

Television Viewing and Initiation of Smoking Among Youth

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ABSTRACT. *Background.* Smoking is the leading preventable cause of death in the United States, and the risk of disease increases the earlier in life smoking begins. The prevalence of smoking among US adolescents has increased since 1991. Despite bans on television tobacco advertising, smoking on television remains widespread.

Objective. To determine whether youth with greater exposure to television viewing exhibit higher rates of smoking initiation.

Methods. We used the National Longitudinal Survey of Youth, Child Cohort to examine longitudinally the association of television viewing in 1990 among youth ages 10 to 15 years with smoking initiation from 1990–1992. Television viewing was based on the average of youth and parent reports. We used multiple logistic regression, taking into account sampling weights, and controlled for ethnicity; maternal education, IQ, and work; household structure; number of children; household poverty; child gender; and child aptitude test scores.

Results. Among these youth, smoking increased from 4.8% in 1990 to 12.3% in 1992. Controlling for baseline characteristics, youth who watched 5 or more hours of TV per day were 5.99 times more likely to initiate smoking behaviors (95% confidence interval: 1.39–25.71) than those youth who watched <2 hours. Similarly, youth who watched >4 to 5 hours per day were 5.24 times more likely to initiate smoking than youth who watched <2 hours (95% confidence interval: 1.19–23.10).

Conclusions. Television viewing is associated in a dose-response relationship with the initiation of youth smoking. Television viewing should be included in adolescent risk behavior research. Interventions to reduce television viewing may also reduce youth smoking initiation. *Pediatrics* 2002;110:505–508; *smoking, adolescents, television, youth smoking.*

ABBREVIATIONS. NLSY, National Longitudinal Survey of Youth; CI, confidence interval; OR, odds ratio.

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Smoking is the leading preventable cause of death in the United States, and the risk of disease increases the earlier in life smoking begins.^{1,2} Approximately 70% of smokers become regular smokers by age 18.³ The prevalence of smoking among US adolescents has increased since 1991.^{4,5} Approximately 3 million adolescent smokers consume nearly a billion packs of cigarettes each year.⁶ Clearer understanding of the factors that influence the initiation of tobacco use by adolescents may provide opportunities for prevention.

Television programs depicting tobacco usage may encourage smoking among adolescents. Although bans have prevented direct tobacco advertising on television, studies have indicated the widespread portrayal of smoking on television in prime-time programming, movies, music videos, and sporting events.^{7–13} In a recent review of 81 G-rated films, 35 films (43%) showed tobacco use with a mean exposure of 2.1 minutes per film.⁸ In music videos, smokers are typically portrayed as attractive, successful, and influential and in a positive social context, often with sexually suggestive content.⁹ Rarely is smoking portrayed in an unattractive manner or associated with negative consequences. Logos, billboards, and banners for cigarettes make tobacco advertising a prominent feature of sporting events on American television.¹¹ Television thereby may serve as an indirect method of smoking advertising.

The premise that television instructs and motivates behavior is grounded in social learning theory.¹⁴ According to this theory, people acquire new skills or behavioral scripts primarily through the observation of models. People perform the behavior in response to expected and valued rewards; these can be rewards that they have earned before or observed being given to others ("vicarious reinforcement"). As noted, television provides adolescents with role models, including movie and television stars and athletes, who portray smoking as a personally and socially rewarding behavior.^{10,12,13}

No longitudinal studies have examined the association between smoking and television exposure. Because adolescents are heavy watchers of television, we hypothesized that youth with greater exposure to television viewing would exhibit higher incidence of smoking initiation.

METHODS

We used the National Longitudinal Survey of Youth, Child Cohort (NLSY), to examine longitudinally the association of television viewing in 1990 with smoking initiation between 1990 and 1992.

Sample

The original NLSY cohort is composed of a nationally representative sample of youth aged 14 to 21 years in 1979. Individuals in the cohort were interviewed in person annually since 1979. Although the focus of the NLSY is labor force-related behavior, the annual interviewer-administered questionnaires provide extensive information on health. The NLSY oversampled African American, Hispanic-American, and poor non-Hispanic white populations. Beginning in 1986, data on the children of women in this original cohort were collected, and these children form the basis for the sample in this study. Additional description of this cohort can be found in a study on obesity and television viewing.¹⁵ We analyzed the responses of youth who were 10 to 15 years of age in 1990; they were still <18 years of age in 1992 and therefore below the legal age to purchase cigarettes in a majority of states. We excluded children without complete reports of television viewing and missing information about smoking. The final sample consists of 592 individuals.

Initiation of Smoking

We classified youth who reported smoking in the last 3 months as having initiated smoking behaviors. Individuals who reported smoking in 1990 were excluded from the analysis because of the focus on smoking initiation. We relied on self-report of smoking behavior. Meta-analysis supports the validity and reliability of self-report of smoking behaviors.¹⁶ In a study of 1702 youth, Wills and Cleary¹⁷ found that self-report of smoking behaviors was valid and reliable when compared with exhaled carbon monoxide.

Hours of Television Viewing

The NLSY provides information for television viewing based on the youth report alone, the parent report alone, and the average of the youth and parent reports. The correlation between the youth and parent reports of hours per day was $r = 0.31$ ($P < .001$), with an estimated mean of 4.9 ± 2.5 hours for the youth reports and 4.7 ± 2.4 hours per day for the parent reports. The mean hours per day were 4.8 ± 2.2 when averaged. We used the average score in the analyses, based on the assumption that the combined score of 2 reporters would be more reliable and valid than a single report.¹⁸ Television viewing was categorized into: 0 to 2, >2 to 3, >3 to 4, >4 to 5, and >5 hours per day. Because the American Academy of Pediatrics recommends limiting television viewing to no more than 2 hours per day,¹⁹ youth who watched <2 hours per day served as the reference group.

Sociodemographic and Cognitive Variables

We controlled for several socioeconomic and demographic factors (ethnicity, household poverty, marital status, number of children in the household), maternal factors (education, measured intelligence, employment), and child factors (gender and baseline child aptitude test scores). Ethnicity was categorized as white non-Hispanic, black, or Hispanic. Household poverty was dichotomized as above or below 100% of the federal poverty line in 1990. Mother's marital status was dichotomized into married or not

married in 1990. Maternal intelligence was measured by the Armed Forces Qualification Test in 1986.²⁰ Maternal employment was categorized as employed or unemployed in 1990. Child aptitude test scores were measured by the Peabody Individual Achievement Test for math and reading and the Peabody Picture Vocabulary Test.²⁰

Analysis

The NLSY uses a complex, stratified sample design. We therefore used sample weights provided by the NLSY to calculate means and proportions, taking the sample design into account. Student *t* tests were used to compare mean results, and χ^2 tests were used to compare differences in proportional results. We used weighted multiple logistic regression to determine the relationship between television viewing and smoking initiation, controlling for ethnicity, poverty, marital status, number of children in the household, maternal education, maternal intelligence, maternal employment, gender of the child, and baseline child aptitude test scores.

RESULTS

In 1990, the mean age of the cohort was 11.5 years with a range of 10 to 15. In 1990, 34 individuals reported smoking in the last 3 months. They were excluded from the cohort. In 1992, an additional 57 individuals reported smoking behaviors. When youth who initiated smoking behaviors were compared with youth who did not initiate smoking behaviors, no significant difference was found based on gender, age, maternal education, household poverty, maternal marriage status, or number of children (Table 1).

The percentage of youth smoking in the cohort increased from 4.8% in 1990 to 12.3% in 1992. The average amount of television viewing in 1990 was 4.8 hours per day. Approximately one third of youth watched >5 hours of television per day, and one tenth of youth watched 0 to 2 hours per day. Of the individuals who initiated smoking in 1992, 42% viewed television for >5 hours per day.

We examined the relationship between television viewing and initiation of smoking and found a strong dose-response relationship with increasing hours (Table 2). Controlling for baseline characteristics, youth who watched >5 of television per day were 5.99 times more likely to initiate smoking behaviors ($P = .02$; 95% confidence interval [CI]: 1.39–25.71) than those youth who watched 0–2 hours per day. Similarly, youth who watched >4 to 5 hours per

TABLE 1. Characteristics of Youth Who Initiated Smoking and Nonsmokers, Ages 10 to 15, in the United States (NLSY, Child Cohort)*

Variable	Initiated Smoking (n = 57)	Nonsmoker (n = 501)
Gender (%)		
Female	47%	52%
Male	53%	48%
Age in 1992 (mean y)	11.3	11.6
Ethnicity (%)		
White, non-Hispanic	84%	64%
Black	10%	27%
Hispanic	6%	9%
Children in household in 1986 (mean)	2.8	2.5
Maternal education in 1986 (mean y)	11.3	11.6
Household poverty in 1986 (%)	32%	26%
Mother married in 1986 (%)	66%	58%
Mother employed full-time in 1986 (%)	61%	58%

* All estimates are weighted.

TABLE 2. Percentage of Smoking Initiation Between 1990 and 1992: Unadjusted and Adjusted* ORs for Smoking by Amount of Television Viewed per Day in 1990†

Hours of Television Viewing per Day (1990)	Percentage of Subjects Who Initiated Smoking	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	P Value
0-2	4.8	1.00 (-)	1.00 (-)	
>2-3	5.1	1.08 (0.23, 5.05)	2.00 (0.37, 10.63)	.42
>3-4	8.8	1.94 (0.47, 8.05)	3.15 (0.64, 15.40)	.16
>4-5	14.2	3.32 (0.84, 13.06)	5.24 (1.19, 23.10)	.03
>5	12.9	3.03 (0.80, 11.48)	5.99 (1.39, 25.71)	.02

* From logistic regression adjusting for: household income in 1979; mother's educational attainment and age in 1979; maternal score on the Armed Forces Qualification Test in 1980; race/ethnicity; the Peabody Individual Achievement Test-Math, Peabody Individual Achievement Test-Reading, and Peabody Picture Vocabulary Test tests; and number of children in household.

† All estimates are weighted.

day were 5.24 times more likely to initiate smoking than youth who watched 0-2 hours ($P = .03$; 95% CI: 1.19-23.10). Although the associations between smoking initiation and youth who watch >2 to 3 hours and >3 to 4 hours were not statistically significant, a clear trend is visible. Youth who watched >2 to 3 hours were 2.00 times more likely to initiated smoking behaviors, and youth who watched >3 to 4 hours were 3.15 times more to likely to initiate smoking behaviors when compared with youth who watched 0 to 2 hours per day.

We found significant associations between smoking initiation and race/ethnicity, household structure, and poverty. African American (odds ratio [OR]: 0.06, $P < .01$, 95% CI: 0.02-0.19) and Hispanic-American youth (OR: 0.11, $P < .01$, 95% CI: 0.02-0.46) were less likely to initiate smoking behaviors than their white counterparts. Youth who lived in a household where their mother was married were half as likely to initiate smoking as youth whose mother was not married (OR: 0.50, $P = .05$, 95% CI: 0.26-1.00). Finally, youth whose families lived in poverty were more likely to initiate smoking behaviors (OR: 2.88, $P = .02$, 95% CI: 1.20-6.89).

DISCUSSION

These results indicate a significant dose-response association between television viewing and youth smoking initiation. The direction of the relationship supports the hypothesis that exposure to images of smoking on television may increase the likelihood of smoking initiation in youth. A similar association between television viewing and the onset of alcohol use has been reported, with each additional hour of television viewing associated with a 9% average increase in the initiation of drinking.²¹

The incidence of smoking in our analysis is consistent with previous epidemiologic research. In 1992, the incidence of smoking in our cohort was 10.2%. When we included youth who were already smoking in 1990, the total prevalence of smoking behaviors was 12.3% in 1992. That same year, the Monitoring the Future Study, a nationally representative sample, found that 15.5% of eighth-graders had used cigarettes in the last 30 days.⁵ In addition, the incidence of smoking among minority groups in our cohort was consistent with data from other studies.^{16,17,22}

This study has several major limitations. Although

our estimates describe a strong prospective association of television viewing with smoking initiation, these are not experimental data. We have no direct evidence that changing television-viewing time will produce changes in smoking initiation. Because this is a nonexperimental epidemiologic study, we need to be mindful of other threats to the validity of making inferences regarding causality. Criteria for assessing causality in nonexperimental studies include these: 1) the causal exposure must clearly precede the hypothesized outcome; 2) the association should be strong and consistent; 3) the association should be specific; 4) there should be evidence of exposure response; and 5) the association should be expected from theory. The longitudinal nature of the NLSY cohort provides temporal sequence; in this study, television viewing was measured 2 years before smoking initiation. The association was substantial, with youth who watched >5 hours per day being 5.99 times as likely to initiate smoking than youth who watched 0 to 2 hours per day. Evidence of exposure response is seen in the dose-dependent association between smoking initiation and television viewing. Finally, the findings are consistent with social learning theory. Youth view positive images of smoking on television in prime-time programming, movies, music videos, and sporting events.

Three other limitations include the following: we were unable to examine the effects of peer smoking because the NLSY did not include that variable. Second, the NLSY provides information only on hours of television viewing without information on the content or type of television exposure. Exactly what adolescents watch may matter a great deal. Robinson and colleagues²¹ found an association of television and music video viewing with increased onset of alcohol use in adolescents, whereas videocassette viewing was associated with a decreased onset of alcohol use. Third, we do not have information on other media use, eg, magazines, Internet, etc.

The association of television viewing and incidence of smoking in this sample could reflect the influence of other unmeasured variables. However, we did control for many of the variables found to be associated with both television viewing and smoking incidence among youth, including ethnicity, household income poverty, and school performance.²³⁻²⁶

TV viewing may serve as a marker for youth who exhibit high-risk behaviors such as smoking. Jessor²⁷

notes that different risk behaviors may cluster together in adolescents because they serve a function related to social or psychological development, including identity formation and achieving adult status. Several researchers have shown a clustering of risk behaviors. Escobedo et al²⁸ demonstrated an association between cigarette smoking and other health risk and problem behaviors. DuRant et al²⁹ found that early age of onset of cigarette smoking was the strongest correlate of the overall number of risk behaviors in a group of middle-school students. Although current work focused on the clustering of adolescent risk behaviors has included smoking, television viewing has not been included as a risk factor.

Alternatively, television viewing may substitute for activities that build resilience and help youth guard against high-risk behaviors. Recent resilience research has demonstrated that bonding to family and school is a protective factor for a broad range of health-risk behaviors in adolescents.^{30–32} Television viewing by youth may reduce family bonding by decreasing interaction between parents and adolescents. Hawkins et al³² reported that an intensive intervention to increase school bonding among elementary school children reduced violent behavior, heavy drinking, and sexual intercourse at 18 years of age. They found no difference in smoking initiation, but the intervention did not include decreasing hours of TV viewing.

IMPLICATIONS

This study indicates a strong association of television viewing with higher rates of smoking initiation among youth. Indeed, the pattern of results suggests that television, with its frequent positive portrayals of smoking, may be an effective indirect method of tobacco promotion. These results should alert parents, educators, and health professionals to the possibility that active efforts to discourage television viewing by youth may be an effective strategy for reducing the incidence of smoking and possibly other high-risk behaviors with which it is correlated.

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REFERENCES

- McGinnis JM, Foege WH. Actual causes of death in the United States. *JAMA*. 1993;270:2207–2212
- Centers for Disease Control and Prevention. *Reducing the Health Consequences of Smoking: 25 Years of Progress—Report of the Surgeon General*. Rockville, MD: US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention; 1989. DHHS Publ. No. (CDC) 89-8411
- US Department of Health and Human Services. *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*. Atlanta, GA: US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention; 1994
- Centers for Disease Control and Prevention. Tobacco use among high school students—United States, 1997. *MMWR Morb Mortal Wkly Rep*. 1998;47:229–233
- Johnston LD, O'Malley PM, Bachman JG. *National Survey Results on Drug Use From the Monitoring the Future Study, 1975–1997*. Vol 1. Rockville, MD: US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute on Drug Abuse; 1998. NIH Publ. No. 98-4345
- DiFranza JR, Tye JB. Who profits from tobacco sales to children? *JAMA*. 1990;263:2784–2787
- Office of National Drug Control Policy. Substance use in popular prime-time television. Rockville, MD: Drug Policy Information Clearinghouse; 2000. Available at: <http://www.mediascope.org/pubs/supptt.pdf>
- Thompson KM, Yokota F. Depiction of alcohol, tobacco, and other substances in G-rated animated feature films. *Pediatrics*. 2001;107:1369–1374
- DuRant RH, Rome ES, Rich M, Allred E, Emans SJ, Woods ER. Tobacco and alcohol use behaviors portrayed in music videos: a content analysis. *Am J Public Health*. 1997;87:1131–1135
- Escamilla G, Craddock AL, Kawachi I. Women and smoking in Hollywood movies: a content analysis. *Am J Public Health*. 2000;90:412–414
- Blum A. The Marlboro Grand Prix: circumvention of the television ban on tobacco advertising. *N Engl J Med*. 1991;324:913–917
- Distefan JM, Gilpin EA, Sargent JD, Pierce JP. Do movie stars encourage adolescents to start smoking? *Prev Med*. 1999;28:1–11
- Epps RP, Lynn WR, Manley MW. Tobacco, youth, and sport. *Adolesc Med*. 1998;9:483–490
- Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall; 1986
- Gortmaker SL, Must A, Sobol AM, Peterson K, Colditz GA, Dietz WH. Television viewing as a cause of increasing obesity among children in the United States, 1986–1990. *Arch Pediatr Adolesc Med*. 1996;150:356–362
- Patrick DL, Cheadle A, Thompson DC, Koepsell T, Kinne S. The validity of self-reported smoking: a review and meta-analysis. *Am J Public Health*. 1994;84:1086–1093
- Wills TA, Cleary SD. The validity of self-reports of smoking: analyses by race/ethnicity in a school sample of urban adolescents. *Am J Public Health*. 1997;87:56–61
- Nunnally J. *Psychometric Theory*. New York, NY: McGraw-Hill International Book Co; 1978
- Strasburger VC, Donnerstein E. Children, adolescents, and the media: issues and solutions. *Pediatrics*. 1999;103:129–139
- Baker PC, Mott FL. *NLSY Child Handbook 1989*. Columbus, OH: Center for Human Resources Research, Ohio State University; 1989
- Robinson TN, Chen HL, Killen JD. Television and music video exposure and risk of adolescent alcohol use. *Pediatrics*. 1998;102(5). Available at: <http://www.pediatrics.org/cgi/content/full/102/5/e54>
- Nelson DE, Giovino GA, Shopland DR, et al. Trends in cigarette smoking among US adolescents, 1974 through 1991. *Am J Public Health*. 1995;85:34–40
- Gordon-Larsen P, McMurray RG, Popkin BM. Adolescent physical activity and inactivity vary by ethnicity: the National Longitudinal Study of Adolescent Health. *J Pediatr*. 1999;135:301–306
- Andersen RE, Crespo CJ, Bartlett SJ, Cheskin LJ, Pratt M. Relationship of physical activity and television watching with body weight and level of fatness among children: results from the Third National Health and Nutrition Examination Survey. *JAMA*. 1998;279:938–942
- Lowry R, Kann L, Collins JL, Kolbe LJ. The effect of socioeconomic status on chronic disease risk behaviors among US adolescents. *JAMA*. 1996;276:792–797
- Hu TW, Lin Z, Keeler TE. Teenage smoking, attempts to quit, and school performance. *Am J Public Health*. 1998;88:940–943
- Jessor R. Risk behavior in adolescence: a psychosocial framework for understanding and action. *J Adolesc Health*. 1991;12:597–605
- Escobedo LG, Reddy M, DuRant RH. Relationship between cigarette smoking and health risk and problem behaviors among US adolescents. *Arch Pediatr Adolesc Med*. 1997;151:66–71
- DuRant RH, Smith JA, Kreiter SR, Krowchuk DP. The relationship between early age of onset of initial substance use and engaging in multiple health risk behaviors among young adolescents. *Arch Pediatr Adolesc Med*. 1999;153:286–291
- Resnick MD, Bearman PS, Blum RW, et al. Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. *JAMA*. 1997;278:823–832
- Bonny AE, Britto MT, Klostermann BK, Hornung RW, Slap GB. School disconnectedness: identifying adolescents at risk. *Pediatrics*. 2000;106:1017–1021
- Hawkins JD, Catalano RF, Kosterman R, Abbott R, Hill KG. Preventing adolescent health-risk behaviors by strengthening protection during childhood. *Arch Pediatr Adolesc Med*. 1999;153:226–234