Chalmers, & Busseri, 2004). As a specific example, Elliott and colleagues (1989) found in the National Youth Study that that many delinquent

youths were not drug users, indicating that involvement in one type of problem behavior is not perfectly related to other types of problem behaviors.

Covariance of Problem Behavior Across Development

Involvement in different types of problem behavior increases throughout adolescence, but the initiation and course of these behaviors varies with the behavior in question. For instance, involvement in delinquent behavior, on average, increases in early adolescence, peaks around age 17, and declines rapidly thereafter (Farrington, 2009). Substance use typically increases through adolescence and peaks in prevalence between ages 18 and 24 (Chassin, Hussong, & Beltran, 2009). In the United States, the average age for first sexual intercourse is estimated to be 17 years for males and 16 for females (Alan Guttmacher Institute, 2010; Centers for Disease Control, 2002). This raises questions about how the covariation of problem behaviors changes over the course of adolescence.

Few studies have examined this question specifically. In general, covariation of problem behaviors is weak in late childhood and early adolescence, increases in strength throughout adolescence, and as youth enter adulthood, begins to weaken. In a series of studies on a longitudinal sample of youth from across adolescence, Gillmore and colleagues (1991) examined the structural nature of deviant behavior, alcohol use, marijuana use, illicit drug use, and trouble at school among sixth graders (ages 11 - 12). Results indicated that the variety of problem behavior – school troubles, delinquency, and substance use – could not be accounted for by a first-order factor (Gillmore et al., 1991). However, in this sample, by the eighth grade, school problems, delinquency, polydrug use, and sexual involvement were all highly correlated (Michael D. Newcomb et al., 2002). In another study, Lytle and colleagues examined smoking,

poor dietary choices, and low physical activity patterns, and found that the clustering of these problems became stronger as youth aged from Grades 8 through 12 (Lytle, Kelder, Perry, & Klepp, 1995). It is less clear how problem behaviors cluster as youth transition out of adolescence, with some studies suggesting that problem behaviors may become more heterogeneous and less correlated as adolescents transition into adulthood (McGee & Newcomb, 1992; Michael D. Newcomb & Bentler, 1988; Osgood, Johnston, O'Malley, & Bachman, 1988), while other work suggests that problem behavior syndrome remains intact into adulthood (Donovan, Jessor, & Costa, 1988).

One longitudinal study examined the covariance among problem behaviors at four ages from early adolescence to adulthood (McGee & Newcomb, 1992). Different indices of problem behavior were examined at each age: in early adolescence, drug use, academic orientation, and social nonconformity were examined. In late adolescence, drug use, academic orientation, social non-conformity, sexual involvement, and criminal behavior were examined. In early adulthood, drug use, social nonconformity, sexual involvement, and criminal behavior were examined. In adulthood, drug use, social nonconformity, sexual involvement, and criminal behavior were examined. Results indicated that in early adolescence, social nonconformity was most strongly related to a common problem behavior factor. During late adolescence and early adulthood, drug use and sexual involvement (age at first intercourse, number of sexual partners, STI infections, and pregnancy) were most strongly related to the general problem behavior factor. Finally, in adulthood, drug use was most strongly related to the common problem behavior factor, followed by criminal behavior, social nonconformity, and number of sexual partners. Of particular note, during late adolescence, each of the measured problem behaviors made approximately equal contributions to a general problem behavior factor. In other developmental periods this was not

the case. Different types of problem behavior covary more strongly in adolescence than in earlier or later developmental periods.

Part of the reason for this developmental variation in covariation among problem behaviors may be due to the developmental pattern and sequencing of problem behaviors. One perspective on how problem behaviors are related is a cascade model of development (Masten et al., 2005), which suggests that problem behaviors in one domain are likely to cascade into problems in other types of domains and this association is likely to be bidirectional. To illustrate, general conduct problems in late childhood predict academic problems in adolescence, which, in turn, predict later externalizing behaviors in adolescence (Masten et al., 2005). In short, academic problems can be both a consequence of and a contributor to externalizing problems. Masten and colleagues found this developmental process for both males and females and it was not attributable to effects of IQ, parenting quality, or socioeconomic characteristics (Masten et al., 2005).

Another example of a model of the progression of problem behaviors during adolescence is Kandel's gateway hypothesis (Kandel & Davies, 1992). From this perspective, youth begin by involvement in less serious or socially unacceptable types of problem behavior and progress to more serious or socially unacceptable types of problem behavior over time. Generally, adolescents engage in problem behaviors in a developmental sequence, with young people tending to commit minor delinquent acts before beginning substance use or sexual behavior (D. S. Elliott, 1994; Huba & Bentler, 1983; Kandel & Davies, 1992; Kuperman et al., 2001). Perhaps the strongest example of a patterned sequence in the initiation of problem behaviors has been found in the relation between delinquency and substance use initiation.

The most common sequence of initiation begins with minor delinquency, followed by either alcohol or tobacco use, followed by marijuana use and more serious delinquency, followed by use of other illicit drugs (D. S. Elliott, 1994). Prospective longitudinal research has shown that delinquency is also a positive predictor of problem substance use and substance-related clinical disorders (Harford & Muthen, 2000; Helene Raskin White, 1990; M. Windle, 1990). More severe behavioral consequences of delinquency, including substance use and problem use, may follow from early-starting conduct problems and delinquent activity (Moffitt, 1993; Patterson & Yoerger, 1997). In turn, alcohol initiation predicts tobacco initiation and visa versa, and use of either of these substances is predictive of initiation of marijuana use (Hawkins, Hill, Guo, & Battin-Pearson, 2002; Kandel, 2002). These findings are consistent with developmental theories positing that antisocial behavior is an important pathway leading to the development of substance abuse and dependence (R A Zucker, 1994), and that early onset delinquency places a youth at risk for maladaptive development in multiple domains, including substance use and risky sexual behavior (Moffitt, 1993; Moffitt, Caspi, Harrington, & Milne, 2002). Importantly, this sequence has been replicated in retrospective data (Kandel, Yamaguchi, & Chen, 1992), prospective data (Collins et al., 1994), and international data (Alder & Kandel, 1981).

The progression and associations among problem behaviors may vary with gender. Some research suggests that involvement in delinquent behavior places females at higher risk for substance use and problem use than it does males (e.g., Costello, Armstrong, & Erkanli, 2000). However, there is also evidence that delinquent activity is equally likely to increase risk for substance use and problem use in males and females (Disney, Elkins, McGue, & Iacono, 1999). Delinquency as early as age 11 is a positive predictor of alcohol use at age 16 for both males and females, and alcohol use at age 16, in turn, is a strong predictor of problem substance use at age

18 (Mason, Hitchings, & Spoth, 2007). Mason and colleagues found a positive correlation between delinquency and problem substance use as young as age 11 that remained consistent throughout adolescence for males (Mason, Hitchings, & Spoth, 2007).

In addition to the relation between delinquency and substance use, there is evidence for a development progression among other types of behaviors. For instance, a study of African American youth found that problems in school predicted drug and alcohol use, which predicted dropping out (Zimmerman & Schmeelk-Cone, 2003). Other research found that, for sexually active adolescents, problem behaviors such as delinquency predicted nonuse of condoms (Biglan, Metzler, Wirt, & Ary, 1990). Use of illicit drugs such as cocaine or heroin, has been found to increase the likelihood of later suicidal behavior (Kandel, Raveis, & Davies, 1991), the chances that an adolescent female will become pregnant while unmarried (D. S. Elliott & Morse, 1986, March; Yamaguchi & Kandel, 1987), and the likelihood that a youth will engage in violence (Hawkins et al., 1998).

It is important to note, however, that the findings on the covariation of problem behaviors and the developmental sequencing of problem behaviors may be partially due to the problem of measuring the same construct across time when the meaning or developmental expression of that construct changes as youth develop. For example, biting and kicking in early childhood are commonplace and are good measures of aggressive behavior during that time period, but by adolescence, biting and kicking are rare and are poor measures of aggression. Measuring aggression the same way in early childhood and adolescence may yield an inaccurate measurement of the construct at one of those points in time. Thus, it is necessary to introduce developmentally appropriate indexes or scales for a construct. However, the cost of the addition of developmentally appropriate indexes of problem behavior is that it becomes difficult to

estimate the equivalence of such age-specific measures. McGee and Newcomb (1992) introduced developmentally appropriate indexes of problem behavior at each time point (i.e., introducing sexual behavior as a construct initially in late adolescence), but did so at the cost of understanding the relation between the exact same indicators across time points. Researchers must balance the study of *homotypic stability* (i.e., stability in a trait measured in the same way at different points in time) and *heterotypic stability* (i.e., stability examined by developmentally appropriate markers of the construct at each developmental stage). It is unclear how much the stronger covariation of problem behaviors during adolescence than at other developmental periods reflects the limitations of measuring problem behaviors across development.

In sum, research indicates that the covariation between problem behaviors is stronger in adolescence than in earlier and later developmental periods, although this evidence is tempered by the methodological limitations of studying the same construct across developmental periods. Delinquency, substance use, and other problem behaviors including risky sexual behaviors are most highly correlated in adolescence (McGee & Newcomb, 1992). By adulthood, continuing substance use is the strongest indicator of a general problem behavior syndrome, which may be reflective of general desistance from criminal behavior in the 20s. In general, youths desist from deviant behavior as they transition into adulthood (Farrington, 2009; Piquero, 2008), and risky sexual behavior declines in young adulthood as youths establish monogamous relationships (Diamond & Savin-Williams, 2009). In contrast, prevalence of substance use and substance abuse peak in early adulthood (Chassin, Hussong, & Beltran, 2009). This pattern may account for stronger covariance among problem behaviors in adolescence, when many problem behaviors are most prevalent.

Risk Factors, Protective Factors and Etiological Mechanisms for Adolescent Problem Behaviors

The greater prevalence of problem behaviors during adolescence does not appear to be due to differences in the ability to appraise the costs and negative consequences of problem behaviors compared to adults (Reyna & Farley, 2006), leading some to suggest that increased problem behavior during adolescence is due to emotional and social factors, rather than cognitive ones (Cauffman & Steinberg, 2000; Scott, Reppucci, & Woolard, 1995; Steinberg & Cauffman, 1996). Moreover, to the extent that problem behaviors covary in adolescence, the same emotional and social factors may underlie multiple types of problem behaviors.

According to Jessor's theory of problem behavior, the underlying cause of externalizing problems during adolescence is unconventionality – both in a youth's personality or characteristics and his or her social environment (Donovan & Jessor, 1985; Menard & Huizinga, 1994). Unconventional individuals are tolerant of deviance in general, are not highly connected to educational or religious institutions, and tend to be very liberal in their views. Unconventional environments are those in which a large number of individuals share these same attitudes, and unconventional individuals in unconventional environments are more likely to engage in a wide variety of problem behaviors – including use of illegal drugs, sex without the use of contraceptives, delinquent behavior, and reckless driving (Brack, Brack, & Orr, 1996; Cooper, 2002; Cooper, Wood, Orcutt, & Albino, 2003; Fergusson & Lynskey, 1996; Jakobsen, Rise, Aas, & Anderssen, 1997; Jessor, 1987b; Spingarn & DuRant, 1996).

Jessor suggested that five domains or sources were necessary to explain adolescent problem behavior, namely the social environment, perceived environment, personality, (other) behaviors, and biology/genetics (Jessor, Donovan, & Costa, 1991). Others have identified possible etiological mechanisms for problem behaviors: risk and protective factors. Risk factors

are defined as predictors of an increased likelihood of problem behavior (Hawkins, Catalano, & Miller, 1992; Kraemer, Kazdin, Offord, & Kessler, 1997; National Research Council and Institute of Medicine, 2009). Protective factors predict a decreased likelihood of problem behavior in the presence of risk exposure (Hawkins, Catalano, & Miller, 1992; Kraemer, Kazdin, Offord, & Kessler, 1997; National Research Council and Institute of Medicine, 2009; Rutter, 1979).

Predictors of future problem behaviors have been found in the individual (e.g., genetic predisposition) and in the environments in which young people are socialized, including the peer group (e.g., friends who use drugs), family (e.g., family conflict), school (e.g., school failure), and community (e.g., availability of alcohol and drugs). Several theoretical models of development posit that decreasing risk while increasing protective factors will prevent problem behaviors (e.g., Catalano & Hawkins, 1996). While risk and protective factors predict the likelihood of later problem behaviors and precede problem behaviors, they are not necessarily “causes” of later problem behavior. Some factors may be causally related to problem behavior, while others may only serve as ‘markers’ for problem behavior. However, the conceptualization and identification of risk and protective factors provides a starting place for which causal mechanisms can be identified. The identification of causal or etiological mechanisms requires theory that links risk factors and protective factors into causal chains, at which point research can test these hypothesized causal chains. The strongest test of causality is experimental research, where hypothesized causal variables are manipulated and subsequent effects on problem behaviors evaluated by comparing intervention and control groups (National Research Council and Institute of Medicine, 2009).

Longitudinal research has identified a number of common risk factors for antisocial behavior, substance use, and risky sexual behaviors (Biglan, Brennan, Foster, & Holder, 2004). These include community disorganization, school failure, family conflict, favorable family and peer attitudes to drug use and antisocial behavior, and individual variation in impulse control (Cauuffman & Steinberg, 2000; Chassin, Hussong, & Beltran, 2009; Hawkins, Catalano, & Miller, 1992; Labouvie & McGee, 1986; R. Loeber, Stouthamer-Loeber, Van Kammen, & Farrington, 1991; Michael D. Newcomb & Felix-Ortiz, 1992; Michael D. Newcomb, Maddahian, Skager, & Bentler, 1987; Sampson & Groves, 1989; Werner & Smith, 1992; H. R. White, Pandina, & LaGrange, 1987). Notably, there is some evidence that the same risk factors underlying adolescent problem behavior in the United States predict adolescent problem behavior in other countries, such as China (Jessor et al., 2003; Ma et al., 2008) and Australia (Hemphill, 2009). Evidence also suggests that most risk factors operate similarly for males and females (Biglan, Brennan, Foster, & Holder, 2004). For example, although there are sex differences in self-reported familial parenting practices such as monitoring of children during adolescence, the relation between familial risk factors and substance use and delinquency does not differ for males and females (A. Fagan, Van Horn, Antaramian, & Hawkins, 2009).

Table 1 illustrates the predictive relationship between various risk factors and different types of adolescent problem behaviors (substance abuse, delinquency, teen pregnancy, school drop out, violence, and depression and anxiety). Check marks denote risk factors that have been shown to relate to the outcome in at least two longitudinal studies. As seen in the table, many risk factors for one type of behavior problem, such as substance abuse, also predict other problems, including delinquency, violence, teen pregnancy, dropping out of school, and depression and anxiety (Howell, Krisberg, Hawkins, & Wilson, 1995). For example, the risk

factor of “family conflict” has been shown to predict youth substance abuse, delinquency, teen pregnancy, school dropout, violence and depression, and anxiety. To the extent that this risk factor is causal, reducing the degree of “family conflict” to which children are exposed could prevent multiple types of problem behaviors.

It is important to note that some individual and environmental factors can buffer against risk exposure (Rutter, 1979). Strong attachment to family members, school success, and opportunities and rewards for prosocial activities protect against involvement in problem behaviors and are linked to positive development (Hawkins, Catalano, & Miller, 1992). Similarly, factors like academic achievement, engagement in school, close familial relationships, and involvement in religious activities can prevent various types of problem behaviors (Jessor, Turbin, & Costa, 1998; Jordan & Lewis, 2005). Importantly though, in a large representative sample of youths from five states, few youths were identified with both high levels of risk and high levels of protective factors and low levels of risk and low levels of protective factors. The majority of youth who are exposed to high levels of risk overall have low levels of protection in their lives (Pollard, Hawkins, & Arthur, 1999). This suggests that interventions seeking to promote positive behaviors and prevent problem behaviors should include a focus on reducing risk exposure among children and adolescents as well as on providing greater protection.

Common vs. Specific Risk Factors

In this section we examine key risk factors for involvement in problem behavior during adolescence across individual, peer, family, school, and community, and discuss if and how each is related to problem behavior.

Domains of Risk.

Individual risk

One factor that may play a strong role in adolescent risk taking is developmental immaturity in the ability to control impulses. Problem behaviors are, in part, the result of an underlying deficit in the ability to control impulses, and, as such, youth who engage in problem behaviors are often referred to as undercontrolled (e.g., R. W. Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996). Krueger and colleagues (2009) have suggested that underlying the associations among substance dependence, antisocial behaviors, conduct disorder, and other disorders along the externalizing spectrum is a genetically mediated, trait-like vulnerability to disinhibition manifested as poor impulse control. Within this framework, individuals with less ability to control their impulses are more likely to engage in a host of problem behaviors. Impulsivity is a generalized risk factor for educational underachievement, delinquent behavior, substance use, and sexual behavior (Chassin, Hussong, & Beltran, 2009; Cooper, Wood, Orcutt, & Albino, 2003; Farrington, 2009). In addition, rank-order individual differences in impulse control remain relatively stable over development (although the interaction between genes and environment may change the strength of this association over time (see Krueger et al., 2002; Krueger et al., 2009; Krueger, Markon, Patrick, Benning, & Kramer, 2007). In early childhood, youth develop increased ability to self-regulate impulses – and youth who are unable to do so are at risk for development of conduct problems in childhood (Kochanska, Murray, & Coy, 1997; Winsler, Diaz, Atencio, McCarthy, & Adams Chabay, 2000). Indeed, the period from adolescence to early adulthood is marked by comparable developmental increases in the ability to control impulses, and it is likely that delays in the ability to control impulses contribute to both initiation and frequency of problem behavior (Monahan, Steinberg, Cauffman, & Mulvey, 2009; Steinberg et al., 2008; Steinberg & Cauffman, 1996).

In addition to the inability to control impulses, there are a number of robust individual risk factors for problem behaviors. Early and persistent aggressive behavior places youth not only at risk for later antisocial behavior, but substance use, risky sexual behavior, and violent behavior (Biglan, Brennan, Foster, & Holder, 2004; Moffitt, 1993; Moffitt, Caspi, Harrington, & Milne, 2002). Early onset substance use incurs a range of deleterious outcomes, including further involvement with substances (Hawkins et al., 1997) and development of substance-related disorders (B.F. Grant & Dawson, 1997; Bridget F. Grant, Stinson, & Harford, 2001; Nelson & Wittchen, 1998; Pitkänen, Kokko, Lyyra, & Pulkkinen, 2008; Michael Windle & Wiesner, 2004). Hawkins and colleagues found that the effects of other risk and protective factors, including parent drinking, proactive parenting, school bonding, and peer alcohol use, were fully mediated by early age of initiation of alcohol use in predicting alcohol misuse later in adolescence (Hawkins et al., 1997). Similarly, early onset of sexual intercourse is associated with lower likelihood of contraceptive use (Coker, 2009) and greater number of sexual partners during adolescence (Durbin, DiClemente, Siegel, & Krasnovsky, 1993). This pattern of early initiation of a problem behavior predicting later severity and persistence of that problem behavior is found across behaviors.

Not only is prior involvement in behavior a strong predictor of subsequent behavior, but attitudes toward behaviors are robust predictors of subsequent problem behaviors. That is, individuals who have positive perceptions of substance use are more likely to use substances (Petraitis, Flay, & Miller, 1995; Schulenberg et al., 1996), and those with positive perceptions of sexual behavior are more likely to debut sexually (Durbin, DiClemente, Siegel, & Krasnovsky, 1993). Thus, favorable attitudes toward problem behaviors are strong predictors of subsequent problem behavior during adolescence.

Peer risk

The peer group is a particularly salient social context during adolescence. The importance of peer groups in adolescence is likely the product of multiple processes, including increases in the amount of time adolescents spend with peers, in the stated importance of peer relationships (Brown & Larson, 2009), and in adolescents' susceptibility to peer influence (Steinberg & Monahan, 2007). One of the most robust findings in the literature on adolescent antisocial behavior is that individuals with deviant peers are more likely to engage in antisocial behavior than individuals without deviant peers (Monahan, Steinberg, & Cauffman, 2009). Similarly, peer substance use is one of the strongest predictors of adolescent substance use (Brendgen, Vitaro, & Bukowski, 2000; Farrington, 2009; Heinze, Toro, & Urberg, 2004; Lipsey & Derzon, 1998; Patterson, Capaldi, & Bank, 1991). Substance-using peers are associated with increased risk of problem substance use (Chassin, Hussong, & Beltran, 2009; Delbert S. Elliott, Huizinga, & Ageton, 1985; Oxford, Harachi, Catalano, & Abbott, 2001). Adolescents who believe that their friends are having sex are more likely to engage in sexual activity (Diamond & Savin-Williams, 2009), and peer involvement in problem behavior predicts lower condom use among sexually active adolescents (Metzler, Noell, Biglan, & Ary, 1994). Recent experimental evidence suggests that the mere presence of peers increases problem behavior in laboratory-based tasks among adolescents (Gardner & Steinberg, 2005). It is not surprising that peer group characteristics are associated generally with problem behaviors during adolescence and that these effects are found across problem behavior domains.

Familial risk

Characteristics of the family also impact problem behavior during adolescence. Some have argued that the early family context in which problem-behaving adolescents are raised

encourages problem behavior as an adaptive response to a hostile environment (Belsky, Steinberg, & Draper, 1991). Lack of maternal involvement with children and low parental expectations are associated with drug use (Kilpatrick et al., 2000; Sale et al., 2005), delinquency (Baumrind, 1985; Farrington, 2009; Penning & Barnes, 1982), and sexual debut (Diamond & Savin-Williams, 2009). The absence of closeness between parents and children (i.e., the absence of bonding to family) also has been found to predict alcohol misuse and problem behavior more generally (Hawkins, Catalano, & Miller, 1992). In general, youth with permissive parents engage in higher levels of problem behavior (Barnes, Reifman, Farrell, & Dintcheff, 2000; Chassin, Hussong, & Beltran, 2009; Jessor & Jessor, 1977), at least partially through parental failure to communicate norms and rules. Moreover, parental attitudes favorable towards problem behaviors are conveyed to children and can increase risk for these behaviors in children. Youths whose parents condone or encourage violent behavior are more likely to exhibit violent behavior in adolescence. Similarly, favorable parental attitudes toward tobacco predict initiation of smoking, and favorable parental norms toward alcohol predict initiation of alcohol use (Hawkins, Hill, Guo, & Battin-Pearson, 2002).

Family structure and parenting practices predict condom use among sexually active adolescents (Metzler, Noell, Biglan, & Ary, 1994), and lower family rule setting, parental involvement, and closeness are associated with delinquency and substance use in adolescence (Catalano & Hawkins, 1996; Metzler, Noell, Biglan, & Ary, 1994). Poor family management practices (failure to set clear expectations for behavior, lax monitoring of children, and excessively severe and inconsistent discipline) predict later alcohol misuse (Hansen et al., 1987; McDermott, 1984; Peterson, Hawkins, Abbott, & Catalano, 1994). Less parental smoking, strict familial monitoring and rules, and stronger parental bonding have been found to predict lower

risk of daily smoking initiation (Oxford, Harachi, Catalano, & Abbott, 2001). Youth whose families consistently provided poor family management from early to mid adolescence (ages 11 to 14) have been found to be more likely to follow chronic or late onset, increasing patterns of violent behavior across adolescence (ages 13 to 18). Importantly, in that study, youths whose families exhibited poor management in early adolescence, but increased in family management over time (ages 11-14), had patterns of violence similar to youths whose parents consistently provided good familial management (Herrenkohl, Hill, Hawkins, Chung, & Nagin, 2006), suggesting that family management practices in early adolescence may be particularly salient for preventing problem behaviors later in adolescence (Burt, 2009). Research suggests that good parenting practices can overcome genetic risks for problem behavior during adolescence (Burt, 2009). In one study, good parental monitoring diminished the association between genetic risk and problem behavior (Dick et al., 2009).

Although children in single-parent homes are at risk for delinquency and drug use (Blum et al., 2000; Penning & Barnes, 1982) and are more likely to be sexually active (Paul, Fitzjohn, Herbison, & Dickson, 2000; Wu & Thomson, 2001), this relation appears to result at least partially from a decreased ability to monitor children's behavior when only one adult caretaker is present in the home. That is, it is not necessarily coming from a single-parent home that predicts increased risky behavior, but rather, other characteristics of parenting that are more likely to occur in single-parent families. Indeed, other factors, such as conflict among family members, appear to be more salient predictors of risky behavior than being from a single-parent home, leading some to suggest that other risk factors are more important to understanding problem behavior than family structure (Paul, Fitzjohn, Herbison, & Dickson, 2000).

Finally, familial history plays a strong role in predicting subsequent problem behavior during adolescence (Hawkins, Catalano, & Miller, 1992). In general, children who come from a family with a history of crime are more likely to be criminally active; children of alcoholics are more likely to abuse substances; and children of teenage mothers are more likely to become teenage parents themselves. Some of this overlapping risk may be genetic (as demonstrated for alcoholism) and some may be environmental influence (Chassin, Hussong, & Beltran, 2009; Hill, Hawkins, Catalano, Abbott, & Guo, 2005).

School risk

Adolescents spend the majority of their day in school and how they feel about and perform in school has important implications for problem behavior. Failure in school has been identified as predictor of drug use (Chassin, Hussong, & Beltran, 2009; Hawkins, Catalano, & Miller, 1992), delinquent behavior (Farrington, 2009; Jessor & Jessor, 1977), and early sexual activity (Diamond & Savin-Williams, 2009). Notably, the relation between school failure and problem behavior is complicated: youth with conduct problems are more likely to fail at school, which in turn predicts increased substance use (Feldhusen, Thurston, & Benning, 1973). In contrast, school attachment and success in school are associated with decreased involvement in problem behavior (Hawkins, 1997), suggesting that bonding to school may protect against multiple types of problem behavior.

Similarly, low commitment to school is associated with greater drug use, delinquency, and sexual behavior (Johnston, O'Malley, Bachman, & Schulenberg, 2009). The effect of truancy on drug involvement is positive and significant even after accounting for parental education, ethnicity, and prior problem behaviors. Other variables pertaining to school attachment, such as time spent doing homework, extracurricular activities, and perceptions of coursework are also

related to decreased problem behaviors (Friedman, 1983), suggesting that an overall low commitment to school is broadly predictive of problem behaviors among adolescence (Biglan, Brennan, Foster, & Holder, 2004).

Community risk

Community characteristics of low socioeconomic status and neighborhood disorganization are also related to some types of problem behaviors in adolescence. Indicators of socioeconomic disadvantage, such as poverty, poor housing, and overcrowding, are associated with increased risk of childhood conduct problems and delinquency, drug use, and risky sexual behavior (Allison et al., 1999; Bursik & Webb, 1982; Farrington, 2009; Li, Stanton, & Feigelman, 2000; Petraitis, Flay, & Miller, 1995; Robinson, Klesges, Zbikowski, & Glaser, 1997). However, research on socioeconomic status and drug use is less clear. Parental education is positively associated with teenage drinking (Biglan, Brennan, Foster, & Holder, 2004) and marijuana use (Robert A. Zucker & Harford, 1983). In contrast, extreme poverty incurs risk for alcoholism and drug use among children who are highly antisocial in childhood (Bachman, Johnston, & O'Malley, 1981). Thus, while socioeconomic status is negatively associated with delinquency, sexual debut, and contraceptive use, the relation between socioeconomic status and drug use is less clear. Indeed, when extreme poverty is examined and characteristics of the child (e.g., prior risk behavior) are taken into account, the association is always negative, such that extreme socioeconomic deprivation increases risk for a number of problem behaviors (L. N. Robins & Ratcliff, 1979). In contrast, higher socioeconomic status predicts drug use among youths without prior behavioral problems.

Finally, disorganized neighborhoods with high population density, high residential mobility, and physical deterioration are more likely to have high rates of crime (Wilson &

Herrnstein, 1985) and illegal drug trafficking (J. Fagan, Weis, & Cheng, 1988). Community norms and laws that are favorable toward drug use, criminal behavior, or violence are predictive of youth involvement in these problem behaviors, possibly through the transmittal and adoption of these community norms by youths (Hawkins, Catalano, & Miller, 1992).

Relations among risk domain, developmental variation, and cumulative risk

The mechanisms that underlie problem behavior are complex. Explanations that seek to understand the etiology of problem behaviors by focusing on only one domain, such as genetics or family environment, will undoubtedly oversimplify the complexity and varied pathways to adolescent problem behaviors. There are a number of ways in which risk factors can affect problem behaviors. First, risk factors have direct effects on problem behaviors. For example, positive perceptions of sexual behavior may precede and directly affect sexual debut (Durbin, DiClemente, Siegel, & Krasnovsky, 1993). Similarly, associations with deviant peers directly impacts one's own deviant behavior (Monahan, Steinberg, & Cauffman, 2009).

A second way that risk factors can impact problem behavior is through indirect effects. That is, in addition to or instead of directly impacting problem behavior, the effects of some risk factors on problem behavior are mediated through other risk factors. Community disorganization makes it difficult for families to transmit prosocial values for children (Shaw & McKay, 1969). Thus, living in a disorganized neighborhood is associated with poor family management, which in turn predicts greater likelihood of having delinquent peers, which is associated with greater problem behavior (Oxford, Harachi, Catalano, & Abbott, 2001). Conversely, while prosocial family processes, such as parental rules, parental monitoring, and child attachment to parents have direct negative effects on substance use initiation, they also have indirect effects on

substance use via their effects on decreasing involvement with antisocial peers. Among families with prosocial family processes, youth are less likely to affiliate with deviant peers, thus further protecting against substance use initiation (Oxford, Harachi, Catalano, & Abbott, 2001).

Third, there is evidence that the impact of risk factors on problem behaviors changes developmentally. For instance, although peers are a very robust predictor of problem behavior throughout adolescence, as individuals age, the influence of their peers on their problem behavior wanes (Monahan, Steinberg, & Cauffman, 2009). In a longitudinal study of youth, Herrenkohl and colleagues found that some constructs are continuously related to violent behavior from ages 11 to 18 (hyperactivity, low academic performance, peer delinquency, and availability of drugs). Other risk factors are more salient predictors of violent behavior at younger ages (poor family management, family conflict, low school commitment, low educational aspirations, economic deprivation, low neighborhood attachment, economic deprivation, and low neighborhood attachment) (Herrenkohl et al., 2000).

Finally, while there is evidence that problem behaviors are predicted by a common set of risk factors observable in childhood (Hawkins, Jenson, Catalano, & Lishner, 1988), it is also the case that effects of risk factor exposure are cumulative, such that the greater number of risk factors an individual is exposed to, the greater the likelihood that the individual will develop drug abuse problems (Bry, McKeon, & Pandina, 1982; M. D. Newcomb, Maddahian, & Bentler, 1986), delinquency (Kolvin, Miller, Fleeting, Kolvin, & Rutter, 1988), and violent behavior (Hawkins et al., 1998; Herrenkohl et al., 2000). The robustness of the relationship between exposure to an increasing number of risk factors and increasing likelihood of variety of problem behaviors is striking (Bry, McKeon, & Pandina, 1982; Michael D. Newcomb, 1995; Pollard, Hawkins, & Arthur, 1999; Rutter, 1979). Indeed, some have suggested that the number of risk

factors present is a more powerful predictor of problem behavior than the specific risk factors present (Sameroff, Bartko, Baldwin, Baldwin, & Seifer, 1998). In general, as cumulative risk is examined, the greater number of risk factors in an individual's life, the fewer protective factors, and vice versa, suggesting that risk and protective factors are not independent (Pollard, Hawkins, & Arthur, 1999). Figure 1 illustrates this relationship, showing that as risk increases, the prevalence of marijuana use in the last 30 days increases. Of a total sample of approximately 77,000 individuals, at least 100 people at each level of intersection of risk and protection were required to be included in Figure 1. As shown, few individuals exposed to high levels of risk were found who also had high levels of protection (Pollard, Hawkins, & Arthur, 1999). Thus, the count of the number of risk factors a youth experiences across individual, peer, family, school, and community domains is a strong predictor of involvement in multiple types of problem behavior during adolescence.

Conclusions

The greatest risks to adolescent health are the behaviors in which adolescents willingly engage (Ozer, Macdonald, Irwin, Mortimer, & Larson, 2002), such as reckless driving, delinquency, substance use, and risky sexual behavior. In the extant literature, there is evidence that such problem behaviors covary during adolescence, such that involvement in multiple types of problem behavior is likely to occur. While this covariance is not perfect, many youth simultaneously engage in a number of different problem behaviors, and involvement in one type of problem behavior is associated with involvement in other types of problem behavior. To the extent that involvement in one type of problem behavior leads to involvement in other types of

problem behavior, preventive efforts that reduce earlier appearing problem behaviors may affect multiple problems.

There is strong evidence that certain risk factors are shared predictors of diverse problem behaviors. For example, impulsivity, poor family management, academic failure, and peers who engage in problem behavior are risk factors for a number of different types of problem behavior during adolescence. Other risk factors, such as low socioeconomic status, are associated with some problem behaviors such as delinquency, but not necessarily others, such as drug use. For the purposes of working to prevent youth problem behavior, it is likely that prevention programs that target shared malleable risk factors for diverse adolescent problem behaviors will affect multiple problems in adolescence.

In fact, there is evidence that targeting risk and protective factors for one type of problem, such as substance use, can have benefits or “crossover effects,” for a broad range of adolescent problem behaviors predicted by these risk and protective factors (Ellickson, McCaffrey, & Klein, 2009). A growing body of research on crossover effects suggests that this may be true. In the Nurse-Family Partnerships program, nurse home visitors work with families in their homes during pregnancy and the child’s first 2 years of life. Targeted populations are low-income, unmarried pregnant women bearing their first child. Fifteen years after the program, children of nurse-visited women have lower substance use, lower rates of arrest, and lower instances of running away compared to control children. Moreover, the families in the experimental condition had lower verified reports of child abuse or neglect, fewer subsequent births, greater intervals between first and second children, fewer maternal arrests and behavioral problem due to substance abuse, and lower receipt of federal aid compared to control families (Olds, Hill, Mihalic, & O'Brien, 1998). The Raising Healthy Children program for teachers,

parents, and children in Grades 1 through 6 was tested in urban elementary schools in the Seattle Social Development Project. When followed up from 6 to 15 years after the program ended, those in the intervention condition reported less lifetime violence and heavy alcohol use at age 18, were more likely to have completed high school by age 21, had better occupational and educational attainment at ages 24 and 27, were less likely to have diagnosable mental health disorders at ages 24 and 27, and were less likely to engage in a range of sexual risk behaviors as well to have experienced sexually transmitted infections from adolescence through age 27 when compared with those who did not receive the program (Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999; Hawkins, Kosterman, Catalano, Hill, & Abbott, 2005, 2008; Lonczak, Abbott, Hawkins, Kosterman, & Catalano, 2002). Participation in Life Skills Training, administered in 7th, 8th, and 9th grades, has been found to predict lower probability of alcohol and drug use, violence, delinquency, problem driving, and HIV risk behavior 10 years after the intervention (Botvin, Griffin, & Nichols, 2006; Griffin, Botvin, & Nichols, 2004). The CASASTART (Striving Together to Achieve Rewarding Tomorrows, formerly called Children at Risk) program targets youth (ages 11 - 13) in high-risk environments and seeks to reduce exposure to drugs and criminal activity by focusing on decreasing individual, peer group, family, and neighborhood risk factors. Participation in CASASTART compared to a control group was linked with lower drug use, lower violent behavior, and lower rates of drug dealing (Harrell, Cavanagh, & Sridharan, 1998). Participation in the "Preventative Treatment Program" for high-risk males between ages 7 and 9 was associated with less antisocial behavior, less aggressive behavior, and greater success in school when compared with controls 3 years post intervention at age 12 (Tremblay et al., 1996). Six years after intervention, youth who participated in the Preventative Treatment Program reported less drug use, less antisocial behavior, fewer delinquent peers, and

were less likely to be gang members than youths in the control group. The findings from these preventive interventions indicate that targeting shared risk and protective factors may have positive effects on a wide range of problem behaviors.

Unfortunately, much research and practice have treated adolescent problem behaviors as separate and independent, with little consideration of their interconnectedness. This is somewhat surprising given high levels of covariation across problem behaviors and the evidence regarding common predictors of multiple risk or problem behaviors. Indeed, one of the greatest challenges to the study and prevention of youth problem behavior is that research and prevention programs tend to focus on problem-specific mechanisms and problem-specific prevention programs. Problem-specific prevention projects tend to be supported by agencies dedicated to that specific problem topic and published in venues specific to that problem behavior (e.g., research and prevention programs on substance use among teenagers is funded by the National Institute on Drug Abuse, with findings often published in drug and alcohol specialty journals, while research and prevention programs on delinquent or criminal behavior are funded by the National Institute of Justice or the Office of Juvenile Justice and Delinquency Prevention with findings often published in criminology journals). Perhaps the greatest danger of this is that research on problem behaviors is segregated into separate domains, risking inadequate attention to the interrelationships among problem behaviors and shared risk factors for diverse problem behavior outcomes. As such, there is a need to foster collaborations of researchers who focus on different domains of problem behavior to promote positive development during adolescence.

Table 1

Risk Factors	<i>Substance Abuse</i>	<i>Teen Pregnancy</i>	<i>School Drop-Out</i>	<i>Violence</i>	<i>Depression & Anxiety</i>	
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	✓	✓	✓	✓	✓	✓
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 Attitudes Toward the Problem Behavior	✓	✓	✓	✓		
Early Initiation of the Problem Behavior	✓	✓	✓	✓	✓	
Constitutional Factors	✓	✓			✓	✓

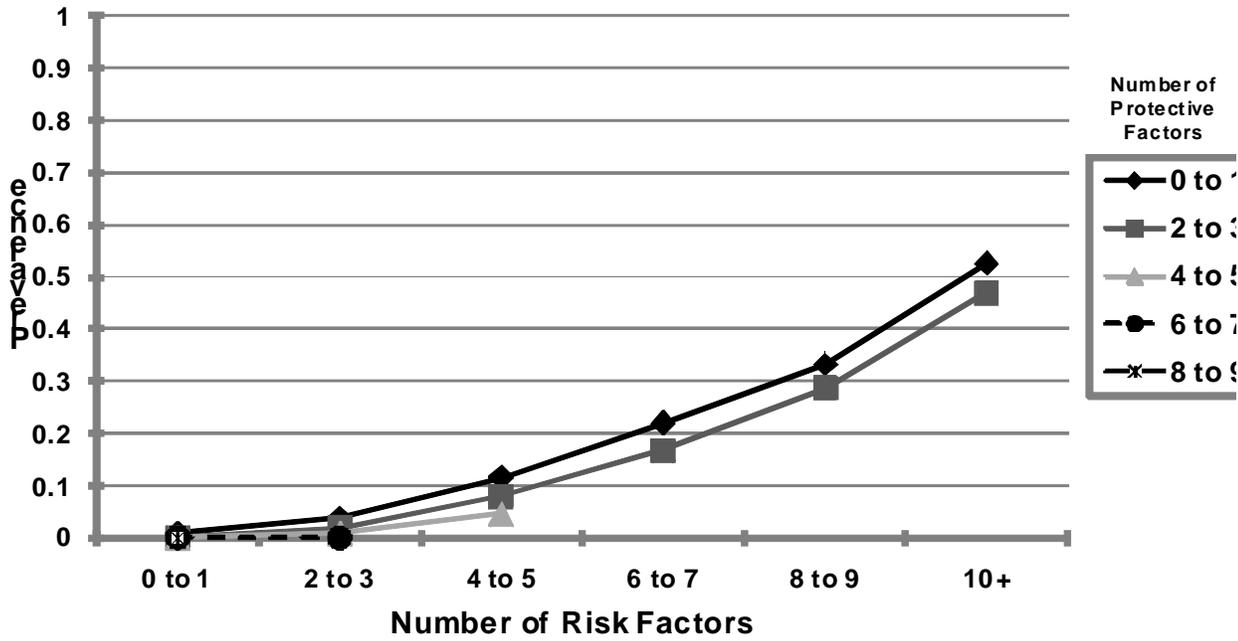


Figure 1. Marijuana Use in the Last 30 Days by Number of Self-reported Risk and Protective Factors

Adapted from Pollard et al., 1999

References

- Alan Guttmacher Institute. (2010). *U.S. Teenage Pregnancy Statistics: National and State Trends and Trends by Race and Ethnicity*. New York: Author.
- Alder, I., & Kandel, D. (1981). Cross-cultural perspectives on developmental stages in adolescent drug use. *Journal of Studies on Alcohol*, 42, 701-715.
- Allison, K. W., Crawford, I., Leone, P. E., Trickett, E., Perez-Febles, A., Burton, L. M., et al. (1999). Adolescent substance use: Preliminary examinations of school and neighborhood context. *American Journal of Community Psychology*, 27(2), 111-141.
- Bachman, J. G., Johnston, L. D., & O'Malley, P. M. (1981). Smoking, drinking, and drug use among American high school students: correlates and trends, 1975-1979. *American Journal of Public Health*, 71(1), 59-69.
- Bachman, J. G., O'Malley, P. M., & Johnston, J. (1978). *Youth in transition: Vol. VI. Adolescence to adulthood--change and stability in the lives of young men*. Ann Arbor, MI: Survey Research Center, University of Michigan, Institute for Social Research.
- Barnes, G. M., Reifman, A. S., Farrell, M. P., & Dintcheff, B. A. (2000). The effects of parenting on the development of adolescent alcohol misuse: A six-wave latent growth model. *Journal of Marriage & the Family*, 62(1), 175-186.
- Barone, C., Weissberg, R. P., Kasprow, W. J., Voyce, C., Arthur, M. W., & Shriver, T. P. (1995). Involvement in multiple problem behaviors of young urban adolescents. *Journal of Primary Prevention*, 15(3), 261-283.
- Baumrind, D. (1985). Familial antecedents of adolescent drug use: a developmental perspective. *NIDA Research Monograph*, 56, 13-44.
- Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development*, 62(4), 647-670.
- Bentler, P. M., & Newcomb, M. D. (1986). Personality, sexual behavior, and drug use revealed through latent variable methods. *Clinical Psychology Review*, 6(5), 363-385.
- Biglan, A., Brennan, P. A., Foster, S. L., & Holder, H. D. (2004). *Helping adolescents at risk: Prevention of multiple problem behaviors*. New York: Guilford Press.
- Biglan, A., Metzler, C. W., Wirt, R., & Ary, D. V. (1990). Social and behavioral factors associated with high-risk sexual behavior among adolescents. *Journal of Behavioral Medicine*, 13(3), 245-261.
- Bingham, C. R., & Crockett, L. J. (1996). Longitudinal adjustment patterns of boys and girls experiencing early, middle, and late sexual intercourse. *Developmental Psychology*, 32(4), 647-658.
- Blum, R. W., Beuhring, T., Shew, M. L., Bearinger, L. H., Sieving, R. e. E., & Resnick, M. D. (2000). The effects of race/ethnicity, income, and family structure on adolescent risk behaviors. *American Journal of Public Health*, 90(12), 1879-1884.
- Botvin, G. J., Griffin, K. W., & Nichols, T. D. (2006). Preventing youth violence and delinquency through a universal school-based prevention approach. *Prevention Science*, 7(4), 403-408.
- Brack, C. J., Brack, G., & Orr, D. P. (1996). Adolescent health promotion: Testing a model using multidimensional scaling. *Journal of Research on Adolescence*, 6(2), 139-149.

- Brendgen, M., Vitaro, F., & Bukowski, W. M. (2000). Deviant friends and early adolescents' emotional and behavioral adjustment. *Journal of Research on Adolescence, 10*(2), 173-189.
- Brown, B. B., & Larson, J. (2009). Peer relationships in adolescence. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology, Vol. 2: Contextual influences on adolescent development* (3rd ed., pp. 74-103). Hoboken, NJ: John Wiley & Sons.
- Bry, B. H., McKeon, P., & Pandina, R. J. (1982). Extent of drug use as a function of number of risk factors. *Journal of Abnormal Psychology, 91*(4), 273-279.
- Bursik, R. J., & Webb, J. (1982). Community change and patterns of delinquency. *American Journal of Sociology, 88*(1), 24-42.
- Burt, S. A. (2009). Rethinking environmental contributions to child and adolescent psychopathology: A meta-analysis of shared environmental influences. *Psychological Bulletin, 135*(4), 608-637.
- Catalano, R. F., & Hawkins, J. D. (1996). The social development model: A theory of antisocial behavior. In J. D. Hawkins (Ed.), *Delinquency and Crime: Current Theories* (pp. 149-197). New York: Cambridge University Press.
- Cauuffman, E., & Steinberg, L. (2000). (Im)maturity of judgment in adolescence: Why adolescents may be less culpable than adults. *Behavioral Sciences & the Law, 18*(6), 741-760.
- Centers for Disease Control. (2002). Trends in sexual risk behaviors among high school students. United States, 1991-2001. . *Morbidity and Mortality Weekly Report, 41*(231), 237-240.
- Chassin, L., Hussong, A., & Beltran, I. (2009). Adolescent substance use. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology: Vol. 1. Individual bases of adolescent development* (3rd ed., pp. 723-763). Hoboken, NJ: John Wiley & Sons.
- Coker, A. L., McKeown, R. E., Garrison, C. Z., Richter, D. L., Valois, R. F., & Vincent, M. L. (2009). Correlates and Consequences of Early Initiation of Sexual Intercourse. *Journal of School Health, 64*(9), 372-377.
- Collins, L. M., Graham, J. W., Rousculp, S. S., Fidler, P. L., Pan, J., & Hansen, W. B. (1994). Latent transition analysis and how it can address prevention research questions. In L. M. Collins & L. Seitz (Eds.), *NIDA Research Monograph: Vol. 142. Advances in data analysis for prevention research* (pp. 81-111). Washington, DC: National Institute on Drug Abuse.
- Cooper, M. L. (2002). Alcohol use and risky sexual behavior among college students and youth: Evaluating the evidence. *Journal of Studies on Alcohol, Suppl 14*, 101-117.
- Cooper, M. L., Wood, P. K., Orcutt, H. K., & Albino, A. (2003). Personality and the predisposition to engage in risky or problem behaviors during adolescence. *Journal of Personality and Social Psychology, 84*(2), 390-410.
- Costello, E. J., Armstrong, T. D., & Erkanli, A. (2000). *Report on the developmental epidemiology of comorbid psychiatric and substance use disorders*. Paper presented at the Assessing the Impact of Childhood Interventions on Subsequent Drug Use conference, Durham, NC.
- Diamond, L. M., & Savin-Williams, R. C. (2009). Adolescent sexuality. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology: Vol. 1. Individual bases of adolescent development* (3rd ed., pp. 479-523). Hoboken, NJ: John Wiley & Sons.
- Dick, D. M., Latendresse, S. J., Lansford, J. E., Budde, J. P., Goate, A., Dodge, K. A., et al. (2009). Role of GABRA2 in trajectories of externalizing behavior across development

- and evidence of moderation by parental monitoring. *Archives of General Psychiatry*, 66(6), 649-657.
- Disney, E. R., Elkins, I. J., McGue, M., & Iacono, W. G. (1999). Effects of ADHD, conduct disorder, and gender on substance use and abuse in adolescence. *American Journal of Psychiatry*, 156(10), 1515-1521.
- Donovan, J. E., & Jessor, R. (1985). Structure of problem behavior in adolescence and young adulthood. *Journal of Consulting and Clinical Psychology*, 53(6), 890-904.
- Donovan, J. E., Jessor, R., & Costa, F. M. (1988). Syndrome of problem behavior in adolescence: A replication. *Journal of Consulting and Clinical Psychology*, 56(5), 762-765.
- Donovan, J. E., Jessor, R., & Costa, F. M. (1991). Adolescent health behavior and conventionality-unconventionality: An extension of problem-behavior theory. *Health Psychology*, 10(1), 52-61.
- Duncan, S. C., Duncan, T. E., & Strycker, L. A. (2000). Risk and protective factors influence adolescent problem behavior: A multivariate latent growth curve analysis. *Annals of Behavioral Medicine*, 22(2), 103-109.
- Duncan, S. C., Strycker, L. A., & Duncan, T. E. (1999). Exploring associations in developmental trends of adolescent substance use and risky sexual behavior in a high-risk population. *Journal of Behavioral Medicine*, 22(1), 21-34.
- Durbin, M., DiClemente, R. J., Siegel, D., & Krasnovsky, F. (1993). Factors associated with multiple sex partners among junior high school students. *Journal of Adolescent Health*, 14(3), 202-207.
- Ellickson, P. L., McCaffrey, D. F., & Klein, D. J. (2009). Long-term effects of drug prevention on risky sexual behavior among young adults. *Journal of Adolescent Health*, 45(2), 111-117.
- Elliott, D. S. (1994). Serious violent offenders: Onset, developmental course, and termination -- The American Society of Criminology 1993 Presidential Address. *Criminology*, 32(1), 1-21.
- Elliott, D. S., Huizinga, D., & Ageton, S. S. (1985). *Explaining delinquency and drug use*. Beverly Hills, CA: Sage.
- Elliott, D. S., Huizinga, D., & Menard, S. (1989). *Multiple problem youth: Delinquency, substance use, and mental health problems*. New York: Springer-Verlag.
- Elliott, D. S., & Morse, B. (1986, March). *Drug use, delinquency, and sexual activity*. Paper presented at the NIDA Conference on Drug Abuse & Adolescent Sexual Activity, Pregnancy, and Parenting, Bethesda, MD.
- Fagan, A., Van Horn, M. L., Antaramian, S., & Hawkins, J. D. (2009). How Do Families Matter? Age and Gender Differences in Family Influences on Delinquency and Drug Use.
- Fagan, J., Weis, J. G., & Cheng, Y. T. (1988). *Delinquency and substance use among inner city students*. New York: New York City Criminal Justice Agency.
- Farrell, A. D., Sullivan, T. N., Esposito, L. E., Meyer, A. L., & Valois, R. F. (2005). A Latent Growth Curve Analysis of the Structure of Aggression, Drug Use, and Delinquent Behaviors and Their Interrelations Over Time in Urban and Rural Adolescents. *Journal of Research on Adolescence*, 15(2), 179-204.
- Farrington, D. P. (2009). Conduct disorder, aggression, and delinquency. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology: Vol. 1. Individual bases of adolescent development* (3rd ed., pp. 683-722). Hoboken, NJ US: John Wiley & Sons.

- Federal Bureau of Investigation. (2009). *Crime in the United States, 2008*.
- Feldhusen, J. F., Thurston, J. R., & Benning, J. J. (1973). A longitudinal study of delinquency and other aspects of children's behaviour. *International Journal of Criminology & Penology, 1*(4), 341-351.
- Fergusson, D. M., Horwood, L. J., & Lynskey, M. T. (1994). The childhoods of multiple problem adolescents: A 15-year longitudinal study. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 35*(6), 1123-1140.
- Fergusson, D. M., & Lynskey, M. T. (1996). Adolescent resiliency to family adversity. *Journal of Child Psychology and Psychiatry, 37*(3), 281-292.
- Fortenberry, J. D. (1995). Adolescent substance use and sexually transmitted diseases at risk: A review. *Journal of Adolescent Health, 16*(4), 304-308.
- Friedman, A. S. (1983). High school drug abuse clients. In *Treatment Research Notes*. Rockville, MD: Division of Clinical Research, National Institute on Drug Abuse.
- Gardner, M., & Steinberg, L. (2005). Peer Influence on Risk Taking, Risk Preference, and Risky Decision Making in Adolescence and Adulthood: An Experimental Study. *Developmental Psychology, 41*(4), 625-635.
- Gillmore, M. R., Hawkins, J. D., Catalano, R. F., Jr., Day, L. E., Moore, M., & Abbott, R. (1991). Structure of problem behaviors in preadolescence. *Journal of Consulting and Clinical Psychology, 59*(4), 499-506.
- Grant, B. F., & Dawson, D. A. (1997). Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: Results from the National Longitudinal Alcohol Epidemiologic Survey. *Journal of Substance Abuse, 9*, 103-110.
- Grant, B. F., Stinson, F. S., & Harford, T. C. (2001). Age at onset of alcohol use and DSM-IV alcohol abuse and dependence: A 12-year follow-up. *Journal of Substance Abuse, 13*(4), 493-504.
- Griffin, K. W., Botvin, G. J., & Nichols, T. R. (2004). Long-term follow-up effects of a School-Based Drug Abuse Prevention Program on Adolescent Risky Driving. *Prevention Science, 5*(3), 207-212.
- Guo, J., Chung, I.-J., Hill, K. G., Hawkins, J. D., Catalano, R. F., & Abbott, R. D. (2002). Developmental relationships between adolescent substance use and risky sexual behavior in young adulthood. *Journal of Adolescent Health, 31*(4), 354-362.
- Hansen, W. B., Graham, J. W., Sobel, J. L., Shelton, D. R., Flay, B., & Johnson, C. (1987). The consistency of peer and parent influences on tobacco, alcohol, and marijuana use among young adolescents. *Journal of Behavioral Medicine, 10*(6), 559-579.
- Harford, T. C., & Muthen, B. O. (2000). Adolescent and young adult antisocial behavior and adult alcohol use disorders: A fourteen-year prospective follow-up in a national survey. *Journal of Studies on Alcohol, 61*(4), 524-528.
- Harrell, A. V., Cavanagh, S. E., & Sridharan, S. (1998). *Impact of the Children at Risk Program: Comprehensive Final Report II*. Washington, DC: The Urban Institute.
- Hawkins, J. D. (1997). Academic performance and school success: Sources and consequences. In R. P. Weissberg, T. P. Gullotta, R. L. Hampton, B. A. Ryan & G. R. Adams (Eds.), *Healthy children 2010: Enhancing children's wellness. Issues in children's and families' lives, Vol. 8* (pp. 278-305). Thousand Oaks, CA: Sage.
- Hawkins, J. D., Catalano, R. F., Kosterman, R., Abbott, R., & Hill, K. G. (1999). Preventing adolescent health-risk behaviors by strengthening protection during childhood. *Archives of Pediatrics and Adolescent Medicine, 153*(3), 226-234.

- Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance-abuse prevention. *Psychological Bulletin*, *112*(1), 64-105.
- Hawkins, J. D., Graham, J. W., Maguin, E., Abbott, R. D., Hill, K. G., & Catalano, R. F. (1997). Exploring the effects of age of alcohol use initiation and psychosocial risk factors on subsequent alcohol misuse. *Journal of Studies on Alcohol*, *58*(3), 280-290.
- Hawkins, J. D., Herrenkohl, T., Farrington, D. P., Brewer, D., Catalano, R. F., & Harachi, T. W. (1998). A review of predictors of youth violence. In R. Loeber & D. P. Farrington (Eds.), *Serious and violent juvenile offenders: Risk factors and successful interventions* (pp. 106-146). Thousand Oaks, CA: Sage.
- Hawkins, J. D., Hill, K. G., Guo, J., & Battin-Pearson, S. R. (2002). Substance use norms and transitions in substance use: Implications for the gateway hypothesis. In D. B. Kandel (Ed.), *Stages and pathways of drug involvement. Examining the Gateway Hypothesis* (pp. 42-64). New York: Cambridge University Press.
- Hawkins, J. D., Jenson, J. M., Catalano, R. F., & Lishner, D. M. (1988). Delinquency and drug abuse: Implications for social services. *Social Service Review*, *62*(2), 258-284.
- Hawkins, J. D., Kosterman, R., Catalano, R. F., Hill, K. G., & Abbott, R. D. (2005). Promoting positive adult functioning through social development intervention in childhood: Long-term effects from the Seattle Social Development Project. *Archives of Pediatrics and Adolescent Medicine*, *159*(1), 25-31.
- Hawkins, J. D., Kosterman, R., Catalano, R. F., Hill, K. G., & Abbott, R. D. (2008). Effects of social development intervention in childhood fifteen years later. *Archives of Pediatrics and Adolescent Medicine*, *162*(12), 1133-1141.
- Heinze, H. J., Toro, P. A., & Urberg, K. A. (2004). Antisocial Behavior and Affiliation With Deviant Peers. *Journal of Clinical Child and Adolescent Psychology*, *33*(2), 336-346.
- Hemphill, S. A., Smith, R., Toumbourou, J. W., Herrenkohl, T. I., Catalano, R. F., McMorris, B. J., & Romaniuk, H. (2009). Modifiable determinants of youth violence in Australia and the United States: A longitudinal study. *The Australian and New Zealand Journal of Criminology*, *42*(3), 289-309.
- Henshaw, S. K. (1998). Barriers to access to abortion services. In L. J. Beckman & S. M. Harvey (Eds.), *The new civil war: The psychology, culture, and politics of abortion*. Washington, DC: American Psychological Association.
- Herrenkohl, T. I., Hill, K. G., Hawkins, J. D., Chung, I.-J., & Nagin, D. S. (2006). Developmental trajectories of family management and risk for violent behavior in adolescence. *Journal of Adolescent Health*, *39*(2), 206-213.
- Herrenkohl, T. I., Maguin, E., Hill, K. G., Hawkins, J. D., Abbott, R. D., & Catalano, R. F. (2000). Developmental risk factors for youth violence. *Journal of Adolescent Health*, *26*(3), 176-186.
- Hill, K. G., Hawkins, J. D., Catalano, R. F., Abbott, R. D., & Guo, J. (2005). Family influences on the risk of daily smoking initiation. *Journal of Adolescent Health*, *37*(3), 202-210.
- Hoeffferth, S. L. (1990). Trends in adolescent sexual activity, contraception, and pregnancy in the United States. In J. H. Bancroft & J. M. Reinisch (Eds.), *Adolescence and Puberty* (pp. 217-233). New York: Oxford University Press.
- Howell, J. C., Krisberg, B., Hawkins, J. D., & Wilson, J. J. (Eds.). (1995). *A sourcebook: Serious, violent, and chronic juvenile offenders*. Thousand Oaks, CA: Sage.

- Huang, B., White, H. R., Kosterman, R., Catalano, R. F., & Hawkins, J. D. (2001). Developmental associations between alcohol and interpersonal aggression during adolescence. *Journal of Research in Crime and Delinquency*, 38(1), 64-83.
- Huba, G. J., & Bentler, P. M. (1983). Test of a drug use causal model using asymptotically distribution free methods. *Journal of Drug Education*, 13(1), 3-14.
- Jakobsen, R., Rise, J., Aas, H., & Anderssen, N. (1997). Noncoital sexual interactions and problem behaviour among young adolescents: The Norwegian Longitudinal Health Behaviour Study. *Journal of Adolescence*, 20(1), 71-83.
- Jessor, R. (1987a). Problem-behavior theory, psychosocial development, and adolescent problem drinking. *British Journal of Addiction*, 82(4), 331-342.
- Jessor, R. (1987b). Risky driving and adolescent problem behavior: An extension of problem-behavior theory. *Alcohol, Drugs & Driving*, 3(3), 1-11.
- Jessor, R., Donovan, J. E., & Costa, F. M. (1991). *Beyond adolescence: Problem behavior and young adult development*. New York: Cambridge University Press.
- Jessor, R., & Jessor, S. L. (1977). *Problem behavior and psychological development: A longitudinal study of youth*. New York: Academic Press.
- Jessor, R., Turbin, M. S., & Costa, F. M. (1998). Protective factors in adolescent health behavior. *Journal of Personality and Social Psychology*, 75(3), 788-800.
- Jessor, R., Turbin, M. S., Costa, F. M., Dong, Q., Zhang, H., & Wang, C. (2003). Adolescent problem behavior in China and the United States: A cross-national study of psychosocial protective factors. *Journal of Research on Adolescence*, 13(3), 329-360.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2009). Monitoring the Future national results on adolescent drug use: Overview of key findings 2008. (NIH Publication No. 09-7401). from <http://www.monitoringthefuture.org/pubs.html>
- Jordan, L. C., & Lewis, M. L. (2005). Paternal relationship quality as a protective factor. *Journal of Black Psychology*, 31(152-171).
- Kandel, D. B. (2002). Examining the Gateway Hypothesis: Stages and pathways of drug involvement. In *Stages and pathways of drug involvement: Examining the Gateway Hypothesis*. (pp. 3-15). New York: Cambridge University Press.
- Kandel, D. B., & Davies, M. (1992). Progression to regular marijuana involvement: Phenomenology and risk factors for near-daily use. In M. D. Glantz & R. W. Pickens (Eds.), *Vulnerability to Drug Abuse* (pp. 211-253). Washington, DC: American Psychological Association.
- Kandel, D. B., Raveis, V. H., & Davies, M. (1991). Suicidal ideation in adolescence: Depression, substance use, and other risk factors. *Journal of Youth and Adolescence*, 20(2), 289-309.
- Kandel, D. B., Yamaguchi, K., & Chen, K. (1992). Stages of progression in drug involvement from adolescence to adulthood: Further evidence for the gateway theory. *Journal of Studies on Alcohol*, 53(5), 447-457.
- Kilpatrick, D. G., Acierno, R., Saunders, B., Resnick, H. S., Best, C. L., & Schnurr, P. P. (2000). Risk factors for adolescent substance abuse and dependence: Data from a national sample. *Journal of Consulting and Clinical Psychology*, 68(1), 19-30.
- Kochanska, G., Murray, K., & Coy, K. C. (1997). Inhibitory control as a contributor to conscience in childhood: From toddler to early school age. *Child Development*, 68(2), 263-277.

- Kolvin, I., Miller, J. W., Fleeting, M., Kolvin, P. A., & Rutter, M. (1988). Risk/protective factors for offending with particular reference to deprivation. In *Studies of psychosocial risk: The power of longitudinal data* (pp. 77-95). New York: Cambridge University Press.
- Kraemer, H. C., Kazdin, A. E., Offord, D. R., & Kessler, R. C. (1997). Coming to terms with the terms of risk. *Archives of General Psychiatry, 54*(4), 337-343.
- Krueger, R. F., Hicks, B. M., Patrick, C. J., Carlson, S. R., Iacono, W. G., & McGue, M. (2002). Etiologic connections among substance dependence, antisocial behavior and personality: Modeling the externalizing spectrum. *Journal of Abnormal Psychology, 111*(3), 411-424.
- Krueger, R. F., Hicks, B. M., Patrick, C. J., Carlson, S. R., Iacono, W. G., McGue, M., et al. (2009). Etiologic connections among substance dependence, antisocial behavior, and personality: Modeling the externalizing spectrum. In *Addictive behaviors: New readings on etiology, prevention, and treatment*. (pp. 59-88). Washington, DC: American Psychological Association.
- Krueger, R. F., Markon, K. E., Patrick, C. J., Benning, S. D., & Kramer, M. D. (2007). Linking antisocial behavior, substance use, and personality: An integrative quantitative model of the adult externalizing spectrum. *Journal of Abnormal Psychology, 116*(4), 645-666.
- Kuperman, S., Schlosser, S. S., Kramer, J. R., Bucholz, K., Hesselbrock, V., Reich, T., et al. (2001). Developmental sequence from disruptive behavior diagnosis to adolescent alcohol dependence. *American Journal of Psychiatry, 158*(12), 2022-2026.
- Labouvie, E. W., & McGee, C. R. (1986). Relation of personality to alcohol and drug use in adolescence. *Journal of Consulting and Clinical Psychology, 54*(3), 289-293.
- Leigh, B. C., & Stall, R. (1993). Substance use and risky sexual behavior for exposure to HIV: Issues in methodology, interpretation, and prevention. *American Psychologist, 48*(10), 1035-1045.
- Li, X., Stanton, B., & Feigelman, S. (2000). Impact of perceived parental monitoring on adolescent risk behavior over 4 years. *Journal of Adolescent Health, 27*(1), 49-56.
- Lindberg, L. D., Boggess, S., & Williams, W. (2000). *Multiple threats: The co-occurrence of teen health risk behaviors.*: Office of the Assistant Secretary for Planning and Evaluation.
- Lipsey, M. W., & Derzon, J. H. (1998). Predictors of violent or serious delinquency in adolescence and early adulthood: A synthesis of longitudinal research. In R. Loeber & D. P. Farrington (Eds.), *Serious and violent juvenile offenders: Risk factors and successful interventions* (pp. 86-105). Thousand Oaks, CA: Sage.
- Loeber, R., & Schmalzing, K. B. (1985). Empirical evidence for overt and covert patterns of antisocial conduct problems: A metaanalysis. *Journal of Abnormal Child Psychology: An official publication of the International Society for Research in Child and Adolescent Psychopathology, 13*(2), 337-353.
- Loeber, R., Stouthamer-Loeber, M. S., Van Kammen, W., & Farrington, D. P. (1991). Initiation, escalation, and desistance in juvenile offending and their correlates. *Journal of Criminal Law and Criminology, 82*, 36-82.
- Lonczak, H. S., Abbott, R. D., Hawkins, J. D., Kosterman, R., & Catalano, R. F. (2002). Effects of the Seattle Social Development Project on sexual behavior, pregnancy, birth, and sexually transmitted disease outcomes by age 21 years. *Archives of Pediatrics and Adolescent Medicine, 156*(5), 438-447.
- Lytle, L. A., Kelder, S. H., Perry, C. L., & Klepp, K.-I. (1995). Covariance of adolescent health behaviors: The Class of 1989 study. *Health Education Research, 10*(2), 133-146.

- Ma, H., Unger, J. B., Chou, C.-P., Sun, P., Palmer, P. H., Zhou, Y., et al. (2008). Risk factors for adolescent smoking in urban and rural China: Findings from the China seven cities study. *Addictive Behaviors, 33*(8), 1081-1085.
- Mason, W. A., Hitchings, J. E., & Spoth, R. L. (2007). Emergence of delinquency and depressed mood throughout adolescence as predictors of late adolescent problem substance use. *Psychology of Addictive Behaviors, 21*(1), 13-24.
- Masten, A. S., Roisman, G. I., Long, J. D., Burt, K. B., Obradovic, J., Riley, J. R., et al. (2005). Developmental cascades: Linking academic achievement and externalizing and internalizing symptoms over 20 years. *Developmental Psychology, 41*(5), 733-746.
- McCord, J. (1990). Crime in moral and social contexts-The American Society of Criminology 1989 Presidential address. *Criminology, 28*(1), 1-26.
- McDermott, D. (1984). The relationship of parental drug use and parents' attitude concerning adolescent drug use to adolescent drug use. *Adolescence, 19*(73), 89-97.
- McGee, L., & Newcomb, M. D. (1992). General deviance syndrome: Expanded hierarchical evaluations at four ages from early adolescence to adulthood. *Journal of Consulting & Clinical Psychology, 60*(5), 766-776.
- Measelle, J. R., Stice, E., & Hogansen, J. M. (2006). Developmental trajectories of co-occurring depressive, eating, antisocial, and substance abuse problems in female adolescents. *Journal of Abnormal Psychology, 115*(3), 524-538.
- Menard, S., & Huizinga, D. (1994). Changes in conventional attitudes and delinquent behavior in adolescence. *Youth & Society, 26*(1), 23-53.
- Metzler, C. W., Noell, J., Biglan, A., & Ary, D. (1994). The social context for risky sexual behavior among adolescents. *Journal of Behavioral Medicine, 17*(4), 419-438.
- Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review, 100*(4), 674-701.
- Moffitt, T. E., Caspi, A., Harrington, H., & Milne, B. J. (2002). Males on the life-course-persistent and adolescence-limited antisocial pathways: Follow-up at age 26 years. *Development and Psychopathology, 14*(1), 179-207.
- Monahan, K. C., Steinberg, L., & Cauffman, E. (2009). Affiliation with antisocial peers, susceptibility to peer influence, and antisocial behavior during the transition to adulthood. *Developmental Psychology, 45*(6), 1520-1530.
- Monahan, K. C., Steinberg, L., Cauffman, E., & Mulvey, E. P. (2009). Trajectories of antisocial behavior and psychosocial maturity from adolescence to young adulthood. *Developmental Psychology, 45*(6), 1654-1668.
- National Research Council and Institute of Medicine. (2009). *Preventing mental, emotional, and behavioral disorders among young people: Progress and possibilities*. Washington, DC: The National Academies Press.
- Nelson, C. B., & Wittchen, H. U. (1998). DSM-IV alcohol disorders in a general population sample of adolescents and young adults. *Addiction, 93*(7), 1065-1077.
- Newcomb, M. D. (1995). Identifying high-risk youth: Prevalence and patterns of adolescent drug abuse. In E. Rahdert, D. Czechowicz & I. Amsel (Eds.), *Adolescent drug abuse: Clinical assessment and therapeutic intervention* (pp. 7-38). Rockville, MD: National Institute on Drug Abuse.
- Newcomb, M. D., Abbott, R. D., Catalano, R. F., Hawkins, J. D., Battin-Pearson, S., & Hill, K. (2002). Mediational and deviance theories of late high school failure: Process roles of

- structural strains, academic competence, and general versus specific problem behavior. *Journal of Counseling Psychology*, 49(2), 172-186.
- Newcomb, M. D., & Bentler, P. M. (1988). *Consequences of adolescent drug use: Impact on the lives of young adults*. Newbury Park, CA: Sage.
- Newcomb, M. D., & Felix-Ortiz, M. (1992). Multiple protective and risk factors for drug use and abuse: Cross-sectional and prospective findings. *Journal of Personality and Social Psychology*, 63(2), 280-296.
- Newcomb, M. D., Maddahian, E., & Bentler, P. M. (1986). Risk factors for drug use among adolescents: concurrent and longitudinal analyses. *American Journal of Public Health*, 76, 525-531.
- Newcomb, M. D., Maddahian, E., Skager, R., & Bentler, P. M. (1987). Substance abuse and psychosocial risk factors among teenagers: Associations with sex, age, ethnicity, and type of school. *American Journal of Drug and Alcohol Abuse*, 13(4), 413-433.
- Olds, D., Hill, P., Mihalic, S., & O'Brien, R. (Eds.). (1998). *Nurse-Family Partnership: Blueprints for Violence Prevention, Book Seven*. Boulder, CO: Center for the Study and Prevention of Violence, Institute of Behavioral Science, University of Colorado.
- Osgood, D. W., Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (1988). The generality of deviance in late adolescence and early adulthood. *American Sociological Review*, 53(1), 81-93.
- Oxford, M. L., Harachi, T. W., Catalano, R. F., & Abbott, R. D. (2001). Preadolescent predictors of substance initiation: A test of both the direct and mediated effect of family social control factors on deviant peer associations and substance initiation. *American Journal of Drug and Alcohol Abuse*, 27(4), 599-616.
- Ozer, E. M., Macdonald, T., Irwin, C. E., Jr., Mortimer, J. T., & Larson, R. W. (2002). Adolescent health care in the United States: Implications and projections for the new millennium. In *The changing adolescent experience: Societal trends and the transition to adulthood* (pp. 129-174). New York: Cambridge University Press.
- Patterson, G. R., Capaldi, D. M., & Bank, L. (1991). An early starter model for predicting delinquency. In D. J. Pepler & K. H. Rubin (Eds.), *The development and treatment of childhood aggression* (pp. 139-168). Hillsdale, NJ: Lawrence Erlbaum.
- Patterson, G. R., & Yoerger, K. (1997). A developmental model for late-onset delinquency. In D. W. Osgood (Ed.), *Motivation and Delinquency. Nebraska Symposium on Motivation* (Vol. 44, pp. 119-177). Lincoln, NE: University of Nebraska Press.
- Paul, C., Fitzjohn, J., Herbison, P., & Dickson, N. (2000). The determinants of sexual intercourse before age 16. *Journal of Adolescent Health*, 27(2), 136-147.
- Penning, M., & Barnes, G. E. (1982). Adolescent marijuana use: A review. *International Journal of the Addictions*, 17(5), 749-791.
- Peterson, P. L., Hawkins, J. D., Abbott, R. D., & Catalano, R. F. (1994). Disentangling the effects of parental drinking, family management, and parental alcohol norms on current drinking by Black and White adolescents. *Journal of Research on Adolescence*, 4(2), 203-227.
- Petratis, J., Flay, B. R., & Miller, T. Q. (1995). Reviewing theories of adolescent substance use: Organizing pieces in the puzzle. *Psychological Bulletin*, 117(1), 67-86.
- Petridou, E., Zavitsanos, X., Dessypris, N., Frangakis, C., Mandyla, M., Doxiadis, S., et al. (1997). Adolescents in high-risk trajectory: Clustering of risky behaviors and the origins of socioeconomic health differentials. *Preventive Medicine*, 26, 215-219.

- Piquero, A. R. (Ed.). (2008). *Taking stock of developmental trajectories of criminal activity over the life course*. New York: Springer.
- Piquero, A. R., Farrington, D. P., & Blumstein, A. (2003). The criminal career paradigm. *Crime and Justice, 30*, 359-506.
- Pitkänen, T., Kokko, K., Lyyra, A.-L., & Pulkkinen, L. (2008). A developmental approach to alcohol drinking behaviour in adulthood: A follow-up study from age 8 to age 42. *Addiction, 103*, 48-68.
- Pollard, J. A., Hawkins, J. D., & Arthur, M. W. (1999). Risk and protection: Are both necessary to understand diverse behavioral outcomes in adolescence? *Social Work Research, 23*(3), 145-158.
- Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., Jones, J., et al. (1997). Protecting adolescents from harm: Findings from the National Longitudinal Study on Adolescent Health. *Journal of the American Medical Association, 278*(10), 823-832.
- Resnicow, K., Ross-Gaddy, D., & Vaughan, R. D. (1995). Structure of problem and positive behaviors in African American youths. *Journal of Consulting and Clinical Psychology, 63*(4), 594-603.
- Reyna, V. F., & Farley, F. (2006). Risk and Rationality in Adolescent Decision Making: Implications for Theory, Practice, and Public Policy. *Psychological Science in the Public Interest, 7*(1), 1-44.
- Robins, L. N., & Ratcliff, K. S. (1979). Risk factors in the continuation of childhood antisocial behavior into adulthood. *International Journal of Mental Health, 7*(3-4), 96-116.
- Robins, R. W., John, O. P., Caspi, A., Moffitt, T. E., & Stouthamer-Loeber, M. (1996). Resilient, overcontrolled, and undercontrolled boys: Three replicable personality types. *Journal of Personality and Social Psychology, 70*(1), 157-171.
- Robinson, L. A., Klesges, R. C., Zbikowski, S. M., & Glaser, R. (1997). Predictors of risk for different stages of adolescent smoking in a biracial sample. *Journal of Consulting and Clinical Psychology, 65*(4), 653-662.
- Rutter, M. (1979). Protective factors in children's responses to stress and disadvantage. In M. W. Kent & J. E. Rolf (Eds.), *Primary prevention of psychopathology: Vol. 3. Social competence in children* (pp. 49-74). Hanover, NH: University Press of New England.
- Sale, E., Sambrano, S., Springer, J. F., Peñ±a, C., Pan, W., & Kasim, R. (2005). Family Protection and Prevention of Alcohol Use Among Hispanic Youth at High Risk. *American Journal of Community Psychology, 36*(3), 195-205.
- Sameroff, A. J., Bartko, W. T., Baldwin, A., Baldwin, C., & Seifer, R. (1998). Family and social influences on the development of child competence. In M. Lewis & C. Feiring (Eds.), *Families, risk, and competence* (pp. 161-185). Mahwah, NJ: Lawrence Erlbaum Associates.
- Sampson, R. J., & Groves, W. B. (1989). Community structure and crime: Testing social-disorganization theory. *American Journal of Sociology, 94*(4), 774-802.
- Santelli, J. S., Lowry, R., Brener, N. D., & Robin, L. (2000). The association of sexual behaviors with socioeconomic status, family structure and race/ethnicity among US adolescents. *American Journal of Public Health, 90*(1582-1588).
- Schulenberg, J., Wadsworth, K. N., O'Malley, P. M., Bachman, J. G., Johnston, L. D., Marlatt, G. A., et al. (1996). Adolescent risk factors for binge drinking during the transition to young adulthood: Variable- and pattern-centered approaches to change. In *Addictive*

- behaviors: Readings on etiology, prevention, and treatment.* (pp. 129-165). Washington, DC: American Psychological Association.
- Scott, E. S., Reppucci, N. D., & Woolard, J. L. (1995). Evaluating adolescent decision making in legal contexts. *Law and Human Behavior, 19*(3), 221-244.
- Shaw, C., & McKay, H. (1969). *Juvenile delinquency and urban area*. Chicago: University of Chicago Press.
- Smith, G. M., & Fogg, C. P. (1978). Psychological predictors of early use, late use, and nonuse of marijuana among teenage students. In D. B. Kandel (Ed.), *Longitudinal research on drug use: Empirical findings and methodological issues* (pp. 101-113). Washington; New York: Hemisphere Pub. Corp.; Halsted Press.
- Spingarn, R., & DuRant, R. (1996). Male adolescents involved in pregnancy: Associated health risk and problem behaviors. *Pediatrics, 11*(4), 351-374.
- Steinberg, L., Albert, D., Cauffman, E., Banich, M., Graham, S., & Woolard, J. (2008). Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual systems model. *Developmental Psychology, 44*(6), 1764-1778.
- Steinberg, L., & Cauffman, E. (1996). Maturity of judgment in adolescence: Psychosocial factors in adolescent decision making. *Law and Human Behavior, 20*(3), 249-272.
- Steinberg, L., & Monahan, K. C. (2007). Age differences in resistance to peer influence. *Developmental Psychology, 43*(6), 1531-1543.
- Sundet, J. M., Magnus, P., Kvale, I. L., Brookesby, J. K., & Bakketeig, L. S. (1989). Number of sexual partners and use of condoms in the heterosexual population of Norway - relevance to HIV-infection. *Health Policy, 13*(2), 159-167.
- Tremblay, R. E., Masse, L. C., Pagani, L., Vitaro, F., Peters, R. D., & McMahon, R. J. (1996). From childhood physical aggression to adolescent maladjustment: The Montreal prevention experiment. In *Preventing childhood disorders, substance abuse, and delinquency* (pp. 268-298). Thousand Oaks, CA: Sage.
- Werner, E. E., & Smith, R. S. (1992). *Overcoming the odds: High risk children from birth to adulthood*. Ithaca, NY: Cornell University Press.
- White, H. R. (1990). The drug use-delinquency connection in adolescence. In R. A. Weisheit (Ed.), *Drugs, crime and the criminal justice system. Academy of Criminal Justice Sciences monograph series* (pp. 215-256). Cincinnati, OH: Anderson.
- White, H. R., Pandina, R. J., & LaGrange, R. L. (1987). Longitudinal predictors of serious substance use and delinquency. *Criminology, 25*(3), 715-739.
- Willoughby, T., Chalmers, H., & Busseri, M. A. (2004). Where Is the Syndrome? Examining Co-Occurrence Among Multiple Problem Behaviors in Adolescence. *Journal of Consulting and Clinical Psychology, 72*(6), 1022-1037.
- Wilson, J. Q., & Herrnstein, R. J. (1985). *Crime and human nature*. New York: Simon & Schuster.
- Windle, M. (1990). A longitudinal study of antisocial behaviors in early adolescence as predictors of late adolescent substance use: Gender and ethnic group differences. *Journal of Abnormal Psychology, 99*(1), 86-91.
- Windle, M., & Wiesner, M. (2004). Trajectories of marijuana use from adolescence to young adulthood: Predictors and outcomes. *Development and Psychopathology, 16*(4), 1007-1027.

- Winsler, A., Diaz, R. M., Atencio, D. J., McCarthy, E. M., & Adams Chabay, L. (2000). Verbal self-regulation over time in preschool children at risk for attention and behavior problems. *Journal of Child Psychology and Psychiatry*, 41(7), 875-886.
- Wu, L. L., & Thomson, E. (2001). Race differences in family experience and early sexual initiation: Dynamic models of family structure and family change. *Journal of Marriage & the Family*, 63(3), 682-696.
- Yamaguchi, K., & Kandel, D. (1987). Drug use and other determinants of premarital pregnancy and its outcome: A dynamic analysis of competing life events. *Journal of Marriage & the Family*, 49(2), 257-270.
- Zabin, L. S., Hardy, J. B., Smith, E. A., & Hirsch, M. B. (1986). Substance use and its relation to sexual activity among inner-city adolescents. *Journal of Adolescent Health Care*, 7(5), 320-331.
- Zimmerman, M. A., & Schmeelk-Cone, K. H. (2003). A longitudinal analysis of adolescent substance use and school motivation among African American youth. *Journal of Research on Adolescence*, 13(2), 185-210.
- Zucker, R. A. (1994). Pathways to alcohol problems and alcoholism: A developmental account of the evidence for multiple alcoholism and for contextual contributions to risk. In R. Zucker, G. Boyd & J. Howard (Eds.), *The development of alcohol problems: Exploring the biopsychosocial matrix of risk*. National Institute on Alcohol Abuse and Alcoholism Research Monograph No. 26 (pp. 255-289). Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.
- Zucker, R. A., & Harford, T. C. (1983). National study of the demography of adolescent drinking practices in 1980. *Journal of Studies on Alcohol*, 44(6), 974-985.

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