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Cigarette smoking status and recurrent subjective health complaints among United States school-aged adolescents

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Abstract

Background—Subjective health complaints are common among adolescents. There is evidence that girls are more likely to register complaints than boys. This study examines gender differences in the relationship between daily smoking and recurrent subjective health complaints in school-age adolescents in the United States.

Methods—A cross-sectional design with a multistage probability sample was used to survey 13,339 middle and high school students (grades six through 10) with the US 2001-2002 Health Behavior in School-Aged Children Survey (HBSC).

Results—Recurrent subjective health complaints were higher for adolescents who smoke daily and experiment with cigarettes than for those who never smoke. In logistic regression analyses, the odds of daily smoking increased two-fold for both boys and girls who report recurrent irritability/bad temper. For girls, the odds of daily smoking were higher among those who reported recurrent headache, stomachache, and backache compared to never smokers. For boys only recurrent backache and feeling dizzy were associated with increased odds of daily smoking.

Conclusions—The relationship between recurrent subjective health complaints and daily smoking provides new insights into both conditions for school-age adolescents. Findings from this study suggest different patterns of association between daily smoking and recurrent subjective health complaints occur for girls and boys. Further studies are needed to explore causes and treatment of daily smoking and recurrent health complaints among school-aged children.

Keywords

Cigarette smoking; positive health; psychological complaints; HBSC; subjective well-being; adolescents

Introduction

The adolescent years are distinguished by physical, intellectual, and psychological changes (Department of Health and Human Services, 1997; Eccles et al. 2008). Novelty seeking and health-risk taking behaviors are common during this developmental stage (Cheng et al., 2008; Simons-Morton & Haynie, 2002). Some adolescents might cope successfully with this stressful transition into adulthood while others experience problem behaviors and/or emotional distress that could interfere with school, home life, and peer relationships (Spratt & DeMaso, 2006; Olsson et al., 2008). Initiation of cigarette smoking is more prevalent among adolescents who are less successful at regulating their emotions (Weinstein et al., 2008), which suggests that adolescent smoking may be a method of coping with psychological and somatic complaints (Saluja et al., 2004).

In pediatric populations, the Diagnostic and Statistical Manual for Primary Care (DSMPC) (Wohlraich, 1996), includes clinically significant distress or impairment in daily functioning as a criterion for somatic complaints. In this study subjective health complaints are symptoms experienced by the adolescent with or without a defined clinical diagnosis; they are classified into two major domains, somatic and psychological (Haugland et al., 2001; Ghandour et al., 2004; Torsheim et al., 2001; Lingass et al., 2000).

Cigarette smoking and subjective health complaints

Etiological research has suggested that subjective complaints may be due to stress at home, school, family, and poor psychological adjustment to negative life events (Due et al., 2005; Gordon et al., 2004; Brill et al., 2001; Robinson et al., 1988; Hjern et al., 2007). The association between mental health symptoms and cigarette smoking has been a cause of continuous debate among investigators (Orlando et al., 2001; Wu et al., 1999). Orlando and colleagues (2001) suggest three possible links between emotional stress and smoking: (1) emotional distress leads to smoking; (2) smoking is a result of emotional distress, and (3) emotional distress and smoking are caused by a third factor. Among adolescents, the association between cigarette smoking and recurrent health complaints is not very well understood.

Somatic complaints, such as headaches and abdominal pain, are highly prevalent among adolescents (Hjern et al., 2007; Roth-Isigkeit et al., 2005) and associated with poorer social and emotional outcomes. In school-based samples, headaches were the most prevalent recurrent somatic symptom reported among youth (Rhee, 2000; Torsheim & Wold, 2001). Among adolescents, reporting frequent headaches is associated with increased negative feelings about school and decreased personal happiness and future optimism (Gordon et al., 2004).

Beiter and colleagues (1991) found that adolescents reporting both abdominal pain and headaches were more likely to report higher behavioral risk (substance use, early sexual activity, and delinquency) than youth in other groups. Another frequently occurring complaint for adolescents is difficulty sleeping. Wong and colleagues (2009) showed that children who indicate having trouble sleeping and are overtired were more likely to be substance abusers than their peers with sufficient sleep. Schoenborn and Adams (2008) found that the prevalence of cigarette smoking was higher among those who slept less than six hours. Similarly, a study by Mattila and collaborators (2008) found that daily smoking was among the strongest risk factors for hospitalization for lower back pain among adolescents.

Gender differences in the prevalence of complaints have been reported in previous studies (Beiter et al., 1991; Sweeting et al., 2007). Piko (2006) found that mean number of

psychosomatic and depressive symptoms were higher in girls than boys. In contrast to girls, sleep disturbances are prevalent among boys and are a significant risk factor for substance use (Wong et al., 2009).

This study of subjective well-being among adolescents will help to identify those at risk of cigarette smoking. Cigarette smoking and subjective health complaints might increase adolescents' morbidity and their transition to adulthood so further examination of this issue is warranted. We examine the relationship between cigarette smoking status and youth's self-report of recurrent health complaints. We hypothesized that (a) an adolescent who reports recurrent subjective health complaints will be more likely to be a daily smoker than a never smoker; and (b) there will be gender differences in the report of recurrent complaints after controlling for other complaints and socio-demographic characteristics.

Methods

Design

The 2001 Health Behavior in School-Aged Children Survey (HBSC) is a self-report questionnaire administered in classrooms every 4 years in approximately 41 countries across Europe and North America (Currie et al., 2001). The main goal of the survey is to assess the prevalence of health behaviors and to gain new insight into young people's health and well-being, health behaviors, and their social context. The 2001 cross-sectional US HBSC nationally representative sample of 14,818 adolescents in grades six through ten was used for the study. The NICHD Institutional Review Board approved the protocol, and active consent was solicited from parents and students.

Sampling

The sample was a U.S. national probability sample of students in grades 6 through 10 with an over-sampling of minorities (Hispanic and African-American) large enough to provide accurate population estimates for subgroup analysis of Hispanic and African American students. An 81.8% participation rate was achieved, yielding an overall sample of 14,818 students. Respondents (1,479) who did not answer the smoking questions were excluded from analyses resulting in a final sample of 13,339.

Measures

Cigarette smoking behavior—Students were asked: “How often do you smoke tobacco at present?” Students who responded “every day” were categorized as daily smokers; “smoke, at least once a week, but not every day”, or “less than once a week” as experimenters, and “never smoked” as never smokers. For logistic regression analysis, separate analyses were conducted to evaluate daily compared to never smokers, and experimenter compared to never smokers.

Subjective health complaints—The *HBSC Symptom Checklist* is a non-clinical measure of physical and mental health that consists of eight-items reflecting general health complaints and their symptoms, rather than diagnostics categories (Due et al., 2005). The psychological and somatic dimensions were used for the present study. Students were asked to report how often in the last six months they had each of the following: feeling low, irritability/bad temper, feeling nervous, difficulty falling asleep, headache, stomach-ache, back-ache, and feeling dizzy. The response options were “about every day”, “more than once a month”, “about every week”, “about every month”, and “rarely or never”. The scale was recoded into two categories: recurrent (about every day, more that once a month) and non-recurrent (“about every week”, “about every month”, and “rarely or never”).

Socio-demographic variables—The following socio-demographic variables were used: a) sex— boys and girls; b) school level – middle and high school; c) race/ethnicity –White, Black, Hispanic, and ‘Other’, the ‘other’ category comprised American Indian, Alaska Natives or Pacific Islanders; d) parent education –less than high school, high school graduate, some education after high school and college graduate; and e) family affluence scale [FAS]. The FAS is an indicator of socio-economic status developed by WHO-HBSC (Currie et al., 2008) for use with adolescents. It has been found to be a more reliable indicator of affluence than youth report of parent education or occupation (Spencer, 2006). The FAS measured perceived material wealth by asking school-aged children: number of family vacations, number of family cars, number of home computers, and whether the respondent had his or her own bedroom. Consistent with the work of Boyce et al. (2006), responses were summed to create a score which was then categorized with 0 to 4 as low, 5 to 6 as moderate, and 7 to 9 as high.

Statistical analyses

Descriptive analyses were used to determine the frequency and distribution of the socio-demographic characteristics, cigarette smoking behavior, and somatic and psychological complaints. Wald chi-square analyses were used to examine the prevalence of cigarette smoking status with socio-demographic characteristics and subjective somatic and psychological complaints.

Gender-specific logistic regressions were performed to compare daily versus never and experimenter versus never smokers. Recurrent somatic complaints and psychological complaints were examined separately. The odds of daily smoking versus never smoking in the presence of recurrent complaints were modeled, adjusting for other complaints and sociodemographic characteristics (school level, race, parents’ education, and affluence). This approach permitted us to focus on the potential contribution of recurrent subjective health complaints to the prevalence of cigarette smoking status in school-aged adolescents. SAS version 9.1.3 survey procedures were used to adjust for the complex sampling design in all statistical analyses.

Results

Cigarette smoking and socio-demographics

As shown in Table 1, participants were evenly distributed by sex (47% male and 53% female); with 64% White followed by Black (15%), Hispanic (13%) and ‘Other’ (8%). Almost half of the participants (49%) had parents with a college graduate education and 52% reported at least a moderate level of family affluence. Only 5% reported daily cigarette smoking and 10% reported experimenting with cigarettes. Boys and girls exhibited different cigarette smoking patterns. Compared to girls, boys were more likely to smoke daily (6% for boys versus 4% for girls) or be experimenters (11% for boys versus 9% for girls) ($X^2 = 32.40, p < .0001$). The prevalence of both daily and experimental smoking daily and experimenting increased with school level. Adolescents in high school were more likely to be smokers compared to their middle school counterparts (for daily smoker, 9% for high school versus 3% for middle school; for experimenting smokers, 13% for high school versus 7% for middle school) ($X^2 = 83.24, p < .0001$).

Participants with a missing value on the cigarette smoking behavior item ($n = 1,479$; 10%) were excluded from the analysis. The deleted sample was not significantly different ($p < .05$) from the analytical sample in the reported prevalence of any of the somatic or psychological complaints. Significant differences in the sociodemographic variables were found such that there was a greater percentage of boys (57% versus 47%) and high school

students (62% versus 38%) in the excluded sample compared to the study sample. Those in the excluded sample reported a lower parent education (58% versus 51% reporting no college) and family affluence (33% versus 28% classified as low)

Cigarette smoking, gender, and subjective health complaints

For recurrent somatic complaints, the most frequently reported recurrent complaint was headache (23%), followed by backache (17%), stomachache (14%), and feeling dizzy (12%). The most frequently reported recurrent psychological complaint was irritable/bad temper (26%), followed by difficulties sleeping (24%), feeling nervous (21%) and feeling low (18%) (see Table 2). Girls were significantly more likely than boys to report a higher prevalence of both somatic and psychological recurrent complaints.

The association between recurrent complaints and cigarette smoking status was also established (Table 2). For example, 41% of daily smokers compared with 21% of never smokers reported recurrent headaches ($X^2 = 75.91, p < .0001$). For psychological complaints, almost half of those who smoke daily reported recurrent irritableness or bad temper compared to only 23% of those who never smoked ($X^2 = 98.24, p < .0001$). A similar pattern was noted in the experimenter group.

Logistic regression analysis

Table 3 shows the results from the logistic regression models stratified by gender, predicting cigarette-smoking status in the presence of recurrent complaints while adjusting for socio-demographic covariates. For somatic complaints (Model 1), among boys the odds of being a daily versus never smoker were higher for those who reported recurrent feeling dizzy (AOR=3.91), or recurrent backache complaints (AOR = 1.65). For girls, the odds of daily versus never smoking were twice as high for those who reported recurrent headache (AOR= 1.99) or stomachache (AOR = 2.31), and one and half times higher for those reporting backache. For psychological complaints (Model 2), boys and girls were more likely to smoke daily versus never in the presence of irritability and bad temper (boys AOR=2.23; girls AOR= 2.34) and difficulty sleeping (boys AOR= 1.65; girls AOR = 3.29). Additionally, boys who reported recurrent problems sleeping were more likely to smoke daily versus never (AOR=1.77). Overall, there were several differences between boys and girls in the pattern of significant associations between somatic complaints and smoking, whereas there were more similarities between the genders among the associations found for psychological complaints.

Discussion

The present study established the association between cigarette smoking status and recurrent subjective complaints in a representative sample of US adolescent students. Consistent with a previous prevalence study among US adolescents (Ghandour, 2004), we found a higher prevalence of recurrent somatic and psychological complaints in girls than in boys and a lower prevalence among ethnic minorities. We found both boys and girls reporting recurrent backache, irritability, and difficulty in sleeping were more likely to be daily smokers. These findings are consistent with previous research on sleep disturbance (Shoenborn and Adams, 2008; Wong et al, 2009) and backache (Matilla et al, 2008). Further, some researchers have postulated that adolescents may use smoking as a way to manage or cope with their negative moods (Escobedo et al., 1998) or to alleviate nervousness (Poikolainen et al., 2000; Stevens et al., 2005). In this sample, an association was found between smoking status and irritability, but not reports of recurring nervousness. In some cases, different complaints were associated with smoking status for girls and boys, suggesting there may be gender-specific mechanisms underlying these relations (Egger et al., 1999). Only among girls did

the frequent headaches or stomachache increase the likelihood of being a daily smoker. In contrast, other studies have found that adolescents with frequent headaches were less likely to be smokers (Larsson & Melin, 1988), and somatic complaints were not predictors of tobacco use (Ernst et al., 2006).

Subjective health complaints may reflect a lack of well-being and health among adolescents and might serve as an antecedent for problem behavior, such as cigarette smoking (Wong et al., 2009). The association found in this study suggests that addressing recurring health complaints may prevent adolescent daily smoking. Conversely, addiction to nicotine may be the underlying cause of the complaints reported by adolescents who smoke. Either way, frequently recurring complaints from adolescents may serve as an indicator to health professionals, school personnel, and family for early identification and prevention of potential health problems or health risk behaviors. Further research in this area is warranted.

This study has several limitations. Of note, this sample has a lower prevalence of cigarette smoking status when compared with other school-based surveys. Johnston et al. (2008) using data from the Monitoring the Future Youth Survey reported 14% reported daily smoking among 10th graders compared to the 10% found in our sample. One possible explanation is the slight skewing of the HBSC sample to younger adolescents in order to meet the requirements of the study to obtain data on particular ages (Currie et al., 2001) rather than students by grades. In addition, we assessed one dimension of cigarette smoking status and of subjective health complaints. Other characteristics of cigarette smoking behavior (e.g. number of cigarettes smoked, and age of initiation) and subjective complaints (e.g., severity of the symptoms and age of onset) which were not measured deserve special attention. Finally, the data are based on adolescent self-report, which may be subject to under- or over-reporting. Also, this survey uses a cross-sectional design; therefore, a cause-effect relationship cannot be established between cigarette smoking and the self-report of subjective health complaints. Thus, longitudinal research is necessary to determine the temporal associations among these variables. Are adolescents who smoke more prone to recurrent complaints or do the somatic or psychological symptoms complained about result in increased risk of smoking? Alternatively, is this relationship moderated by a third-factor such as school related stress?

Despite these limitations, the findings presented here reveal that cigarette smoking and recurrent subjective health complaints are indicators of limited well being among school-age children. Efforts to reduce cigarette smoking and the occurrence of health complaints in the school setting can help prevent the onset and progression of problem behaviors. Collaboration between schools, health professionals, and families is urgent to prevent adolescent tobacco use and help them to cope successfully with the challenges of the adolescent developmental stage.

Key Messages

- Daily adolescent smokers may be at risk to experience recurrent health complaints.
- Early identification of adolescents with recurrent health complaints might deter the onset of cigarette smoking in vulnerable adolescents.
- Adolescents should be advised on how to cope successfully with school, family, and other sources of stress. This may reduce the risk of experiencing minor health problems and reduce the likelihood of smoking uptake.

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References

- Beiter M, Ingersoll G, Ganser J, Orr DP. Relationships of somatic symptoms to behavioral and emotional risk in young adolescents. *J of Pediatrics*. 1991; 118:473–478.
- Boyce W, Torsheim T, Currie C, Zambom A. The family affluence scale as a measure of national wealth: validation of an adolescent self-report measure. *Social Indicators Research*. 2006; 78:473–487.
- Brill S, Patel D, MacDonald E. Psychosomatic Disorders in Pediatrics. *Indian J Pediatr*. 2001; 68:597–603. [PubMed: 11519281]
- Cheng TL, Haynie D, Brenner R, Wright JL, Chung SE, Simons-Morton B. Effectiveness of a mentor-implemented, violence prevention intervention for assault-injured youths presenting to the emergency department: results of a randomized trial. *Pediatrics*. 2008; 122:938–946. [PubMed: 18977971]
- Currie, C.; Samdal, O.; Boyce, W. Research protocol for the 2001-2002 survey. Edinburgh: Child and Adolescent Health Research Unit, University of Edinburgh; 2001. Health Behaviour in School-aged Children: a World Health Organization cross national Study (HBSC).
- Currie CE, Molcho M, Boyce W, Holstein B, Torsheim T, Richer M. Researching health inequalities in adolescents: the development of the Health Behaviour in School-Aged Children (HBSC) Family Affluence Scale. *Social Science & Medicine*. 2008; 66:1429–1436. [PubMed: 18179852]
- Department of Health and Human Services. Understanding Youth Development: Promoting Positive Pathways of Growth was developed by CSR, Incorporated, for the Family and Youth Services Bureau. Administration on Children, Youth and Families; Administration for Children and Families; U.S.: 1997. under Contract No. 105-94-2017; Delivery Order No. 105-95-1735
- Dudas R, Hans K, Barabas K. Anxiety, depression and smoking in schoolchildren – implications for smoking prevention. *JRSH*. 2005; 125:87–92. [PubMed: 15819184]
- Due P, Holstein BE, Lynch J, Diderichsen F, Gabhain SN, Scheidt P, et al. Bullying and symptoms among school-aged children: international comparative cross sectional study in 28 countries. *Eur J Public Health*. 2005; 15:128–132. [PubMed: 15755782]
- Eccles, J.; Brown, BV.; Templeton, J. A developmental framework for selecting indicators of well-being during the adolescent and young adult years. In: Borwn, BV., editor. Key indicators of child and youth well-being. New York, NY: Lawrence Erlbaum Associates; 2008. p. 197-236.
- Egger HL, Costello EJ, Erkanli A, Angold A. Somatic complaints and psychopathology in children and adolescents: stomach aches, musculoskeletal pains, and headaches. *J Am Acad Child Adolesc Psychiatry*. 1999; 38:852–860. [PubMed: 10405503]
- Ernst M, Luckenbaugh D, Moolchan ET, Leff MK, et al. Behavioral predictors of substance-use initiation in adolescents with and without attention-deficit hyperactivity disorder. *Pediatrics*. 2006; 117:2030–2039. [PubMed: 16740845]
- Escobedo LG, Reddy M, Giovino G. The relationship between depressive symptoms and cigarette smoking in US adolescents. *Addiction*. 1998; 93:433–440. [PubMed: 10328050]
- Ghandour RM, Overpeck MD, Huang ZJ, Kogan MD, Scheidt PC. Headache, Stomachache, Backache, and Morning Fatigue Among Adolescent Girls in the United States: Associations With Behavioral, Sociodemographic, and Environmental Factors. *Arch Pediatr Adolesc Med*. 2004; 158:797–803. [PubMed: 15289254]

- Gordon KE, Dooley JM, Wood EP. Self-Reported Headache Frequency and Features Associated with Frequent Headaches in Canadian Young Adolescents. *Headache*. 2004; 44:555–561. [PubMed: 15186299]
- Haugland S, Wold B. Subjective health complaints in adolescence—Reliability and validity of survey methods. *Journal of Adolescence*. 2001; 24:611–624. [PubMed: 11676508]
- Hjern A, Alfven G, Östberg V. School stressors, psychological complaints and psychosomatic pain. *Acta Paediatrica*. 2007; 97:112–117. [PubMed: 18076714]
- Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. University of Michigan News Service; Ann Arbor, MI: December 11. 2008 More good news on teen smoking: Rates at or near record lows. Retrieved 29/01/2009 from <http://www.monitoringthefuture.org>
- Larsson B, Melin L. The Psychological Treatment of Recurrent Headache in Adolescents Short-Term Outcome and Its Prediction. *Headache*. 1988; 28:187–195. [PubMed: 3290158]
- Lingaas T, Barrett-Conner E, Holmen J, Bjerner L. Health problems in teenage daily smokers versus nonsmokers, Norway, 1995-1997. *American Journal of Epidemiology*. 2000; 151:148–155. [PubMed: 10645817]
- Mattila VM, Saarni L, Parkkari J, Koivusilta L, Rimpela A. Predictors of low back pain hospitalization – A prospective follow-up of 57,408 adolescents. *Pain*. 2008; 139:209–217. [PubMed: 18472217]
- Olsson A, Fahlén I, Janson S. Health behaviours, risk-taking and conceptual changes among schoolchildren aged 7 to 19 years in semi-rural Sweden. *Child: care, health and development*. 2008; 34:302–309.
- Orlando M, Ellickson PL, Jinnett K. The temporal relationship between emotional distress and cigarette smoking during adolescence and young adulthood. *J of Consulting and Clinical Psychology*. 2001; 69:959–970.
- Piko BF. Self-perceived health among adolescents: the role of gender and psychosocial factors. *Eur J Pediatr*. 2006; 1007/s00431-006-0311-0
- Poikolainen K, Aalto-Setälä T, Marttunen M, et al. Predictors of somatic symptoms: Five year follow up of adolescents. *Arch Dis Child*. 2000; 83:388–392. [PubMed: 11040143]
- Rhee H, Holditch-Davis D, Margaret M. Patterns of Physical Symptoms and Relationships with Psychosocial Factors in Adolescents. *Psychosomatic Medicine*. 2005; 67:1006–1012. [PubMed: 16314607]
- Robinson DP, Greene JW, Walker LS. Functional somatic complaints in adolescents: relationship to negative life events. *J Pediatr*. 1988; 113:588–593. [PubMed: 3411408]
- Roth-Isigkeit, Thyen U, Stoven H, Schwarzenberger J, Schmucker P. Pain among children and adolescents: restrictions and triggering factors. *Pediatrics*. 2005; 115:e152–e162. [PubMed: 15687423]
- Saluja G, Iachan R, Scheidt P, et al. Prevalence of and Risk Factors for Depressive Symptoms among Young Adolescents. *Arch Pediatr Adolesc Med*. 2004; 158:760–765. [PubMed: 15289248]
- Schoenborn CA, Adams PF. Sleep duration as a correlate of smoking, alcohol use, leisure-time physical inactivity, and obesity among adults: United States, 2004-2006. *Health E-Stats*. 2008 May.;1–4.
- Simons-Morton, BG.; Haynie, D. The Center for Child Well-being. Growing up drug free: A developmental challenge. In: Bornstein, MH.; Davidson, L.; Keyes, CLM.; Moore, KA., editors. *Well-being: Positive development across the life course*. Mahwah, NJ: Erlbaum; 2002. p. 109-122.
- Spencer N. Socioeconomic determinants of health related quality of life in childhood and adolescence: results from a European study. *Child Care Health Dev*. 2006; 32:603–604.
- Spratt EG, DeMaso DR. Somatoform Disorder: Somatization. 2006 Downloaded from eMedicine Pediatrics on 2/27/2009.
- Stevens S, Colwell B, Smith D, et al. An exploration of self-reported negative affect by adolescents as a reason for smoking: implications for tobacco prevention and intervention programs. *Preventive Medicine*. 2005; 41:589–596. [PubMed: 15917057]
- Sweeting HN, West PB, Der G. Explanations for female excess psychosomatic symptoms in adolescence: evidence from a school-based cohort in the West of Scotland. *BMC Public Health*. 2007; 7:298. [PubMed: 17953744]

- Torsheim T, Wold B. School-related stress, support, and subjective health complaints among early adolescents: a multilevel approach. *Journal of Adolescence*. 2001; 24:701–713. [PubMed: 11790051]
- Torsheim T, Aaroe LE, Wold B. Sense of coherence and school-related stress as predictors of subjective health complaints in early adolescence: interactive, indirect or direct relationships? *Social Science & Medicine*. 2001; 53:603–614. [PubMed: 11478540]
- Weinstein S, Mermelstein R, Shiffman S, Flay B. Mood variability and cigarette smoking escalation among adolescents. *Psychology of Addictive Behaviors*. 2008; 22:504–513. [PubMed: 19071975]
- Wolraich, ML.; Felice, ME.; Drotar, D. The classification of child and adolescent mental diagnoses in primary care. *Diagnostic and Statistical Manual for Primary Care (DSM-PC) Child and Adolescent*. Elk Grove Village: American Academy of Pediatrics; 1996.
- Wong MM, Brower KJ, Zucker RA. Childhood sleep problems, early onset of substance use and behavioral problems in adolescence. *Sleep Medicine*. 200910.1016/j.sleep.2008.06.015
- Wu L-T, Anthony JC. Tobacco smoking and depressed mood in late childhood and early adolescence. *Am J of Public Health*. 1999; 89:1837–1840. [PubMed: 10589312]

Table 1

Association of cigarette smoking status with sociodemographic characteristics: Health Behaviors in School-Aged Children Survey, 2001-2001

Characteristics	Sample, n (%) 13,339	Cigarette smoking status ^a , n (%)		
		Daily 616 (5)	Experimenter 1,273(10)	Never 11,450 (85)
Gender				
Boys	6,252 (47)	364 (6)	665 (11)	5,223 (83)
Girls	7,087 (53)	252 (4)	608 (9)	6,227 (87)
School Level				
Middle School	8,478 (62)	211 (3)	641 (7)	7,626 (90)
High School	4,861 (38)	405 (9)	632 (13)	3,824 (77)
Race/ethnicity (Missing=138)				
White	6,892 (64)	392 (6)	609 (9)	5,891 (85)
Black	2,583 (15)	81 (4)	243 (9)	2,259 (87)
Hispanic	2,560 (13)	92 (4)	286 (12)	2,182 (84)
Other	1,166 (8)	46 (5)	123 (11)	997 (84)
Parent's education (Missing=2,094)				
<High School	1,164 (8)	117 (13)	163 (15)	884 (72)
High School	2,438 (21)	125 (6)	253 (10)	2,060 (84)
>High School	2,430 (22)	128 (6)	276 (12)	2,060 (82)
College	5,213 (49)	188 (4)	421 (8)	4,604 (88)
Family Affluence Scale (Missing=165)				
Low	4,065 (28)	239 (7)	412 (11)	3414 (82)
Moderate	6,603 (52)	265 (4)	632 (10)	5,706 (86)
High	2,506 (20)	99 (4)	207 (8)	2,200 (88)

Note.

^a A statistically significant ($p < .0001$) association was found based on a Wald χ^2 analysis between cigarette smoking status and the characteristic. n=number of subjects; %=weighted percentages based on sample design.

Table 2

Subjective health complaints, gender, and cigarette smoking status

Complaint	Sample 13,339	Gender ^a n (%)		Cigarette smoking status ^b n (%)		
		Boys 6,252 (47)	Girls 7,087(53)	Daily 616 (5)	Experiment 1,273 (10)	Never 11, 450 (85)
Somatic						
Headache						
Recurrent	2,964 (23)	1,038 (17)	1,926 (28)	244 (41)	380 (31)	2,340 (21)
Non-recurrent	10,048 (77)	5,013 (83)	5,035 (72)	348 (59)	849 (69)	8,851 (79)
Stomachache						
Recurrent	1,814 (14)	679 (11)	1,135 (16)	161 (27)	245 (20)	1,408 (13)
Non-recurrent	11,141 (86)	5,349 (89)	5,792 (84)	427 (73)	982 (80)	9,732 (87)
Backache						
Recurrent	2,168 (17)	895 (15)	1,273 (18)	207 (35)	320 (26)	1,641 (15)
Non-recurrent	10,707 (83)	5,094 (85)	5,613 (82)	377 (65)	902 (74)	9,428 (85)
Feeling dizzy						
Recurrent	1,604 (12)	656 (11)	948 (14)	181 (31)	267 (22)	11,156 (10)
Non-recurrent	11,311 (88)	5,347 (89)	5,964 (86)	403 (69)	966 (78)	9,942 (90)
Psychological						
Feeling low						
Recurrent	2, 333 (18)	912 (15)	1,421 (21)	198 (49)	365 (30)	1,770 (16)
Non-recurrent	10,438 (82)	5,026 (85)	5,412 (79)	376 (51)	855 (70)	9,207 (84)
Irritable						
Recurrent	3,345 (26)	1,383 (23)	1,962 (29)	285 (49)	500 (41)	2,560 (23)
Non-recurrent	9,514 (74)	4,600 (77)	4,914 (71)	298 (51)	727 (59)	8,489 (74)
Feeling nervous						
Recurrent	2,804 (21)	1,150 (20)	1,654 (24)	192 (33)	358 (29)	2,254 (20)
Non-recurrent	10,002 (79)	4,815 (80)	5,187 (76)	383 (67)	856 (71)	8,763 (80)
Difficulties sleeping						
Recurrent	3,052 (24)	1,301 (22)	1,748 (25)	237 (41)	413 (34)	2,402 (22)
Non-recurrent	9,802 (76)	4, 675 (78)	5,127 (75)	343 (59)	806 (66)	8,653 (78)

Note.

^a A statistically significant ($p < .0001$) association was found based on a Wald χ^2 analysis between gender and complaints.

^b A statistically significant ($p < .0001$) association was found based on a Wald χ^2 analysis between cigarette smoking status and complaints. n=number of subjects; %=weighted percentages based on sample design.

Table 3

Adjusted odds ratios and 95% confidence interval for daily versus never smoking, predicted by somatic (Model 1) and psychological (Model 2) recurrent complaints, separately for boys and girls

Variable	BoysOR (95% CI)		GirlsOR (95% CI)	
Sociodemographic	Model 1 (Somatic)	Model 2 (Psychological)	Model 1 (Somatic)	Model 2 (Psychological)
School level				
Middle school (Ref)				
High school	3.64 (2.67-4.97)	3.64 (2.70-4.92)	3.12 (2.11-4.63)	3.29 (2.18-4.97)
Race/ethnicity				
White (Ref)				
African American	.64 (.42-.98)	.67 (.44-1.03)	.30 (.15-.16)	.28 (.14-.57)
Hispanic	.63 (.41-.97)	.72 (.46-1.12)	.40 (.24-.68)	.38 (.22-.66)
Other	.85 (.52-1.39)	1.12 (.67-1.87)	.63 (.30-1.31)	.61 (.30-1.26)
Parent's education				
Less than college (Ref)				
College	1.49 (1.12-2.00)	1.57 (1.17-2.10)	2.60 (1.69-4.00)	2.80 (1.77-4.41)
Family affluence scale				
Moderate (Ref)				
Low	1.96 (1.39-2.78)	1.84 (1.32-2.56)	1.75 (1.27-2.42)	1.62 (1.20-2.19)
High	1.10 (.77-1.58)	1.14 (.79-1.65)	.82 (.45-1.50)	.89 (.48-1.66)
Recurrent complaints *				
Somatic				
Headache	1.39 (.90-2.15)	na	1.99 (1.39-2.85)	na
Stomachache	1.14 (.71-1.83)	na	2.31 (1.53-3.48)	na
Backache	1.65 (1.13-2.39)	na	1.53 (1.05-2.23)	na
Feeling dizzy	3.91 (2.86-5.34)	na	1.13 (.72-1.77)	na
Psychological				
Feeling low	na	1.77 (1.20-2.62)	na	1.37 (.89-2.12)
Irritable/Bad temper	na	2.23 (1.64-3.01)	na	2.34 (1.56-3.49)
Feeling nervous	na	.98 (.69-1.39)	na	1.17 (.79-1.74)
Difficulty sleeping	na	1.65 (1.18-2.30)	na	3.29 (2.18-4.97)

* Non-recurrent (referent group) =refers to complaints reported occasionally, rarely or never. Recurrent =refers to complaints reported about every day and more than once a week. Ref=referent category; na=not applicable;