

## Tracking of Avoidance of Alcohol Use and Smoking Behavior in a Fifth Grade Cohort over Three Years

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**Abstract** This study examined the maintenance of positive health behavior (avoidance of alcohol use and cigarette smoking) and factors associated with the maintenance of these behaviors from fifth through seventh grade by a cohort of rural students ( $N = 232$ ). African American and White students showed similar patterns of high avoidance of alcohol until seventh grade. Although more girls avoided use than boys, avoidance decreased in both groups with progression in grade. Mothers', fathers', and best friends' drinking behaviors influenced avoidance behavior; drinking was less likely to occur among those whose parents and friends did not drink. Friends' drinking behavior influenced alcohol use as early as fifth grade. Smoking avoidance was maintained by 74% of the students over the 3 years. Although there were no racial differences in smoking, African Americans started smoking about 1 year earlier than Whites. During seventh grade, an increase in smoking occurred among boys and girls,

but was particularly striking among girls. Avoidance of smoking was influenced by mothers' behavior but not fathers'. Best friends' smoking behavior exerted a major influence on avoidance between grades 6 and 7. In grades 5 and 6, those who avoided smoking were more physically active than smokers, but by seventh grade their physical activity declined to a similar level as smokers. Rural adolescent boys seemed to be at early risk for alcohol use and smoking, while rural girls delayed involvement by 1 to 2 years. Communities, schools, and families can help adolescents avoid alcohol use and smoking through early prevention efforts.

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Alcohol use among American youths is alarmingly high; estimates are that 3 out of 10 adolescents have alcohol-related problems (Epstein, Botvin, Diaz, & Schinke, 1995). Experimentation with alcohol begins about a year earlier in boys than in girls (Morrison, Rogers, & Thomas, 1995), although by age 13, about one-third of all adolescents have experimented with drinking. By age 14, about two-thirds of all adolescents have tried alcohol (O'Malley, Johnston, & Bachman, 1995). One percentage of this age group is engaged in daily alcohol use and 10% report being drunk in the past month (American Public Health Association [APHA], 1997).

Over the years, there has been an increase in the rates of smoking initiation and current, frequent, and daily use (APHA, 1997; Kann et al., 1995, 1996). About 25% of

students nationwide initiate smoking before the age of 13. It is estimated that 3000 youths start smoking everyday. Teen smokers make up about 85% to 90% of new smokers (Hanson, 1997). Concerns about the health of adolescents continue to escalate. Most of the research in this area has focussed on problem behaviors rather than healthy behaviors. Since adolescence is a period of transition that includes experimentation with health damaging as well as health promoting behaviors, longitudinal study of health behavior from childhood into adolescence could provide valuable information about optimal times and critical areas for intervention (Millstein, Nightingale, Petersen, Mortimer, & Hamburg, 1993). The purposes of this study therefore were to examine the maintenance of positive health behaviors (avoidance of alcohol use and smoking) and the factors associated with maintenance of these behaviors by a fifth grade cohort of rural students over 3 years. Using Bandura's social cognitive theory as an organizational framework (Bandura, 1986), the study examined the associations of personal factors (gender, race, and grade level), environmental factors (parents and best friends' alcohol use and smoking behaviors), and behavioral factors (physical activity) with avoidance of alcohol use and smoking. Most studies to date have found that boys have greater alcohol intake, drink more frequently, and have more episodes of heavy drinking than girls (Kann et al., 1996; Long & Boik, 1993; South Carolina Commission on Alcohol and Drug Abuse (SCCADA), 1994; Teets, 1991). However, Thorlindsson & Vilhjalmsson's (1991) study of Icelandic 9th grade students showed that girls drink more frequently than boys.

White adolescents have been shown to have a higher drinking rate than African American youths (Kann et al., 1996; Millstein et al., 1992; SCCADA, 1994). In a recent national survey, more White students than African American students reported having consumed alcohol at least once or having had a drink in the previous 30 days (Kann et al., 1996). Not surprisingly, rates of drinking have also been reported to increase with age and grade level (Kann et al., 1996; SCCADA, 1994).

Having at least one parent at home, good relationships with parents, sibling and parental intolerance of substance use, and establishment of conduct rules by parents defer drinking (Cohen, Richardson, & LaBree, 1994; Kafka & London, 1991; Kandel & Andrews, 1987; Lau, Quadrel, & Hartman, 1990). A study of drinking among Swedish students ages 13–16, however, found that children who lived with one parent have a slightly higher tendency to consume alcohol than those who lived with both parents (82.8% and 72.5%, respectively) (Persson, Hanson, & Rastam, 1994). Friends' use of alcohol and peer pressure to use alcohol have been shown to promote alcohol use among adoles-

cents (Dielman, Campanelli, Shope, & Butchart, 1987; Sarvela & McClendon, 1987). In a study by Epstein, Botvin, Diaz, & Schinke (1995), students who reported their friends' attitudes toward alcohol as positive or neutral were 3.5 times more likely to use alcohol than those whose friends' attitudes were negative. Youths with low physical activity have been found to exhibit higher rates of negative health behavior than other youths (Pate, Heath, Dowda, & Trost, 1996). At the same time, however, initiation of alcohol use and heavy drinking are associated with participation in competitive sports (Faulkner & Slattery, 1990; Rainey, McKeown, Sargent, & Valois, 1996). Yet other studies of high school students have shown drinking patterns to be similar among athletes and nonathletes (Rooney, 1984; Teets, 1991).

Smoking patterns in one national sample of high school seniors differed by gender, with a higher proportion of girls than boys in the earlier phases of smoking adoption but not at the maintenance stage (Waldron, Lye, & Brandon, 1991). Such differences were observed in another group of rural and urban high school seniors (Cronk & Sarvela, 1997). In South Carolina, high school boys have a greater tendency to be smokers, to initiate smoking before 13 years of age, and to smoke regularly than girls. In addition, they are also heavier smokers than girls (Valois, 1996). African Americans are less likely than Hispanics and Whites to have tried cigarettes before age 13. Current and frequent use are also higher among White youths than African Americans with use increasing with grade level (Kann et al., 1996).

In one study, children with a parent who was a smoker were at least twice as likely as other children to become regular smokers (Glendinning, Shucksmith, & Hendry, 1997). Other studies of parental smoking behavior have found that a mother's status as either a smoker or exsmoker was associated with a greater likelihood that the child would initiate smoking (Stanton & Silva, 1992).

Deterrents to smoking include positive relationships with parents and friends, high self-esteem, and physical activity (Aaron et al., 1995; Cohen et al., 1994; McBride et al., 1995; Pate et al., 1996; Raitakari, Porkka, & Taimela, 1994). During adolescence, the influence of parents and friends is significant. Peers have been cited as most effective in influencing smoking behavior, especially after the age of 11 (Wang, Fitzhugh, Westerfield, & Eddy, 1995). The strength of one or more friends having smoked outweighed the influence of both parents in preventing smoking during adolescence (Stanton & Silva, 1992).

Research on the relationships between physical activity and alcohol and cigarette use has yielded inconsistent results. Physical activity has been shown to increase the risk of smoking among urban African American youth (D'Elio,

Mundt, Bush, & Ianotti, 1993). In other studies cigarette smoking and drinking have been reported to be inversely associated with regular exercise and sports participation (Jessor, 1991; Thorlindsson & Vilhjalmsson, 1991; Waldron et al., 1991). Still other researchers have reported sports participation to be inversely related to smoking but positively associated with alcohol use (Faulkner & Slattery, 1990; Rainey et al., 1996). Clearly, more studies are needed to determine the relationship between physical activity and smoking.

This study examined a model of the interaction effects of a repeated measure factor (grade level) and personal factors (race and gender), and the main effects of grade level and personal factors on avoidance of smoking and alcohol use. The study also examined a model of the main and interaction effects of the environmental factors (father's, mother's, and best friend's drinking and smoking status) and the behavior factor (physical activity) on avoidance of drinking and smoking behavior of students.

## METHODS

### Setting and Sample

This longitudinal study of two health behaviors of adolescents and factors associated with those behaviors was conducted over a 3-year period in two rural southern communities. The students were in fifth grade when the study was initiated in 1994, and in seventh grade when it was completed in 1996. Questionnaires were returned by 379 fifth graders; subsequently 295 of these students responded in the seventh grade. Prior to participation, written informed consent was obtained from each participant and the primary parent/guardian. The study was approved by the University of South Carolina Institutional Review Board for use of human subjects.

Missing questionnaires or information on demographic, environmental, or behavioral measures from fifth grade to seventh grade resulted in the loss of 147 respondents (39%) yielding a final sample of 232 (61%). The demographic characteristics of the sample were unchanged by the exclusion of subjects. The final sample included 105 (45%) boys and 127 (55%) girls. Of these, 165 (71%) were African American and 67 (29%) were White. The mean age was 10.8 years ( $SD = 0.6$ ) at entry into the study. Both male and female groups were similar in race and age. Sixty-five percent were eligible for the free or reduced price lunch program.

### Measures

Alcohol use and cigarette smoking were measured by items selected from the National Center for Disease Control's School Youth Risk Behavior Survey (YRBS) (Kann, Kolbe, & Collins, 1993). The YRBS was designed to assess

adolescent risk behaviors associated with the leading causes of premature death and disability in the United States. Two YRBS questions were used in this study to measure alcohol use and smoking: (1) During the past month, on how many days did you have at least one drink of alcohol (do not count drinking with parents or for religious purposes)? and (2) During the past month, on how many days did you smoke cigarettes? Subjects were classified as avoiding alcohol use and smoking if they had not used alcohol or smoked during the past month. This criterion was used to reduce the chance of classifying a subject who had experimented with alcohol and smoking as a user rather than avoider. The validity and reliability of the YRBS have been reported elsewhere (Brener, Collins, Kann, Warren, & Williams, 1995). For this sample, test-retest reliability coefficients for a one-week interval were .81 and .95 for alcohol use and smoking, respectively.

Mother's, father's and best friend's drinking and smoking behavior were measured by six dichotomous items selected from a study by Hansen, Johnson, Flay, Graham & Sobel (1988) and from Lowe et al. (1988). Percent of agreement (a measure of reliability) for a one-week interval for the alcohol use measure was 90% (mother), 75% (father), and 93% (friend) for alcohol use and 98% (mother), 79% (father), and 93% (friend) for smoking.

Physical activity during after-school hours was assessed using the Previous Day Physical Activity Recall (PDPAR). This self-report instrument uses a standardized form organized into 17 30-minute blocks beginning at 3:00 p.m. and continuing through 11:30 p.m. Thirty-five common activities are listed on the form and each student enters the main activity performed during each of the 30-minute time periods on the previous day. For each block, the respondent rates the intensity of the activity as either very light, light, medium, or hard. The students were provided with verbal and written descriptions and cartoon illustrations depicting activity typical of each intensity level.

The PDPAR has established validity based on concurrent observation with both motion sensors ( $r = 0.77$ ) and heart rate monitors ( $r = 0.63$ ), and established test-retest reliability ( $r = 0.98$ ) (Weston, Petosa, & Pate, 1997). The PDPAR was administered in the classroom on 3 consecutive days by two trained research assistants. Data from each day were reduced to the average daily number of 30-minute blocks in which the main activity was rated at 3 METs or more, indicating moderate and vigorous physical activity. Subjects with two or fewer 30-minute blocks at the 3 METs level were classified as inactive.

### Statistical Analysis

Frequency distributions were used to examine the patterns of alcohol and smoking avoidance in this cohort of fifth graders over the 3-year study period. A series of analyses

of variance (ANOVAs) with repeated measures on grade level were performed. In evaluating the model, the interaction effect was examined first and when an interaction was not significant, the corresponding main effect was used to describe the relationship. If an interaction was significant, tests of contrasts were performed to determine the grade level at which differences were statistically significant. The chi-square test was used to determine the significance of the models.

### Alcohol Avoidance

Those students who did not report drinking throughout the study period were categorized as alcohol avoiders. Those who initiated drinking in a specific year were categorized as new drinkers in that year. Those who had initiated drinking in one year and continued to report drinking in the following years were identified as continuers. Those who reported drinking in the previous year but not in the subsequent year were categorized as quitters.

Seventy-eight percent ( $n = 178$ ) of the students avoided alcohol throughout the 3 years. In the fifth grade 3.5% ( $n = 8$ ) were drinkers; in sixth grade 3.5% ( $n = 8$ ) were new drinkers, 3% ( $n = 7$ ) were continuing drinkers and one student ( $n = 1$ ) had quit drinking. In seventh grade, the proportion of new drinkers increased to 15% ( $n = 35$ ), 4% ( $n = 9$ ) were continuing drinkers and 3% ( $n = 7$ ) were quitters.

Results of repeated measures ANOVAs for alcohol avoidance and drinking by race and gender are shown in Table 1. There was neither a significant interaction effect of race and grade level nor was there a main effect for race and alcohol avoidance. However, grade level had a significant main effect on alcohol avoidance ( $x^2 = 33.37$ ,  $p < 0.005$ ). Test of contrasts for grade level showed that

alcohol avoidance remained high among students during grades 5 and 6 but decreased significantly during grade 7. Although there was not a significant interaction between gender and grade level, the main effects of both gender ( $x^2 = 7.33$ ,  $p < 0.01$ ) and grade level ( $x^2 = 32.71$ ,  $p < 0.005$ ) were significant. More girls avoided alcohol than boys, and the proportions of both boys and girls who avoided alcohol decreased with progression in grade level.

Fathers' and mothers' drinking were found to be significant (Table 2). A higher proportion of students who avoided alcohol than students who reported drinking had fathers who avoided alcohol ( $x^2 = 6.24$ ,  $p < 0.01$ ); as students progressed in grade level, a greater increase in alcohol use was found among students whose fathers drank than among students with nondrinking fathers ( $x^2 = 11.25$ ,  $p < 0.005$ ). Though the prevalence of alcohol use among mothers was about 50% less than among fathers, the main effect of mothers' drinking was similar to that of fathers' ( $x^2 = 8.03$ ,  $p < 0.005$ ). A higher proportion of students who avoided alcohol had mothers who did not drink than students who used alcohol.

The interaction effect of best friend drinking and grade level was significant ( $x^2 = 38.60$ ,  $p < 0.005$ ). Tests of contrasts showed no significant difference between fifth and sixth graders in avoidance and friends' use. However, the proportion of students who were avoiders and whose best friend avoided alcohol decreased in seventh grade ( $p < 0.001$ ). Among drinkers, there were significant increases in the proportion of best friends who used alcohol from fifth to sixth grade ( $p < 0.007$ ) and from sixth to seventh grade ( $p < 0.001$ ).

Physical activity had neither an interaction effect nor a main effect on avoidance of alcohol. A significant main effect for grade level, however, ( $x^2 = 9.11$ ,  $p = 0.01$ )

TABLE 1 *Categorical Repeated Measures ANOVA for Gender and Race for Alcohol, Smoking Avoiders Across Grades 5, 6 and 7 (N=232)*

Repeated Factor	Within Subject Groups Gender/Race		Between Subject Groups Grade Level		Interaction	
	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value
Race <sup>a</sup>						
Drink	0.34	0.56	33.37	0.000**	0.81	0.67
Smoke	1.81	0.18	42.05	0.000**	9.35	0.009*
Gender <sup>b</sup>						
Drink	7.33	0.007*	32.71	0.000**	3.80	0.15
Smoke	14.88	0.000**	43.97	0.000**	8.12	0.01*

\*  $p < .01$  (two-tailed probability)

\*\*  $p < .005$  (two-tailed probability)

<sup>a</sup> Race: African American ( $n = 165$ ) and White ( $n = 67$ )

<sup>b</sup> Gender: Boys ( $n = 105$ ) and Girls ( $n = 127$ )

TABLE 2. Categorical Repeated Measures ANOVA between Avoiders and Drinkers Across Grades 5, 6, and 7 (N=232)

Repeated Factor	Between Subject Groups Avoiders/Drinkers		Within Subjects Grade Level		Interaction	
	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value
Father drinks	6.24	0.01**	11.25	0.00**	1.31	0.52
Mother drinks	8.03	0.00**	0.34	0.84	4.26	0.12
Best friend drinks	36.22	0.00**	69.78	0.00**	38.60	0.00**
Active > 3 METs	1.95	0.16	9.11	0.01*	0.67	0.71

\* p < .01 (two-tailed probability)  
 \*\* p < .005 (two-tailed probability)

was found. The proportion of avoiders who were physically active was similar during grades 5 and 6 but decreased during grade 7.

**Smoking Avoidance**

Seventy-four percent (n = 167) of the students did not smoke over the 3-year period. Among fifth graders, 4% (n = 9) were smokers; in sixth grade 6% (n = 13) were new smokers, 2% (n = 4) were continuing smokers, and 2% (n = 5) were quitters. By seventh grade, the proportion of new smokers was 17% (n = 38), 4% (n = 9) continued to smoke from the previous year, and 5% (n = 11) had quit smoking.

Results of repeated measures ANOVAs for avoidance of smoking by race and gender are shown in Table 1. A significant interaction was found between race and grade level (x<sup>2</sup> = 9.35, p < 0.01). Tests of contrast showed that among African Americans, the proportion of students who avoided smoking were relatively high in the fifth and sixth grades but the proportion decreased in the seventh grade (p < 0.004). White students avoided smoking until seventh grade, at which time a shift in behavior occurred (p < 0.0001).

Gender difference in smoking was also present. The

interaction between gender and grade level (x<sup>2</sup> = 8.12, p < 0.01) showed more girls than boys avoiding smoking in all three grades. Of the girls, 98% (p < 1.00) avoided smoking in both grades 5 and 6. The proportion of those who avoided smoking dropped to 86% (p < 0.001), however, in seventh grade. The proportion of boys who avoided smoking dropped from 94% in fifth grade to 86% (p < 0.02) in sixth grade and to 65% (p < 0.001) in seventh grade.

Fathers' smoking was not associated with students' smoking status (Table 3). About the same percentages of students who avoided smoking and those who smoked had fathers who smoked. A higher percentage of students who smoked had mothers who smoked than students who avoided smoking (x<sup>2</sup> = 7.10, p < 0.005). A significant interaction was found between grade in school and best friend smoking (x<sup>2</sup> = 33.2, p < 0.00). The proportion of avoiders whose best friend avoided cigarettes decreased from grade 6 to 7 (p < 0.0001). Not surprisingly, the number of students who were smokers and whose best friend smoked also increased.

A significant interaction was also found between activity (> 3 METS) and grade level (x<sup>2</sup> = 7.10, p < 0.05) among avoiders of smoking and smokers. A greater proportion of

TABLE 3. Categorical Repeated Measures ANOVA between Avoiders and Smokers Across Grades 5, 6, and 7 (N=232)

Repeated Factor	Between Subject Groups Avoiders/Drinkers		Within Subjects Grade Level		Interaction	
	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value
Father smokes	0.09	0.76	2.79	0.25	0.72	0.70
Mother smokes	7.10	0.01**	0.63	0.73	0.46	0.80
Best friend smokes	52.9	0.000***	98.9	0.000***	33.20	0.000***
Active > 3 METs	5.43	0.02*	19.3	0.000***	7.10	0.03*

\* p < 0.1 (two-tailed probability)  
 \*\* p < 0.05 (two-tailed probability)  
 \*\*\* p < 0.005 (two-tailed probability)

avoiders of smoking were moderately physically active in the fifth and sixth grade than in the seventh grade ( $p < 0.01$ ). By seventh grade, avoiders and smokers were similar in physical activity level ( $p = 0.20$ ).

## DISCUSSION

The study reported here is unique in that it tracked the avoidance of alcohol and cigarette smoking from grade 5 through grade 7 among a population of rural predominantly African American youths. Avoiders of alcohol use dropped from 97% at fifth grade to 78% by seventh grade. The decline in avoiders was slight until seventh grade, at which time a 15% drop occurred. The avoidance prevalence found in this study (78%) is similar to that reported for seventh graders by Webb, Baer, McLaughlin, McKelvey, & Caid (1991) but greatly exceeds the 42% avoidance rate reported for a seventh grade sample of Montana youth (Long & Boik, 1993). The substantial decrease in avoidance reported here supports the view that alcohol use accelerates around seventh grade (Epstein et al., 1995).

### Alcohol Avoidance

We found no racial difference in alcohol avoidance rates over the 3-year period. This finding supports that of Epstein et al. but contradicts the reported higher avoidance rates among Whites than among African Americans (Barnes & Welte, 1986; Kann et al., 1996; Millstein et al., 1992; SCCADA, 1994). Because the sample contained fewer White subjects (29%) than African American subjects (71%), some disparities may have gone undetected. Although the subjects were racially different, they shared characteristics and social norms that contributed to similar avoidance patterns.

Gender similarities in alcohol use have been reported as early as fifth grade by Teets (1991) and as late as seventh grade by Epstein and colleagues (1995). We found gender differences in alcohol avoidance, with more girls than boys avoiding alcohol in all three grades. In grade 5, 100% of girls and 92% of boys avoided alcohol use. In grade 6, 99% of girls and 86% of boys avoided alcohol. By grade 7, 82% of girls and 79% of boys avoided alcohol use. Girls delayed use longer than boys but abruptly increased alcohol use around puberty, while boys initiated use early with substantial progression in use over the 3 years. The surge in initiation of drinking by girls around seventh grade suggests that they are particularly vulnerable at this time.

Among environmental factors, mothers' and fathers' avoidance of alcohol was associated with children's avoidance of alcohol. More mothers avoided alcohol than fathers. Of the seventh graders who avoided alcohol, 16% of mothers and 55% of fathers were drinkers. Among students who reported alcohol use, 40% of mothers and 76% of fathers

were drinkers. Previous studies indicate that the odds of drinking are substantially higher among adolescents who perceive their parents to approve of drinking (Epstein et al., 1995; Grube & Wallack, 1994; Webb, Baer, Getz, & McKelvey, 1996).

Best friends' avoidance of alcohol was also associated with students' avoidance of alcohol. During seventh grade, however, there was a significant increase in the proportion of avoiders whose best friend used alcohol. Peer influence has been shown to gain strength over parental influence as children move into adolescence (Webb, Baer, & McKelvey, 1995). Thus, this notable shift in peer behavior may have contributed to the 15% increase in drinkers observed during seventh grade.

Physical activity was not found to be associated with alcohol avoidance. There was a continual decrease in physical activity across the 3 years, with only 50% of the sample in grade 7 reporting physical activity at moderate or higher levels. Other researchers have also reported a lack of influence of physical activity on the drinking behavior of high school students (Rooney, 1984; Teets, 1991).

### Smoking Avoidance

In this study, 4% of fifth graders, 8% of sixth graders, and 22% of seventh graders smoked. Five percent of seventh graders were previous smokers. Thus, by seventh grade only 74% of students had not initiated smoking. This 26% prevalence rate exceeds the 21% national rate for 8th graders (APHA, 1997). Moreover, 25% of U.S. adolescents have reported initiating smoking before age 13 (Kann et al., 1995), compared to 26% of this sample whose average age was less than 13 years.

African American and White students had similar smoking rates. Although African American students initiated smoking a year earlier than White students (fifth versus sixth grade), by seventh grade the proportion of Whites who smoked (34%) surpassed that of African Americans (17%). Our findings differ from those of other investigators (Headen, Bauman, Deane, & Koch, 1991; Kann et al., 1996) who found Whites more likely to initiate smoking earlier than African Americans.

A striking decrease in smoking avoidance was observed from grades 6 to 7 among both boys and girls, but particularly among girls. Boys showed a gradual decrease in avoidance of smoking, whereas girls demonstrated an abrupt decrease. These findings suggest vulnerability for both sexes, but particularly girls, at this time, and validate the need for early gender-specific intervention programs. Encouragement to reduce smoking during this developmental stage was successful in the school-based Minnesota Heart Health Program (Kelder, Perry, Klepp, & Lytle, 1994) in which smoking prevalence between sixth and seventh grades was 10% less than in the control community.

In this study, avoidance of smoking was not associated with fathers' smoking status but was associated with mothers' smoking status. This finding is in agreement with Stanton & Silva's (1992) report of an association between mothers' status and children's smoking behavior. Other studies have found parental influence on adolescents to be constant but not significant (Wang et al., 1995). Across all grade levels, the smoking status of the best friend was the most salient of environmental factors in smoking avoidance behavior. Determination of whether the best friend was the same sex or opposite sex was not made in this study. In older adolescents, same-sex friends have been found to have a greater influence (Wang et al.). An important finding of our study was the grade level at which peer influence exerted the most influence. Our findings suggest that best friends' smoking status begins to exert a major influence on adolescents between sixth and seventh grade.

This study found a decline in physical activity from grade 6 to grade 7. By grade 7, smoking avoiders and smokers were similar in physical activity, although among those who avoided smoking in fifth and sixth grades, a greater proportion were active than inactive. Regular exercise and interscholastic sports participation have been associated with lower prevalence of initiation, regular, and heavy use of cigarettes (Escobedo, Marcus, Holtzman, & Giovino, 1993; Jessor, 1991). Also, protective effects of physical activity against smoking initiation among adolescent girls have been reported (Aaron et al., 1995). One study of the correlation between physical activity and health behaviors found lower activity levels associated with negative health behaviors (Pate et al.).

Our findings are limited to predominantly African American and rural populations. Subject attrition and the use of self-report data may limit the validity of the findings. Within these limits, however, the results provide guidance for promoting alcohol and smoking avoidance in youths. Two components of Social Cognitive Theory, personal factors and environmental factors, were found to influence avoidance of alcohol and smoking. Although gender and race differences in avoidance behavior were present in grade 5 and 6, these differences were no longer evident by grade 7. However, environmental factors including the modeling of behavior by mother, father, and best friend significantly influenced avoidance of drinking and smoking. The findings of this study suggest that interventions simultaneously address these two aspects of Social Cognitive Theory.

The progressive decrease in alcohol and smoking avoidance observed across the 3 years points to the need for early health promotion interventions to counter early establishment of high risk health behaviors. Our findings suggest that parents can protect their children by modeling healthful

behavior. Programs to equip parents with the skills to foster positive family relationships and become more suitable role models to their children may prove helpful. In addition, strategies are needed to counter the strong influence of peers on drinking and smoking behavior. Involvement of adolescents in planning and promoting alcohol and smoke-free environmental campaigns and activities in schools, churches, and communities have been shown to be useful in promoting alcohol and smoking avoidance (Komro et al., 1996; Kelder et al., 1994).

Alcohol use and smoking at an early age are associated with regular use at older ages. In our 3-year study, new alcohol and cigarette users, for the most part, continued their behaviors into subsequent years. Given the addictive properties and health risks associated with both of these substances, a greater emphasis should be on primary prevention. Interventions to promote alcohol and smoking avoidance should begin before grade 5 for boys, and before grade 7 for girls. However, given the prevalence of alcohol and cigarette use, many students are in need of treatment and cessation programs (Kelder et al.).

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