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Relationship Between Frequency and Intensity of Cigarette Smoking and TTFC/C Among Students of the GYTS in Select Countries, 2007-2009

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Abstract

BACKGROUND—This study assessed the construct validity of a measure of nicotine dependence that was used in the Global Youth Tobacco Survey (GYTS).

METHODS—Using 2007-2009 data from the GYTS, subjects from 6 countries were used to assess current smokers' odds of reporting time to first cigarette or craving positive (TTFC/C+) by the number of cigarette smoking days per month (DPM) and the number of cigarettes smoked per day (CPD).

RESULTS—The percentage of GYTS smokers who reported TTFC/C+ ranged from 58.0% to 69.7%. Compared with students who smoked on 1-2 DPM, those who smoked on 3-9 DPM had 3 times the adjusted odds of reporting TTFC/C+. The adjusted odds of reporting TTFC/C+ were 3 to

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7 times higher among those who smoked 10-29 DPM and 6 to 20 times higher among daily smokers. Similarly, the adjusted odds of TTFC/C+ were 3-6 times higher among those who smoked 2-5 CPD and 6 to 20 times higher among those who smoked >6 CPD, compared to those who smoked <1 CPD.

CONCLUSION—Associations of TTFC/C+ prevalence with both frequency and intensity of cigarette smoking provide a construct validation of the GYTS question used to assess respondents' TTFC/C status.

Keywords

smoking; nicotine dependence; Global Youth Tobacco Survey

The initiation of cigarette use among youth is a serious health issue as adolescence represents a time of heightened sensitivity to nicotine dependence.[1] Cigarette smoking by youth also has both immediate and delayed detrimental health effects including early abdominal aortic atherosclerosis which leads to reduced lung growth and increased risk of developing chronic obstructive pulmonary disease later in life.[2] Those who initiate smoking during adolescence are also more likely to continue cigarette smoking as adults, become daily smokers, and have a more difficult time quitting smoking;[3-5] thus, highlighting the importance of strategies in preventing youth from use of tobacco and dependence. In addition, quitting smoking as an adolescent substantially lowers the risk of nicotine dependence later in life.[6]

Symptomology of nicotine dependence progression as well as dependence assessment in youth have been previously reported.[7-10] Symptoms of tobacco dependence in youth develop rapidly after the onset of intermittent smoking and without a minimum nicotine dose or duration of use.[7,8] Measures of tobacco dependence among adolescents include the Stanford Dependence Index,[11] the modified Fagerström Tolerance Questionnaire (FTQ),[12] the Hooked on Nicotine Checklist,[13] and the Autonomy Over Tobacco Scale (AUTOS).[14] More recently, DiFranza et al developed a clinical approach to outlining tobacco addiction in adolescence with progressive steps along the sequence of wanting, craving, and needing.[15] Baker and colleagues have shown that among adults, time to first cigarette (TTFC) in the morning is the best predictor of quitting;[16] however, there are no studies to our knowledge assessing TTFC alone among adolescents in the current literature.

The Global Youth Tobacco Survey (GYTS) is a joint project of the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC) aiming to obtain standardized behavioral data from same-aged youth on prevalence of cigarette and other tobacco use; perceptions and attitudes about tobacco; access and availability of tobacco products; and exposure to secondhand smoke, school curricula, media and advertising, and smoking cessation interventions.[17-19] As GYTS investigators recognized that adolescents might want to smoke a cigarette early in the day but cannot because their parents would disapprove, the GYTS questionnaire has adapted the usual TTFC measure to assess either having a cigarette or feeling like having a cigarette first thing in the morning. However, the question used to assess this measure in the GYTS, herein referred to as time to first cigarette or craving (TTFC/C), has not been validated. As GYTS is a survey developed

to monitor tobacco use among youth worldwide, validation of this survey question will be important for assessing nicotine dependence among adolescents. The objective of this study is to assess and determine whether the measure of TTFC/C used in the GYTS was associated with frequency and intensity of cigarette use among youth smokers, as a first step in validating the use of this question.

METHODS

Participants and Instruments

Global Youth Tobacco Survey is a self-administered school-based survey focusing on students in grades primarily associated with ages 13-15 years.[17-19] The questionnaire is conducted in defined geographic sites that can be countries, provinces, cities, or any other sampling frame, including subnational areas, non-WHO member states, or territories of other countries. The school, class, and student anonymity are maintained throughout the GYTS process. Participation in the survey by schools and students is voluntary. Global Youth Tobacco Survey uses a 2-stage cluster sample design that produces representative samples of students in grades associated with ages 13-15 years. At the first stage, the probability of schools being selected is proportional to the number of students enrolled in the specified grades. Classes within the selected schools are then randomly selected at the second sampling stage. All students in selected classes who were present during the day in which the survey was conducted were eligible to participate.

One country from each WHO region was selected based on the following inclusion criteria: a nationally representative sample, recent completion of GYTS (2007-2009), large sample size (≥2000 subjects), and a publicly released data set. Out of 35 eligible countries which met the inclusion criteria, data analysis was performed in 6 randomly selected countries by a subset of participants who affirmatively reported TTFC/C and also had no missing data on covariates among all subjects: Slovakia 2007 (590/4696), Argentina 2007 (688/4926), Thailand 2009 (195/9963), Malaysia 2009 (237/3303), South Africa 2008 (417/8602), and Jordan 2007 (68/2250).

Overall response rates (calculated as the school response rate multiplied by the class and student response rates) for all 6 countries were as follows: 86.1% (Slovakia), 68.2% (Argentina), 93.1% (Thailand), 91.3% (Malaysia), 77.9% (South Africa), and 91.6% (Jordan). Global Youth Tobacco Survey data are weighted to adjust for sample selection (school and class levels), nonresponse (school, class, and student levels), and post-stratification of the sample population relative to grade and sex distribution in the total population.

Assessment of Frequency and Intensity of Cigarette Smoking

Current cigarette smoking status was defined as self-reported cigarette use on 1 or more of the past 30 days. Frequency of cigarette smoking was assessed by the number of days per month (DPM) on which cigarettes were smoked (1 or 2 days/3 to 9 days/10 to 29 days/All 30 days). Intensity of cigarette use was measured by the number of cigarettes smoked per day (CPD) on days smoked (1 cigarette/2 to 5 cigarettes/≥6 cigarettes per day).

Assessment of TTFC/C and Other Covariates

Persons who smoked during the previous 30 days and responded affirmatively to the question: “Do you ever have a cigarette or feel like having a cigarette first thing in the morning?” were coded as TTFC/C+. In contrast, persons were coded as TTFC/C− if s/he did not smoke or feel like smoking a cigarette first thing in the morning but had smoked during the previous 30 days. Other covariates assessed in this study that may be potential confounders include age of first cigarette (dichotomized into <12 years old and ≥12 years old), parental smoking status, desire to quit smoking now, previous attempts to quit smoking in the past year, perception of ability to quit smoking, and use of other tobacco products. Parental smoking status was defined as “Smoker” if the father, mother or both smoked cigarettes. The “desire to quit smoking now” and “previous attempts to quit smoking in the past year” were assessed by the questions: “Do you want to stop smoking now?” and “During the past year, have you ever tried to stop smoking cigarettes?” respectively. Participants who answered “Yes” to the following question: “Do you think you would be able to stop smoking if you wanted to?” were defined as those with an affirmative response to “perception of ability to quit smoking.”

Data Analysis

All analyses were conducted using STATA version 11 (StataCorp, College Station, TX, 2009) to account for the complex survey design and to calculate weighted point estimates, standard error (SE), and 95% confidence intervals (CIs) of the estimates. Baseline characteristics of all variables were calculated to examine weighted point estimates and possible trends with respect to DPM of cigarette smoking and CPD. A relative standard error (RSE) greater than 30% was used to identify unreliable estimates. The RSE is defined as the ratio of the SE of the estimate divided by the estimate multiplied by 100. In the tables, an estimate with a RSE greater than 30% is identified with an asterisk (*).

Bivariate logistic regression models were used to determine covariates adjusted in the multivariable model. Each of the independent variables was assessed for association with the dependent variable (TTFC/C) in the bivariate model. All covariates were considered potential confounders and were chosen for inclusion in multivariable analyses if the $p < .2$ in bivariate analysis. Multivariable logistic regression models were used to compute adjusted odds ratios with accompanying 95% CI for the association between both frequency and intensity of cigarette smoking and TTFC/C+. Because age of first cigarette and past year quit attempts are important indices of nicotine dependence, we fitted models that included basic adjustment for age and sex as well as compared to a fully adjusted model. The fully model adjusted for age, sex, parental smoking status, age of first cigarette, desire to quit smoking now, and past year quit attempts, and perception of ability to quit, to determine whether these 2 indices may cause misspecification of the TTFC and smoking association. Associations for trend were examined using an adjusted Wald test for linear trend across groups.

RESULTS

The weighted percentage of TTFC/C+ reported among GYTS smokers with complete data in the select 6 countries were as follows: 68.5% in Slovakia, 58.0% in Argentina, 60.8% in Thailand, 58.4% in Malaysia, 69.7% in South Africa, and 59.4% in Jordan. Tables 1 and 2 show baseline characteristics of current youth smokers in the 6 countries with respect to frequency (DPM) and intensity (CDP) of cigarette use. Although there are slight variations of reported TTFC/C between countries, increasing DPM of cigarettes smoked was associated with reporting TTFC/C+ across all 6 countries. In addition, increasing DPM of cigarettes smoked was associated with the increasing likelihood of being aged 15 years or older, being male (with the exception of Argentina), and starting cigarette smoking at age 11 or younger. Increasing DPM of cigarettes smoked was associated with decreased likelihood of perceived ability to quit. With respect to intensity of cigarette use, increasing CPD was associated with increasing likelihood of being male, starting cigarette smoking at age 11 or younger, and developing TTFC/C+ across the 6 countries. Increasing CPD was also associated with decreasing likelihood of being aged 14 years or younger and desire to stop smoking now.

Bivariate analysis of factors associated with TTFC/C+ among GYTS subjects are shown in Table 3. Increasing numbers of smoking DPM and CPD both had statistically significant associations with TTFC/C+ across all 6 countries. Covariates with $p < .2$ in bivariate analysis, as marked with an asterisk (*) in the table, were chosen for inclusion in the multivariable model along with demographic information of age and sex. Table 4 shows the results of multivariable logistic regression analyses of the associations between both frequency and intensity of cigarette smoking and TTFC/C+ among GYTS subjects from Slovakia, Argentina, Thailand, Malaysia, and South Africa. Jordan was removed from the multivariable analysis due to insufficient cell size (<30). Basic adjustment for age and sex did not affect the significance of trend for both measures of smoking. In the fully adjusted model, students who smoked on 3 to 9 DPM compared to those who smoked on 1 to 2 DPM had up to 3 times the adjusted odds of reporting TTFC/C+. The adjusted odds of reporting TTFC/C+ were approximately 3 to 7 times higher among those who smoked 10 to 29 DPM and approximately 6 to 20 times higher among daily smokers. Similarly, the adjusted odds of TTFC/C+ were 3 to 6 times higher among those who smoked 2 to 5 CPD and 6 to 20 times higher among those who smoked ≥ 6 CPD, compared to those who smoked ≤ 1 CPD. Tests for trend of increasing TTFC/C+ were statistically significant for both measures of smoking ($p < .001$) in every country studied in the multivariable analyses.

Table 5 shows the covariates that remained statistically significant factors ($p < .05$) for reporting TTFC/C+ in the multivariable models include the following: Slovakia — age of first cigarette with respect to both DPM and CPD, perception of ability to quit to both DPM and CPD; Argentina — desire to quit smoking now with respect to both DPM and CPD, being aged 15 years or older to DPM only, and parental smoking status to CPD only; Thailand — parental smoking status with respect to both DPM and CPD, being female to both DPM and CPD, and age of first cigarette to DPM; Malaysia — age of first cigarette with respect to both DPM and CPD; South Africa — being female with respect to both DPM and CPD as well as desire to quit smoking now with respect to both DPM and CPD.

DISCUSSION

The purpose of this study was to assess and validate whether the measure of TTFC/C used in the GYTS was associated with frequency and intensity of cigarette use among youth smokers in 6 countries in each of the WHO regions that conducted the GYTS and met the study eligibility. Our study found that the prevalence of TTFC/C+ among youth smokers increased significantly with increasing frequency and intensity of cigarette smoking. In the GYTS, the TTFC/C question was assessed by reports of ever smoking or feeling like smoking a cigarette in the morning. This question is of significance because TTFC in the morning has been shown to be a powerful predictor of smoking cessation.[16] The research literature suggests that nicotine dependence is not decided completely by measures of frequency of cigarette use and that TTFC is generally regarded as the single best indicator of dependence. Borland et al examined both TTFC and CPD and reported that the 2 items were independent predictors of quitting outcomes but can also be combined to predict quitting behavior as used in the Heaviness of Smoking Index (HSI).[20] Moreover, a recent study performed with magnetic resonance imaging reported that indices of smoking behavior, such as TTFC and CPD, were negatively related to prefrontal cortex function during response inhibition among late adolescent smokers.[21]

Our findings are consistent with previous studies found in the literature. DiFranza et al have shown that nicotine dependence symptoms can develop soon after smoking initiation and that up to 20% of adolescents report 1 or more indicators of dependence within 1 month of initiating monthly smoking.[7,22,23] DiFranza et al[7] reported that the median frequency of tobacco use at onset of nicotine dependence-related symptoms was 2 cigarettes, 1 day per week. In a study conducted by O'Loughlin et al,[24] nicotine dependence symptoms were also shown to be associated with smoking frequency in adolescents early in the smoking onset process.

In our multivariable analysis, covariates in addition to the measure of smoking that were associated with TTFC/C+ included age of smoking initiation. The age of first cigarette has been shown to be inversely associated with the number of CPD in adulthood.[3] In the recent US Surgeon General's report on tobacco use among youth, age of first cigarette puffed and age of first cigarette smoked daily were shown to be inversely related to nicotine dependence as measured by the Nicotine Dependence Syndrome Scale.[2] Breslau et al reported findings that are consistent with a mechanism of dependence, in which continued regular use of cigarette smoking is associated with increased consumption in number of cigarettes smoked through the physiologic development of tolerance.[25]

Strengths and Limitations

Although there is good evidence that TTFC is a valid measure of dependence in adults, this study provides evidence of construct validity of a measure of dependence among adolescents. A major strength is the use of a large multicountry data set that is nationally representative of students. Furthermore, response rates are excellent in 5 of the 6 sample countries. Limitations of the study need to be recognized. The measure of the TTFC's construct is validated against smoking pattern (frequency and rate), which is only one of numerous important components of nicotine dependence. Further, discriminant validity is

not assessed, and some degree of mono-method bias is likely because all measures are self-reported. Due to the self-report nature of responses from the GYTS, misclassification bias is also a possibility as under- or overreporting of smoking behaviors may occur. Whereas reliability studies conducted in Canada and the United States have shown good test-retest results for similar tobacco-related questions,[26,27] the reliability of the GYTS question used in this study to determine respondents' TTFC/C status has yet to be tested. Finally, the possibility of residual confounding cannot be excluded.

Conclusions

In summary, a significant association between the frequency and intensity of cigarette smoking and time to first cigarette and craving was found in this study. Our findings that TTFC/C+ prevalence was positively associated with both frequency and intensity of cigarette smoking among youth provide a beginning to determine construct validation of the GYTS question used to assess respondents' TTFC/C status.

IMPLICATIONS FOR SCHOOL HEALTH

Schools are a valuable resource for adolescent smoking prevention and cessation programs; therefore, the accuracy of self-reported school-based surveillance data regarding tobacco use and nicotine dependence is of high importance. In addition, students may be less likely to disclose their smoking activities and symptoms of dependence to their parents at home. In such instances, school health programs may need to rely on information gathered from anonymous surveys such as GYTS to assess the severity of tobacco use among their students. Results from this study indicate that frequency and intensity of cigarette smoking are correlated with a measure of nicotine dependence, such as time to first cigarette and craving, among boys and girls and that these patterns are consistent across 6 countries from each WHO region. More importantly, our findings provide construct validation of the survey question used to determine respondents' nicotine dependence status in GYTS, a survey developed to monitor tobacco use among youth worldwide. Our results show that such a measure can add value to surveys and assessments in schools doing such work and can also help individual administrators and counselors assess where students are at in terms of their nicotine dependence. Just as we use a question to assess if an adult smoker smokes his/her first cigarette of the day within 30 minutes of awakening to assess if they are dependent, so too can we recommend that school administrators and health educators assess whether the student smokes or feels like smoking first thing in the morning as an indicator of dependence.

Human Subjects Approval Statement

The GYTS surveillance protocol was approved by WHO and CDC. All ethics committee and consent procedures are decided and approved at the individual country level.

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Table 1

Baseline Characteristics by DPM of Cigarette Smoking Among Current Smokers

DPM of Cigarette Smoking	Age,%(SE)		Sex,%(SE)		Age of First Cigarette, %(SE)		Parent(s) Who Smoke, %(SE)	Wants to Stop Smoking Now, %(SE)	Tried to Quit in Past Year, %(SE)	Thinks Able to Quit If Wanted to,%(SE)	TTFC/C+, %(SE)
	<15 Years	≥15 Years	Female	Male	<12 Years	≥ 12 Years					
Slovakia (N=590)											
≤2 days (N=86)	66.8 (4.6)	33.2 (4.6)	38.2 (4.6)	61.8 (4.6)	56.6 (5.4)	43.4 (5.4)	68.9 (4.7)	72.2 (5.1)	77.3 (4.6)	96.3 (2.2)	33.6 (4.5)
3-9 days (N=136)	59.6 (5.4)	40.4 (5.4)	53.6 (5.7)	46.4 (5.7)	43.4 (4.0)	56.6 (4.0)	54.2 (4.5)	56.3 (4.3)	78.8 (3.0)	91.6 (2.4)	48.8 (4.6)
10-29 days (N=189)	55.5 (4.2)	44.5 (4.2)	41.4 (3.5)	58.6 (3.5)	61.1 (3.6)	38.9 (3.6)	67.6 (2.6)	68.1 (2.7)	80.4 (2.8)	83.8 (2.9)	78.8 (3.2)
All 30 days (N= 179)	39.1 (3.9)	60.9 (3.9)	43.1 (4.3)	56.9 (4.3)	64.3 (4.3)	35.7 (4.3)	78.3 (2.9)	53.6 (5.0)	75.5 (3.0)	70.5 (4.3)	90.6 (2.5)
Argentina (N=688)											
≤2 days (N=136)	49.2 (6.2)	50.8 (6.2)	73.6 (5.4)	26.4 (5.4)	17.7 (5.0)	82.3 (5.0)	62.0 (5.3)	54.6 (6.3)	52.7 (5.5)	96.6 (1.6)	32.6 (5.6)
3-9 days (N=155)	29.7 (5.7)	70.3 (5.7)	59.9 (4.5)	40.1 (4.5)	15.9 (2.5)	84.1 (2.5)	53.4 (4.8)	51.6 (6.9)	49.7 (4.6)	92.8 (2.9)	42.3 (6.6)
10-29 days (N=197)	25.0 (5.4)	75.0 (5.4)	48.8 (5.2)	51.2 (5.2)	25.0 (4.5)	75.0 (4.5)	59.9 (4.0)	53.6 (3.8)	70.5 (4.0)	86.8 (3.5)	60.3 (3.7)
All 30 days (N=200)	11.9 (3.2)	88.1 (3.2)	53.8 (4.9)	46.2 (4.9)	30.1 (4.9)	69.9 (4.9)	72.4 (4.3)	45.2 (4.0)	60.1 (3.3)	77.6 (2.5)	84.9 (3.2)
Thailand (N=195)											
≤2 days (N=30)	64.0 (9.5)	36.0 (9.5)	28.6 (8.5)	71.4 (8.5)	38.0 (10.6)	62.0 (10.6)	82.2 (5.1)	76.6 (8.0)	67.0 (8.8)	87.2 (6.6)	31.5 (6.5)
3-9 days (N=51)	67.1 (7.3)	32.9 (7.3)	14.6 (3.3)	85.4 (3.3)	35.2 (5.9)	64.8 (5.9)	70.8 (8.0)	69.2 (8.6)	83.5 (7.9)	95.0 (3.5)	36.4 (7.3)
10-29 days (N=64)	55.2 (4.6)	44.8 (4.6)	7.8 (1.7)	92.2 (1.7)	17.4 (3.1)	82.6 (3.1)	59.6 (5.3)	63.7 (5.4)	89.4 (3.4)	87.6 (3.6)	67.9 (5.3)
All 30 days (N=50)	50.8 (5.9)	49.2 (5.9)	10.0 (5.3)*	90.0 (5.3)	39.5 (11.7)	60.5 (11.7)	66.3 (5.8)	67.9 (5.6)	76.7 (4.9)	67.3 (5.5)	88.0 (4.0)
Malaysia (N=237)											
≤2 days (N=66)	78.2 (3.6)	21.8 (3.6)	17.1 (3.0)	82.9 (3.0)	39.3 (6.2)	60.7 (6.2)	66.1 (4.4)	80.5 (3.5)	89.0 (2.0)	90.0 (2.2)	36.3 (4.7)
3-9 days (N=66)	66.5 (9.0)	33.5 (9.0)	9.2 (1.9)	90.8 (1.9)	22.3 (2.5)	77.7 (2.5)	69.3 (5.0)	82.7 (5.1)	78.9 (4.5)	87.2 (5.1)	43.1 (4.8)
10-29 days (N=73)	57.7 (6.9)	42.3 (6.9)	8.5 (5.7)*	91.5 (5.7)	28.6 (4.4)	71.4 (4.4)	73.5 (6.0)	67.3 (5.6)	73.8 (4.6)	77.1 (3.3)	81.4 (3.1)
All 30 days (N=32)	48.0 (10.5)	52.0 (10.5)	—	100.0	33.4 (4.6)	66.6 (4.6)	66.8 (8.5)	45.1 (8.3)	59.4 (9.1)	56.0 (7.6)	85.1 (6.1)
South Africa (N=417)											
≤2 days (N=49)	18.3 (5.8)*	81.7 (5.8)	50.6 (6.1)	49.4 (6.1)	23.1 (5.5)	76.9 (5.5)	63.9 (5.9)	92.9 (3.5)	75.7 (4.6)	80.3 (5.7)	36.6 (6.2)
3-9 days (N=89)	21.6 (3.5)	78.4 (3.5)	52.1 (5.2)	47.9 (5.2)	16.2 (3.1)	83.8 (3.1)	52.1 (4.4)	78.4 (2.8)	72.6 (5.7)	82.0 (3.6)	64.1 (4.0)
10-29 days (N=91)	13.7 (4.4)*	86.3 (4.4)	33.2 (5.0)	66.8 (5.0)	14.6 (3.2)	85.4 (3.2)	51.3 (4.6)	69.3 (4.3)	81.1 (3.5)	86.4 (3.1)	63.3 (3.5)
All 30 days (N=188)	5.7 (1.7)	94.3 (1.7)	29.8 (2.6)	70.2 (2.6)	24.9 (3.9)	75.1 (3.9)	58.1 (4.1)	78.7 (3.4)	79.4 (2.8)	76.2 (2.5)	81.5 (3.9)
Jordan (N=68)											

DPM of Cigarette Smoking	Age,%(SE)		Sex,%(SE)		Age of First Cigarette, %(SE)		Parent(s) Who Smoke, %(SE)	Wants to Stop Smoking Now, %(SE)	Tried to Quit in Past Year, %(SE)	Thinks Able to Quit If Wanted to,%(SE)	TTFC/C+, %(SE)
	<15 Years	≥15 Years	Female	Male	<12 Years	≥ 12 Years					
≤2 days (N=25)	54.3 (7.3)	45.7 (7.3)	50.8 (11.2)	49.2 (11.2)	26.8 (6.9)	73.2 (6.9)	63.8 (9.9)	52.5 (9.3)	55.2 (9.4)	63.0 (7.6)	44.6 (4.2)
3-9 days (N=19)	40.9 (11.1)	59.1 (11.1)	17.2 (5.8)*	82.8 (5.8)	18.3 (6.9)*	81.7 (6.9)	61.7 (10.7)	49.0 (10.9)	46.9 (9.9)	54.6 (7.3)	40.2 (6.3)
10-29 days (N=8)	—	100.0	30.5 (15.5)*	69.5 (15.5)	22.9 (7.9)*	77.1 (7.9)	61.2 (9.2)	53.6 (15.1)	43.5 (10.4)	62.0 (14.6)	71.9 (13.4)
All 30 days (N=16)	20.7 (7.0)*	79.3 (7.0)	15.5 (7.2)*	84.5 (7.2)	59.4 (11.2)	40.6 (11.2)	67.7 (9.0)	33.8 (10.4)*	44.1 (12.2)	30.1 (9.6)*	95.0 (4.9)

DPM, days per month; TTFC/C+, time to first cigarette or craving positive; SE, standard error.

*Estimates with RSE >30%.

Table 2

Baseline Characteristics by Number of Smoked CPD Among Current Smokers

Number of Smoked CPD	Age,%(SE)		Sex,%(SE)		Age of First Cigarette %(SE)		Parent(s) Who Smoke, %(SE)	Wants to Stop Smoking Now, %(SE)	Tried to Quit in Past Year, %(SE)	Thinks Able to Quit If Wanted to,%(SE)	TTFC/C+, %(SE)
	<15 Years	≥ 15 Years	Female	Male	<12 Years	≥ 12 Years					
Slovakia (N=590)											
1 CPD (N=142)	63.1 (4.2)	36.9 (4.2)	49.1 (5.1)	50.9 (5.1)	46.0 (5.8)	54.0 (5.8)	57.2 (4.0)	65.8 (4.0)	73.2 (3.5)	96.4 (1.7)	39.5 (3.6)
2-5 CPD (N=240)	53.9 (4.2)	46.1 (4.2)	46.4 (3.1)	53.6 (3.1)	54.9 (4.4)	45.1 (4.4)	65.0 (3.4)	61.4 (2.9)	83.2 (2.3)	88.4 (2.1)	70.6 (3.4)
≥6 CPD (N=208)	45.4 (4.2)	54.6 (4.2)	38.5 (4.0)	61.5 (4.0)	67.9 (4.6)	32.1 (4.6)	78.7 (3.1)	58.8 (4.3)	75.4 (3.6)	68.7 (4.1)	86.5 (2.7)
Argentina (N=688)											
1 CPD (N=256)	38.5 (5.4)	61.5 (5.4)	64.4 (3.8)	35.6 (3.8)	17.0 (3.0)	83.0 (3.0)	60.6 (3.7)	55.1 (4.6)	55.7 (4.3)	92.8 (2.2)	38.9 (3.9)
2-5 CPD (N=244)	25.4 (4.6)	74.6 (4.6)	57.6 (4.4)	42.4 (4.4)	23.1 (4.1)	76.9 (4.1)	59.9 (4.6)	50.7 (5.1)	62.6 (3.0)	88.5 (2.2)	62.1 (4.2)
≥6 CPD (N=188)	12.5 (2.8)	87.5 (2.8)	48.7 (4.0)	51.3 (4.0)	31.4 (4.7)	68.6 (4.7)	68.5 (3.8)	45.0 (3.2)	59.8 (3.8)	78.5 (2.9)	80.5 (4.6)
Thailand (N=195)											
1 CPD (N=48)	70.3 (6.8)	29.7 (6.8)	19.8 (4.6)	80.2 (4.6)	31.2 (5.0)	68.8 (5.0)	78.5 (6.4)	72.7 (8.8)	66.9 (7.1)	86.1 (3.6)	33.7 (4.8)
2-5 CPD (N=103)	62.6 (4.5)	37.4 (4.5)	12.1 (2.8)	87.9 (2.8)	30.9 (5.2)	69.1 (5.2)	65.3 (5.2)	64.9 (5.1)	88.6 (3.4)	84.5 (3.2)	64.7 (4.7)
≥6 CPD (N=44)	34.7 (5.6)	65.3 (5.6)	6.3 (4.9)*	93.7 (4.9)	29.4 (8.2)	70.6 (8.2)	59.4 (5.6)	70.0 (6.2)	80.0 (4.6)	80.2 (6.6)	79.2 (4.6)
Malaysia (N=237)											
1 CPD (N=100)	74.7 (5.0)	25.3 (5.0)	13.5 (2.8)	86.5 (2.8)	27.7 (4.9)	72.3 (4.9)	68.5 (3.5)	83.9 (4.0)	81.3 (2.5)	86.3 (2.5)	40.0 (4.6)
2-5 CPD (N=107)	57.6 (7.0)	42.4 (7.0)	7.7 (3.0)	92.3 (3.0)	32.9 (3.3)	67.1 (3.3)	69.2 (4.9)	67.8 (5.5)	80.4 (4.6)	83.2 (4.0)	68.3 (4.5)
≥6 CPD (N=30)	56.7 (8.8)	43.3 (8.8)	6.3 (2.8)*	93.7 (2.8)	31.0 (10.1)*	69.0 (10.1)	73.0 (7.8)	49.6 (10.1)	55.1 (9.1)	52.7 (5.1)	84.9 (5.5)
South Africa (N=417)											
1 CPD (N=98)	23.2 (5.5)	76.8 (5.5)	46.1 (4.4)	53.9 (4.4)	18.1 (3.3)	81.9 (3.3)	56.4 (3.4)	81.1 (5.7)	74.7 (4.3)	76.9 (3.9)	36.4 (3.6)
2-5 CPD (N=201)	9.0 (2.1)	91.0 (2.1)	41.8 (4.1)	58.2 (4.1)	16.2 (2.1)	83.8 (2.1)	54.4 (3.7)	80.5 (2.2)	79.8 (1.5)	83.7 (2.6)	72.5 (2.0)
≥6 CPD (N=118)	8.1 (2.8)	91.9 (2.8)	22.5 (3.6)	77.5 (3.6)	29.5 (4.6)	70.5 (4.6)	58.1 (4.8)	71.5 (3.4)	77.9 (3.4)	76.5 (2.4)	88.6 (3.4)
Jordan (N=68)											
1 CPD (N=31)	35.2 (6.3)	64.8 (6.3)	45.1 (7.9)	54.9 (7.9)	22.4 (3.9)	77.6 (3.9)	66.5 (6.3)	52.7 (8.2)	50.2 (9.1)	65.1 (7.3)	36.4 (5.1)
2-5 CPD (N=17)	52.0 (9.4)	48.0 (9.4)	33.1 (14.2)*	66.9 (14.2)	24.7 (9.8)*	75.3 (9.8)	61.0 (9.6)	53.1 (10.0)	50.5 (8.7)	62.0 (10.0)	64.2 (8.4)
≥6 CPD (N=20)	25.1 (12.7)*	74.9 (12.7)	8.8 (4.4)*	91.2 (4.4)	51.4 (9.3)	48.6 (9.3)	62.8 (9.1)	34.6 (9.1)	45.6 (8.7)	27.7 (8.5)*	86.0 (5.1)

CPD, cigarettes per day; TTFC/C+, time to first cigarette or craving positive; SE, standard error.

*Estimates with RSE >30%.

Table 3

Bivariate Analysis of Factors Associated With TTFC/C+ Among Current Smokers

	Slovakia (N=590)		Argentina (N=688)		Thailand (N=195)		Malaysia (N=237)		South Africa (N=417)		Jordan (N=68)	
Characteristic	**TTFC/C+, %**	**Bivariate OR (95% CI)**	**TTFC/C+, %**	**Bivariate OR (95% CI)**	**TTFC/C+, %**	**Bivariate OR (95% CI)**	**TTFC/C+, %**	**Bivariate OR (95% CI)**	**TTFC/C+, %**	**Bivariate OR (95% CI)**	**TTFC/C+, %**	**Bivariate OR (95% CI)**
Age												
< 15 years	64.6	Referent	55.5	Referent	58.6	Referent	50.8	Referent	73.2	Referent	52.5	Referent
≥ 15 years	72.9	1.47 (0.8, 1.9)*	58.9	1.1 (0.8, 1.6)	63.9	1.3 (0.8, 2.1)	72.3	2.5 (1.4, 4.6)*	69.2	0.8 (0.5, 1.4)	63.2	1.6 (0.9, 2.8)*
Sex												
Male	67.6	Referent	57.0	Referent	63.8	Referent	60.3	Referent	66.8	Referent	56.4	Referent
Female	69.5	1.1 (0.7, 1.7)	58.7	1.1 (0.7, 1.6)	40.3	0.4 (0.2, 1.0)*	41.1	0.5 (0.2, 1.0)*	74.7	1.5 (1.0, 2.2)*	66.3	1.5 (0.7, 3.5)
Smoking DPM												
1 or 2 days	33.6	Referent	32.6	Referent	31.5	Referent	36.3	Referent	36.6	Referent	44.6	Referent
3-9 days	48.8	1.9 (1.1, 3.4)*	42.3	1.5 (0.7, 3.2)	36.5	1.2 (0.5, 3.3)	43.1	1.3 (0.7, 2.4)	64.1	3.1 (1.7, 5.8)*	40.2	0.8 (0.4, 1.7)
10-29 days	78.8	7.4 (4.2, 12.8)*	60.3	3.1 (1.7, 5.6)*	67.9	4.6 (2.2, 9.6)*	81.4	7.7 (4.3, 13.7)*	63.3	3.0 (1.6, 5.4)*	71.9	3.2 (0.6, 17.6)*
All 30 days	90.6	19.0 (10.0, 35.9)*	84.9	11.7 (5.5, 24.8)*	88.0	15.9 (6.2, 41.0)*	85.1	10.0 (4.3, 23.3)*	81.5	7.6 (3.2, 18.3)*	95.0	23.4 (2.2, 243.3)*
CPD												
≤1 CPD	39.5	Referent	38.9	Referent	33.7	Referent	40.0	Referent	36.4	Referent	36.4	Referent
2-5 CPD	70.6	3.7 (2.4, 5.7)*	62.1	2.6 (1.8, 3.7)*	64.7	3.6 (2.1, 6.3)*	68.3	3.2 (1.7, 6.3)*	72.5	4.6 (3.3, 6.4)*	64.2	3.1 (1.0, 9.9)*
≥6 CPD	86.5	9.8 (5.3, 18.4)*	80.5	6.5 (3.3, 12.6)*	79.2	7.5 (3.9, 14.5)*	84.9	8.4 (2.8, 25.8)*	88.6	13.7 (6.0, 30.9)*	86.0	10.8 (3.6, 32.0)*
Age of first cigarette												
< 12 years old	73.9	1.8 (1.2, 2.7)*	64.5	1.4 (0.9, 2.3)*	50.7	0.5 (0.3, 1.2)*	64.3	1.4 (0.8, 2.7)	74.1	1.3 (0.7, 2.6)	65.4	1.5 (0.5, 4.0)
≥ 12 years old	61.3	Referent	56.0	Referent	65.3	Referent	55.8	Referent	68.5	Referent	56.5	Referent
Parental smoking status												
Nonsmoker	61.4	Referent	49.3	Referent	54.7	Referent	56.7	Referent	67.1	Referent	56.3	Referent
Smoker	71.8	1.6 (1.2, 2.2)*	63.2	1.8 (1.1, 2.8)*	63.8	1.5 (0.9, 2.4)*	59.2	1.1 (0.6, 2.2)	71.7	1.2 (0.9, 1.7)*	61.1	1.2 (0.5, 3.3)
Wants to stop smoking now												
No	73.8	1.5 (0.9, 2.5)*	64.7	1.7 (1.2, 2.6)*	63.3	1.2 (0.7, 2.1)	71.1	2.1 (1.4, 3.3)*	83.9	2.7 (1.4, 5.4)*	70.5	2.7 (1.1, 6.7)*
Yes	65.1	Referent	51.5	Referent	59.6	Referent	53.5	Referent	65.6	Referent	46.8	Referent
Tried to stop smoking in past year												

Characteristic	Slovakia (N=590)		Argentina (N=688)		Thailand (N=195)		Malaysia (N=237)		South Africa (N=417)		Jordan (N=68)	
	TTFC/C+, %	Bivariate OR (95% CI)	TTFC/C+, %	Bivariate OR (95% CI)	TTFC/C+, %	Bivariate OR (95% CI)	TTFC/C+, %	Bivariate OR (95% CI)	TTFC/C+, %	Bivariate OR (95% CI)	TTFC/C+, %	Bivariate OR (95% CI)
No	66.3	Referent	54.8	Referent	64.5	Referent	73.1	Referent	73.0	Referent	60.3	Referent
Yes	69.1	1.1 (0.7, 1.7)	60.2	1.2 (0.9, 1.8)	60.0	0.8 (0.4, 1.5)	54.2	0.4 (0.2, 0.8)*	68.7	0.8 (0.5, 1.3)	58.4	0.9 (0.4, 2.4)
Thinks able to quit if wanted to												
No	95.0	Referent	75.7	Referent	71.4	Referent	73.2	Referent	75.0	Referent	73.5	Referent
Yes	63.2	0.1 (0.03, 0.26)*	55.4	0.4 (0.2, 0.8)*	58.8	0.6 (0.2, 1.7)	54.9	0.4 (0.2, 0.9)*	68.4	0.7 (0.5, 1.1)*	46.4	0.3 (0.1, 0.7)*

CI, confidence interval; OR, odds ratio; CPD, cigarettes per day; DPM, days per month; TTFC/C+, time to first cigarette or craving positive.

*$p < .2$.

Table 4

Odds Ratios (95% CI) for the Relation of DPM and of Number of CPD With TTFC/C+

	Age- and Sex-Adjusted OR (95% CI)				
	Slovakia (N=590)	**Argentina (N=688)**	**Thailand (N=195)**	**Malaysia (N=237)**	**South Africa (N=417)**
DPM of cigarette smoking					
1 or 2 days	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)
3 to 9 days	1.8 (1.0, 3.3)	1.7 (0.9, 3.5)	1.1 (0.4, 2.8)	1.2 (0.7, 2.0)	3.1 (1.6, 6.1)
10 to 29 days	7.3 (4.2, 12.8)	3.8 (2.2, 6.7)	4.0 (2.0, 8.3)	6.7 (3.4, 13.0)	3.5 (1.8, 6.7)
All 30 days	18.6 (9.8, 35.2)	15.0 (7.0, 32.3)	14.6 (5.6, 38.4)	7.8 (3.3, 18.4)	9.6 (3.8, 24.3)
p for overall trend	<.001	<.001	<.001	<.001	<.001
Number of smoked CPD					
1 cigarette per day	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)
2 to 5 cigarettes per day	3.7 (2.3, 5.8)	2.7 (1.9, 4.0)	3.5 (1.9, 6.4)	2.9 (1.5, 5.4)	5.6 (3.7, 8.4)
≥6 cigarettes per day	9.9 (5.2, 18.8)	7.3 (3.8, 14.1)	7.3 (3.5, 15.2)	7.4 (2.4, 23.3)	19.6 (7.8, 48.9)
p for overall trend	<.001	<.001	<.001	<.001	<.001
	Fully*-Adjusted OR (95% CI)				
DPM of cigarette smoking					
1 or 2 days	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)
3 to 9 days	1.8 (1.0, 3.3)	1.8 (0.8, 3.7)	1.2 (0.5, 2.9)	1.1 (0.6, 1.9)	2.9 (1.5, 5.6)
10 to 29 days	6.6 (3.6, 12.0)	3.8 (2.1, 6.9)	4.4 (1.8, 10.8)	6.2 (3.2, 12.1)	3.0 (1.5, 6.0)
All 30 days	13.7 (7.1, 26.4)	13.3 (5.8, 30.6)	18.9 (7.7, 46.5)	6.4 (2.6, 15.9)	8.6 (3.4, 22.1)
p for overall trend	<.001	<.001	<.001	<.001	<.001
Number of smoked CPD					
1 cigarette per day	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)	1 (Referent)
2 to 5 cigarettes per day	3.3 (2.1, 5.2)	2.7 (1.8, 4.0)	4.2 (2.1, 8.6)	2.9 (1.5, 5.4)	5.9 (3.6, 9.5)
≥6 cigarettes per day	6.7 (3.5, 12.7)	6.4 (3.2, 12.6)	9.3 (4.8, 17.8)	6.1 (1.9, 19.5)	19.5 (7.5, 50.9)
p for overall trend	<.001	<.001	<.001	<.001	<.001

CPD, cigarettes per day; DPM, days per month; TTFC/C+, time to first cigarette or craving positive; CI, confidence interval; OR, odds ratio.

*Adjusted for age, sex, age of first cigarette, parental smoking status, previous attempts to quit smoking in the past year, and perception of ability to quit smoking. Variables included for fully-adjusted analyses if $p < .2$ in bivariate analysis or if epidemiologic plausibility suggested an association with TTFC/C.

Table 5

Odds Ratios (95% CI) for the Relation of Additional Covariates to TTFC/C+ With Respect to DPM of Cigarette Smoking and Number of Smoked CPD

	Fully† -Adjusted OR (95% CI) With Respect to DPM of Cigarette Smoking				
Characteristic	**Slovakia**	**Argentina**	**Thailand**	**Malaysia**	**South Africa**
Age					
<15 years	Referent	Referent	Referent	Referent	Referent
≥15 years	1.2 (0.8, 1.8)	0.7 (0.5, 1.0)*	0.9 (0.5, 1.7)	2.0 (1.1, 3.6)*	0.9 (0.5, 1.5)
Sex					
Male	Referent	Referent	Referent	Referent	Referent
Female	1.4 (0.9, 2.2)	1.4 (0.9, 2.1)	0.4 (0.2, 0.9)*	0.5 (0.2, 1.1)	1.9 (1.2, 3.1)*
Age of first cigarette					
<12 years old	1.6 (1.1, 2.2)*	1.1 (0.6, 2.0)	0.5 (0.2, 0.8)*	N/A	N/A
≥12 years old	Referent	Referent	Referent	Referent	Referent
Parental smoking status					
Nonsmoker	Referent	Referent	Referent	Referent	Referent
Smoker	1.3 (0.9, 1.9)	1.5 (1.0, 2.5)	2.5 (1.2, 5.3)*	N/A	1.2 (0.8, 1.7)
Wants to stop smoking now					
No	1.2 (0.8, 2.0)	1.6 (1.0, 2.6)*	N/A	1.1 (0.6, 2.1)	2.6 (1.3, 5.4)*
Yes	Referent	Referent	Referent	Referent	Referent
Tried to stop smoking in past year					
No	Referent	Referent	Referent	Referent	Referent
Yes	N/A	N/A	N/A	0.6 (0.2, 1.6)	N/A
Thinks able to quit if wanted to					
No	Referent	Referent	Referent	Referent	Referent
Yes	0.2 (0.1, 0.5)*	0.7 (0.4, 1.5)	N/A	0.8 (0.4, 1.9)	0.9 (0.6, 1.5)
	Fully† -Adjusted OR (95% CI) With Respect to Number of Smoked CPD				
Age					
<15 years	Referent	Referent	Referent	Referent	Referent
≥15 years	1.4 (0.9, 2.1)	0.8 (0.6, 1.1)	0.9 (0.5, 1.5)	2.1 (1.1, 3.9)*	0.7 (0.3, 1.4)
Sex					
Male	Referent	Referent	Referent	Referent	Referent
Female	1.5 (0.9, 2.4)	1.3 (0.8, 2.0)	0.4 (0.2, 0.9)*	0.5 (0.2, 1.1)	2.3 (1.3, 3.8)*
Age of first cigarette					
<12 years old	1.5 (1.0, 2.3)*	1.1 (0.6, 2.0)	0.5 (0.2, 1.1)	N/A	N/A
≥12 years old	Referent	Referent	Referent	Referent	Referent
Parental smoking status					
Nonsmoker	Referent	Referent	Referent	Referent	Referent
Smoker	1.2 (0.9, 1.7)	1.8 (1.1, 2.9)*	2.4 (1.3, 4.4)*	N/A	1.1 (0.8, 1.7)

Characteristic	Fully† -Adjusted OR (95% CI) With Respect to DPM of Cigarette Smoking				
	Slovakia	**Argentina**	**Thailand**	**Malaysia**	**South Africa**
Wants to stop smoking now					
No	1.2 (0.8, 2.0)	1.6 (1.1, 2.3)*	N/A	1.0 (0.6, 2.0)	2.5 (1.4, 4.4)*
Yes	Referent	Referent	Referent	Referent	Referent
Tried to stop smoking in past year					
No	Referent	Referent	Referent	Referent	Referent
Yes	N/A	N/A	N/A	0.6 (0.2, 1.3)	N/A
Thinks able to quit if wanted to					
No	Referent	Referent	Referent	Referent	Referent
Yes	0.2 (0.1, 0.5)*	0.6 (0.3, 1.1)	N/A	0.7 (0.3, 1.6)	0.7 (0.4, 1.2)

CPD, cigarettes per day; DPM, days per month; TTFC/C+, time to first cigarette or craving positive; CI, confidence interval; OR, odds ratio; N/A, not applicable because the covariate was not included in the multivariable model.

* $p < .05$

† Adjusted for age, sex, age of first cigarette, parental smoking status, previous attempts to quit smoking in the past year, and perception of ability to quit smoking. Variables included for fully-adjusted analyses if $p < .2$ in bivariate analysis or if epidemiologic plausibility suggested an association with TTFC/C.