The Relationship between Smoking and Other Adolescent Problems

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Suggested running head: Relative risks of smoking and other problems

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Abstract

This study examined the relationships between adolescent smoking and other problems, including other substance use, drunk driving, antisocial behavior, depression, suicide attempts, academic difficulties, and lack of involvement in extracurricular, religious, and athletic activities. Here we report the relative risk of these problems given smoking and the relative risk of smoking given these problems for over 38,000 8th and 11th graders who completed surveys in school in 2000-01 or 2001-02. With few exceptions, those who smoke were more likely than nonsmokers were to have these other problems; having any of these problems is associated with a greater risk of smoking. The extent of association between smoking and other adolescent problems raises questions about whether we can expect to prevent youthful smoking through interventions targeting only smoking. This also points to the potential of reducing adolescent smoking by including a focus on it in efforts to treat or prevent other adolescent problems.

Key words: smoking, adolescents, problem behaviors, relative risks

Introduction

This paper reports on the relationships between adolescent cigarette smoking and involvement in other problems. Numerous studies have found adolescent smoking correlated with other substance use and delinquency (Ary et al., 1999; Biglan & Smolkowski, 2002; Donovan & Jessor, 1978; Duncan, Duncan, Biglan, & Ary, 1998; Kandel, 2002). However, far fewer have viewed the relationship of smoking with other problems; most employed correlational and factor-analytic procedures, making it impossible to estimate the proportion of adolescents for which smoking and other problems co-occur. We report on such co-occurrence in a sample of 8th and 11th grade students assessed in two consecutive years in a population-based sample of Oregon middle and high schools.

Method

Oregon Healthy Teens (OHT) is a National Cancer Institute-funded collaborative effort of Oregon Research Institute (ORI) and Oregon's Department of Health & Human Services, Department of Education, and Commission on Children and Families. OHT monitors adolescent well-being in Oregon. Here we report results from the first two years of the study.

Using a cluster-sampling frame compatible with existing state and federal surveillance systems, we identified primary sampling units (PSUs), consisting of high schools and middle, junior, or elementary schools feeding into them. The first year we sampled 115 PSUs and successfully recruited 79 (69%) to participate. In the second year, we recruited 14 additional PSUs. Three of those from the first year dropped out, leaving 90 PSUs (78%) in the second year. We attempted to survey all 8th and 11th grade students in schools in those PSUs. The sample included 23,009 8th grade and 15,857 11th grade students (17,172 in cohort 1; 21,694 in cohort

2). Five percent were Native American, 4% Asian, 2% Hawaiian or Pacific Islanders, 3% African American, 10% Hispanic, and 83% White, non-Hispanic.

The OHT questionnaire consists of a demographics section and six modules ordered into sets of three so that one student completes a randomly chosen set, allowing collection on a wide range of data on adolescent well-being and risk and protective factors. Table 1 includes all aspects of behavior discussed in this paper, with a brief description of each item, the question for each aspect, the primary measure source, and prevalence.[1]

Results

Table 1 presents the proportion of students reporting each behavior of interest, including confidence intervals. We analyzed relationships between smoking and other problems in terms of the relative risk of a problem given the adolescent was smoking and the relative risk of smoking given the teen engaged in a specific other behavior (Fleiss, 1981). We performed analyses separately for 8th and 11th grades collapsed across assessment years. Due to the instrument's modular nature, about 50% of students received each item. About 20% received the smoking questions plus any others. While this reduced the sample somewhat, all relative risk estimates (except condom and bike helmet use) used at least 2,929 valid responses.

Table 2 presents the relative risk of each behavior given the adolescent smoked; we present data for both grades. We tested for gender differences in estimates of relative risk using the Breslow-Day test for homogeneity of odds ratios (Breslow & Day, 1994); we present separate risk ratios for each gender only where this test indicated a gender difference. Smokers in 8th grade had significantly higher rates of 26 of the 28 problems—exceptions were paid work and lack of condom use during sex. We did not include drunk driving for eighth graders.

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[1] Find a more thorough description of project methods and design on the OHT website, http://www.ori.org/oht.

Table 2 also presents the relative risk of problems given smoking for 11th grade students. For all but five variables, the relative risk of a problem given smoking was lower in 11th than in 8th grade. Yet, problems were significantly more likely among 11th grade smokers than nonsmokers for 27 of 29 problems. For two problems, the risk was significantly greater only among female smokers: for 11th grade girls, the risk of extreme dieting was about 2.0 as high for smokers as nonsmokers and the risk of not exercising was 1.2 times more likely.

Table 3 presents the relative risk of smoking given each other problem. Across grades, current smoking is significantly more likely among adolescents who report most other problems. In eighth grade, the only exceptions are no condom use during intercourse and paid work. Although risk ratios were significant for both genders, they were significantly greater among girls for smoking given fire setting, depression, and bad grades.

Table 3 also presents the relative risk of smoking given other problems for 11th grade students. All but two are statistically significant, although generally smaller, than for 8th grade. There were gender differences on three variables in 11th grade. The likelihood of smoking was significantly greater among girls engaged in extreme dieting or who did not exercise; this was not true for boys.

Discussion

These results are consistent with numerous prior studies showing that adolescents who smoke engage in many other problem behaviors and are more likely than other youth to be depressed (Biglan et al., 2004). We go beyond most existing research by providing evidence on a wider range of problems than studied previously and by studying a population-based sample.

The fact that we examined only concurrent relationships among these problems limits this study. A longitudinal study would have allowed examination of the order in which these

problems typically develop. Existing evidence suggests that cigarette smoking and alcohol use typically precede the use of marijuana and other drugs, but the order of initiation of alcohol and smoking is more variable (Kandel, 1991). Aggressive social behavior, a primary behavioral risk factor for antisocial behavior, precedes all other problems and is predictive of later antisocial behavior and substance use (Patterson, Reid, & Dishion, 1992).

Longitudinal evidence about the sequence of development of problems is necessary, but not sufficient, to assess whether a given problem directly contributes to development of another problem. For example, longitudinal studies indicate that aggressive behavior contributes to antisocial behavior and substance use because such behavior leads to social rejection by non-deviant peers (Patterson et al., 1992) and acceptance by deviant peer groups that support varied problem behaviors.

It would be a mistake, however, to infer that engagement in one behavior directly causes engagement in another. From a contextualist perspective (Biglan & Hayes, 1996), we can best analyze relationships among behaviors in terms of the context that shapes and maintains them and their inter-relations. A recent review of the development of multiple problem behaviors (Biglan et al., 2004) indicates that young people with multiple problem behaviors are likely to have (a) friends who engage in diverse problems, (b) conflicts with their parent(s), and (c) parents who fail to monitor their behavior and set effective limits. These same young people also exhibit problems with aggressive social behavior and experience rejection by non-deviant peers. Understanding this context is essential in order to develop interventions that will substantially lower the prevalence of adolescent smoking and the other problems discussed here.

Nonetheless, the evidence in the present paper does point to opportunities for reducing the prevalence of smoking. Given that many adolescent smokers have multiple problems, it may

be difficult to excise smoking from a constellation of other problems. How likely is it that tobacco prevention or cessation programs can influence young people not to use tobacco when these young people use alcohol in excess, get into fights, engage in high-risk sexual behavior, do badly in school, or engage in other behaviors that place them at risk? Studies of the social context for multiple problem behaviors point to social and biological factors that increase the likelihood of a wide range of problems (Biglan et al., 2004). While it is clear that adolescent smoking can be reduced through school-based (Tobler, 1986), media (Flynn et al., 1997), and community (Biglan, Ary, & Wagenaar, 2000) interventions focusing only on tobacco use, even with the most-effective interventions, many young people take up smoking. This could be due to the inefficacy of such interventions for deterring smoking among young people with numerous other problems.

The findings imply the need for two kinds of studies. The first are analyses of whether current smoking prevention programs are less effective among young people with multiple problems than among those without those problems. It may be possible to analyze existing data from studies that assessed problems other than smoking. Future smoking-prevention studies should assess the entire range of youth problems in order to examine this question.

Second, studies evaluating prevention and treatment programs for young people need to assess the effects of those interventions on smoking. It may be that interventions targeting improvement in the family, peer, and school environments (Biglan et al., 2004), although not specifically addressing smoking, nonetheless prevent it by reducing deviant peer influences in general. For example, Kellam et al. (1998; 2000) found that a behavior management program for first graders designed to reinforce prosocial behavior and reduce aggressive behavior led to a significantly lower rate of smoking in middle school.

As a practical matter, the findings suggest a number of venues through which to reach adolescents who smoke in efforts to prompt them to quit. These venues include drug abuse clinics, sexually transmitted disease clinics, Planned Parenthood, alternative or "opportunity" schools, and clinics that treat depressed adolescents.

Neither research nor practice systems are appropriately structured in light of the multiproblem phenomenon. Both research and practice tend to organize around one or two youth problems. With respect to research, we need cooperative efforts among funding agencies to support research on preventing and treating multiple problem behaviors of youth and we need research that tests intervention effects on diverse outcomes. Practice systems need integration, in light of the fact that multiple agencies—each of which addresses only a subset of youth problems—reach the same young people. Schools need to include in their missions the prevention of diverse social and psychological problems. Providers of family services, community youth programs, healthcare services, and juvenile delinquency programs need to provide a comprehensive approach to the multiple problems of youth and to assess the effects of their programs on the entire range of problems.

In sum, it may be difficult to reduce the prevalence of youth smoking beyond a certain point, unless we take into account the social and behavioral context in which adolescent smoking begins and persists. Substantial improvements in our ability to lower adolescent smoking prevalence may require integration of antismoking efforts with efforts to prevent numerous other problem behaviors of youth. Coordinated action of funding agencies could facilitate such progress so that more studies focus on altering the social context that influences the development of diverse problems. The coordinated efforts of practice agencies can help to ensure that youth with multiple problems find much-needed assistance in overcoming all of their problems.

Table 1: *Measurement and Prevalence (95% CI) of Adolescent Problems*

Problem	Item*		8th grade	11th grade
Smoking	During the past 30 days, on how many days did you smoke cigarettes? [a]	♀	0.12 (0.12, 0.13)	0.20 (0.19, 0.22)
		♂	0.10 (0.09, 0.10)	0.19 (0.18, 0.20)
ST	During past 30 days, how many days did you use chewing tobacco, snuff, or dip? [a]	♀	0.01 (0.01, 0.02)	0.02 (0.01, 0.02)
		♂	0.03 (0.03, 0.04)	0.10 (0.09, 0.11)
Alcohol	During past 30 days, on how many days did you have at least 1 drink of alcohol? [a]	♀	0.26 (0.25, 0.27)	0.42 (0.40, 0.43)
		♂	0.23 (0.22, 0.24)	0.44 (0.42, 0.46)
Binge drinking	During past 30 days, # days had 5 or more drinks of alcohol w/in a few hours? [a]	♀	0.10 (0.09, 0.11)	0.22 (0.20, 0.23)
		♂	0.09 (0.08, 0.10)	0.28 (0.26, 0.29)
Marijuana	During the past 30 days, on how many days did you use marijuana? [a]	♀	0.12 (0.11, 0.13)	0.20 (0.19, 0.21)
		♂	0.13 (0.13, 0.14)	0.24 (0.23, 0.26)
Hard drugs	# times in past 30 days used stimulants, cocaine, heroin, other opiates, or Ecstasy?[b]	♀	0.04 (0.03, 0.04)	0.04 (0.03, 0.04)
		♂	0.04 (0.03, 0.04)	0.05 (0.04, 0.05)
Drove drunk	During past 30 days, how many times did you drive when drinking alcohol? [b]	♀		0.08 (0.07, 0.08)
		♂		0.11 (0.10, 0.12)
Antisocial	# times past 3 months school suspension, stolen something worth >$10, stolen motor vehicle, tried to seriously hurt someone, stopped by the police, arrested, or in a fight using a weapon? [b]	♀	0.19 (0.18, 0.20)	0.21 (0.20, 0.23)
		♂	0.33 (0.31, 0.34)	0.37 (0.35, 0.38)
Carry weapon	During past 30 days, # days carried a gun or other weapon on/off school property?[a]	♀	0.08 (0.07, 0.09)	0.05 (0.05, 0.06)
		♂	0.28 (0.27, 0.30)	0.25 (0.23, 0.26)
Gang member	Are you: a) never in, b) used to be in, c) currently in/tried to get out, or d) currently in/plan to stay in gang? [b] (a & b vs. c & d)	♀	0.02 (0.02, 0.03)	0.01 (0.00, 0.01)
		♂	0.04 (0.03, 0.05)	0.03 (0.02, 0.03)
Set fire	# times in past 3 months set a fire where it didn't belong, w/o adult permission/supervision[c]	♀	0.11 (0.11, 0.12)	0.05 (0.04, 0.05)
		♂	0.24 (0.23, 0.25)	0.15 (0.14, 0.17)
No homework	Over last month, on average, # hours spent doing homework? [a] (0 vs. 1/> hours/week)	♀	0.04 (0.04, 0.05)	0.04 (0.03, 0.04)
		♂	0.10 (0.09, 0.11)	0.11 (0.10, 0.12)

Table 1: *Measurement and Prevalence (95% CI) of Adolescent Problems*

Problem	Item*	8th grade	11th grade
Bad grades	Your grades better than most classmates [a] (“NO!” or “no” vs. “yes” or “YES!”)	♀ 0.38 (0.36, 0.39) ♂ 0.44 (0.43, 0.45)	0.34 (0.32, 0.35) 0.39 (0.37, 0.41)
Truancy	During the last 4 weeks # whole school days missed because you skipped/“cut?” [b]	♀ 0.23 (0.21, 0.24) ♂ 0.20 (0.19, 0.21)	0.39 (0.38, 0.41) 0.34 (0.33, 0.36)
Depression	Which describes # days in past week: did not want to eat; poor appetite; depressed; sad; could not get going, had low energy. [d]	♀ 0.16 (0.15, 0.17) ♂ 0.13 (0.12, 0.14)	0.15 (0.14, 0.16) 0.15 (0.14, 0.16)
Suicide attempt	During the past 12 months, how many times did you actually attempt suicide? [a]	♀ 0.11 (0.10, 0.12) ♂ 0.05 (0.04, 0.05)	0.07 (0.06, 0.08) 0.04 (0.03, 0.05)
No bike helmet	When riding bike past 12 months, how often wore helmet? [a] (never/rarely/always)	♀ 0.32 (0.31, 0.34) ♂ 0.35 (0.34, 0.37)	0.56 (0.54, 0.59) 0.62 (0.60, 0.63)
No seatbelt	How often wear seatbelt in car driven by someone else? [a] (never or rarely vs. sometimes to always)	♀ 0.05 (0.05, 0.06) ♂ 0.08 (0.07, 0.08)	0.02 (0.02, 0.03) 0.05 (0.04, 0.06)
Overweight	Describe your self? [a] (overweight/very overweight vs. slightly overweight or less)	♀ 0.06 (0.05, 0.07) ♂ 0.03 (0.03, 0.04)	0.05 (0.04, 0.06) 0.03 (0.02, 0.03)
Extreme dieting	In past 30 days, fasted for 24 hrs/more to lose/not gain wt, took diet pills, powders, or liquids w/o MD advice, or vomit/take laxatives to lose/not gain wt [a]	♀ 0.18 (0.17, 0.19) ♂ 0.08 (0.07, 0.08)	0.21 (0.19, 0.22) 0.07 (0.06, 0.08)
Sexual partners	During the past 3 months, with how many people have you had sex [a] (never or no partners vs. one or more partners)	♀ 0.07 (0.06, 0.08) ♂ 0.11 (0.10, 0.11)	0.32 (0.30, 0.33) 0.25 (0.24, 0.27)
No condoms	The last time you had sex, did you or your partner use a condom? [a] (yes vs. no)	♀ 0.30 (0.26, 0.33) ♂ 0.28 (0.25, 0.31)	0.41 (0.39, 0.43) 0.29 (0.26, 0.31)
Pregnancy	How many times have you been pregnant or gotten someone pregnant? [a]	♀ 0.01 (0.01, 0.02) ♂ 0.03 (0.02, 0.03)	0.04 (0.04, 0.05) 0.04 (0.03, 0.05)

Table 1: *Measurement and Prevalence (95% CI) of Adolescent Problems*

Problem	Item*	8th grade	11th grade
No exercise	# of past 7 days physical activity for at least 20 min making you sweat/breathe hard (fast sports, fast bike, dance, similar aerobics? [a] (0/1 vs. 2/ >2 days)	♀ 0.14 (0.13, 0.15) ♂ 0.10 (0.10, 0.11)	0.30 (0.29, 0.32) 0.16 (0.15, 0.18)
Paid work	Over last month, on average, # hours spent working at paying job [a] (0 to 2 vs. 3/ >3)	♀ 0.16 (0.15, 0.17) ♂ 0.19 (0.18, 0.20)	0.44 (0.42, 0.46) 0.43 (0.41, 0.44)
No extracurricular activities	Last month, average # hrs volunteer or religious activities, youth, music, drama at/away from school (not sports)? [a] (0 vs. 1/ >1)	♀ 0.44 (0.43, 0.45) ♂ 0.58 (0.57, 0.60)	0.36 (0.35, 0.38) 0.49 (0.48, 0.51)
No sports	Over last month, average weekly hours participating in sports, either through school or in the community? [a] (0 vs. 1/ >1)	♀ 0.46 (0.44, 0.47) ♂ 0.47 (0.45, 0.48)	0.61 (0.60, 0.63) 0.52 (0.51, 0.54)
No church	How often attend religious services or activities? [a] never v. rarely to 1/week/more	♀ 0.22 (0.21, 0.24) ♂ 0.27 (0.26, 0.28)	0.28 (0.27, 0.30) 0.32 (0.31, 0.34)
No chores	Over last month, average # hours spent doing household chores or helping the family with house projects? [a] (0 vs. 1 />1)	♀ 0.06 (0.05, 0.07) ♂ 0.10 (0.09, 0.11)	0.05 (0.04, 0.05) 0.08 (0.07, 0.09)
TV watching	On an average school day, how many hours do you spend watching TV? [a] (< 4 vs. 4/>4 per day)	♀ 0.11 (0.10, 0.12) ♂ 0.17 (0.16, 0.18)	0.06 (0.06, 0.07) 0.09 (0.08, 0.10)

Note: 95% confidence intervals given in parentheses with prevalence values
*****Except where noted, a positive event represented one or more occurrences of the behavior in the specified timeframe
Sources: a: Youth Risk Behavior Surveillance, b: Oregon Office of Alcohol and Drug Abuse Programs (OADAP), c: Written for this survey by Anthony Biglan, d: Center for Epidemiological Studies CES-D (Radloff, 1977)

Table 2: *Relative Risk* (95% CI) of Other Problems Given Smoking*

Problem	8th grade	11th grade
ST	14.63 (11.42,18.73)	5.75 (4.84, 6.81)
Alcohol	4.33 (4.10, 4. 57)	2.48 (2.38, 2.59)
Binge drinking	9.11 (8.19, 10.14)	3.70 (3.45, 3.97)
Marijuana	9.16 (8.39, 10.01)	4.74 (4.39, 5.11)
Hard drugs	17.90 (14.60, 21.94)	9.46 (7.50, 11.94)
Drove drunk	N/A	5.75 (4.60, 7.19)
Antisocial	3.28 (3.01, 3.58)	2.27 (2.05, 2.50)
Carry weapon	2.56 (2.27, 2.90)	1.68 (1.43, 1.99)
Gang member	8.80 (6.17, 12.55)	3.37 (2.02, 5.62)
Set fire	♀ 3.80 (3.02, 4.75);	1.92 (1.55, 2.38)
	♂ 2.14 (1.81, 2.54)	
No homework	2.81 (2.18, 3.61)	♀ 3.01 (1.77, 5.13)
		♂ 1.49 (1.07, 2.09)
Bad grades	♀ 2.02 (1.81, 2.25)	1.68 (1.52, 1.85)
	♂ 1.45 (1.29, 1.63)	
Truancy	3.02 (2.70, 3.38)	1.83 (1.67, 2.00)
Depression	2.91 (2.50, 3.38)	1.87 (1.56, 2.24)
Suicide attempt	4.86 (4.00, 5.92)	2.43 (1.79, 3.30)
No bike helmet	2.35 (2.15, 5.17)	1.44 (1.35, 1.54)
No seatbelt	4.04 (3.20, 5.11)	2.93 (2.01, 4.27)
Overweight	1.61 (1.22, 2.30)	1.46 (0.99, 2.15)
Extreme dieting	2.88 (2.46, 3.56)	♀ 2.06 (1.71, 2.50)
		♂ 1.21 (0.78, 1.86)
Sexual partners	8.02 (6.58, 9.78)	2.46 (2.22, 2.72)
No condoms	0.98 (0.78, 1.24)	1.20 (1.04, 1.40)
Pregnancy	9.89 (6.17, 15.86)	3.63 (2.62, 5.03)

Table 2: *Relative Risk* (95% CI) of Other Problems Given Smoking*

Problem	8th grade	11th grade
No exercise	1.39 (1.12,1.74)	♀ 1.22 (1.04, 1.44)
		♂ 0.80 (0.58, 1.10)
Paid work	1.18 (0.98, 1.44)	1.20 (1.10, 1.32)
No extracurricular	1.27 (1.18, 1.38)	1.43 (1.31, 1.55)
No sports	1.23 (1.13, 1.35)	1.19 (1.11, 1.27)
No church	1.50 (1.30, 1.72)	1.49 (1.32, 1.68)
No chores	2.26 (1.79, 2.87)	1.44 (1.06, 1.97)
TV watching	1.47 (1.19, 1.80)	1.22 (0.91, 1.62)

95% confidence intervals in parentheses with RR values. *RR estimates both genders unless otherwise specified

Table 3: *Relative Risk* (95% CI) of Smoking Given Other Problems*

Problem	8th grade	11th grade
ST	6.85 (6.14, 7.64)	3.68 (3.33, 4.06)
Alcohol	10.30 (9.07, 11.70)	6.08 (5.38, 6.86)
Binge drinking	7.99 (7.27, 8.79)	4.53 (4.14, 4.94)
Marijuana	10.36 (9.37, 11.46)	5.42 (4.96, 5.91)
Hard drugs	7.83 (7.14, 8.58)	4.00 (3.67, 4.37)
Drove drunk	N/A	3.65 (3.20, 4.17)
Antisocial	6.59 (5.50, 7.90)	2.84 (2.47, 3.26)
Carry weapon	3.74 (3.12, 4.47)	1.77 (1.50, 2.11)
Gang member	5.38 (4.39, 6.58)	2.42 (1.78, 3.30)
Set fire	♀ 3.80 (3.04, 4.76)	1.80 (1.49, 2.17)
	♂ 2.72 (2.11, 3.51)	
No homework	2.69 (2.17, 3.35)	♀ 2.16 (1.59, 2.95)
		♂ 1.43 (1.07, 1.91)
Bad grades	♀ 3.18 (2.55, 3.98)	2.02 (1.75, 2.34)
	♀ 2.05 (1.56, 2.69)	
Truancy	3.86 (3.29, 4.53)	2.42 (2.08, 2.81)
Depression	3.17 (2.67, 3.77)	1.76 (1.50, 2.07)
Suicide attempt	4.55 (3.82, 5.42)	2.00 (1.62, 2.48)
No bike helmet	4.25 (3.48, 5.20)	2.64 (2.10, 3.33)
No seatbelt	3.57 (2.93, 4.35)	2.24 (1.76, 2.87)
Overweight	♀ 1.22 (0.80, 1.85)	1.35 (1.01, 1.81)
	♂ 2.17 (1.33, 3.52)	
Extreme dieting	3.10 (2.60, 3.69)	♀ 2.04 (1.69, 2.45)
		♂ 1.18 (0.81, 1.71)
Sexual partners	6.43 (5.55, 7.46)	3.02 (2.63, 3.48)
No condoms	0.97 (.80, 1.18)	1.20 (1.04, 1.40)
Pregnancy	5.29 (4.20, 6.68)	2.52 (2.09, 3.03)

Table 3: *Relative Risk* (95% CI) of Smoking Given Other Problems*

Problem	8th grade	11th grade
No exercise	1.40 (1.12, 1.74)	♀ 1.26 (1.04, 1.53)
		♂ 0.80 (0.59, 1.10)
Paid work	1.19 (0.95, 1.48)	1.30 (1.13, 1.50)
No extracurricular	1.64 (1.38, 1.96)	1.74 (1.51, 2.00)
No sports	1.44 (1.22, 1.72)	1.41 (1.21, 1.64)
No church	1.62 (1.36, 1.94)	1.60 (1.38, 1.86)
No chores	2.18 (1.75, 2.72)	1.36 (1.07, 1.74)
TV watching	1.47 (1.18, 1.83)	1.18 (0.93, 1.51)

95% confidence intervals in parentheses with RR values. * RR estimates both genders unless otherwise specified

Reference List

Ary, D. V., Duncan, T. E., Biglan, A., Metzler, C. W., Noell, J. W., & Smolkowski, K. (1999). Development of adolescent problem behavior. *Journal of Abnormal Child Psychology, 27*(2), 141-150.

Biglan, A., Ary, D. V., & Wagenaar, A. C. (2000). The value of interrupted time-series experiments for community intervention research. *Prevention Research, 1*(1), 31-49.

Biglan, A., Brennan, P. A., Foster, S. L., Holder, H. D., Miller, T. L., Cunningham, P. B. et al. (2004). *Helping adolescents at risk: Prevention of multiple problem behaviors*. New York: Guilford.

Biglan, A. & Hayes, S. C. (1996). Should the behavioral sciences become more pragmatic? The case for functional contextualism in research on human behavior. *Applied and Preventive Psychology, 5*(1), 47-57.

Biglan, A. & Smolkowski, K. (2002). Intervention effects on adolescent drug use and critical influences on the development of problem behavior. In D. B. Kandel (Ed.), *Stages and pathways of drug involvement: Examining the Gateway Hypothesis*, (pp. 158-183). New York: Cambridge University.

Breslow, N. E. & Day, N. L. (1994). *Statistical Methods in Cancer Research, Volume II: The Design and Analysis of Cohort Studies*. New York: Oxford University Press.

Donovan, J. E. & Jessor, R. (1978). Adolescent problem drinking: Psychosocial correlates in a national sample study. *Journal of Studies on Alcohol, 39*(9), 1506-1524.

Duncan, S. C., Duncan, T. E., Biglan, A., & Ary, D. (1998). Contributions of the social context to the development of adolescent substance use: A multivariate latent growth modeling approach. *Drug & Alcohol Dependence, 50*(1), 57-71.

Fleiss, J. L. (1981). *Statistical methods for rates and proportions*. (2nd ed.) New York: Wiley.

Flynn, B. S., Worden, J. K., Secker-Walker, R. H., Pirie, P. L., Badger, G. J., & Carpenter, J. H. (1997). Long-term responses of higher and lower risk youths to smoking prevention interventions. *Preventive Medicine, 26*(3)*,* 389-94.

Kandel, D. (1991). Drug use, epidemiology and developmental stages of involvement. In R. M. Lerner, A. C. Petersen, & J. Brooks-Gunn (Eds.), *Encyclopedia of Adolescence*, (pp. 262-264). New York: Garland Publishing, Inc.

Kandel, D. B. (2002). *Stages and pathways of drug involvement: Examining the gateway hypothesis*. New York: Cambridge University Press.

Kellam, S. G., Ling, X., Merisca, R., Brown, C. H., & Ialongo, N. (1998). The effect of the level of aggression in the first grade classroom on the course and malleability of aggressive behavior into middle school. *Development and Psychopathology, 10*(2)*,* 165-185.

Kellam, S. G., Ling, X., Merisca, R., Brown, C. H., & Ialongo, N. (2000). Erratum: The effect of the level of aggression in the first grade classroom on the course and malleability of aggressive behavior into middle school. *Development and Psychopathology, 12,* 107.

Patterson, G. R., Reid, J. B., & Dishion, T. J. (1992). *Antisocial boys: A social interactional approach*. (vols. 4) Eugene: Castalia Publishing Company.

Radloff, L. S. (1977). The CES-D Scale: A self-report scale for research in the general population. *Applied Psychological Measurement, 1,* 385-401.

Tobler, N. S. (1986). Meta-analysis of 143 adolescent drug prevention programs: Quantitative outcome results of program participants compared to a control or comparison group. *Journal of Drug Issues, 16*(4)*,* 537-567.