The tobacco dependence dimension in Colombia

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ABSTRACT *This epidemiological study of a sample of smokers from the general population of Colombia examined the population distribution and dimensionality of eight hypothesized inter-correlated clinical features (CFs) associated with tobacco dependence syndrome (TDS). Data were drawn from interviews of 4 426 smokers conducted in a national survey in Colombia as part of the World Mental Health Survey Initiative. Daily smokers completed a Spanish-language TDS module, and the 237 smokers who had begun smoking during the five years prior to the assessment were selected. Confirmatory factor analysis (CFA) for a unidimensional TDS provided discrimination and difficulty parameter estimates. Two CFs that were reported very infrequently among the study sample were dropped from the CFA. Among the six remaining CFs, discrimination (D1) estimates ranged from 1.1 to 6.0 and difficulty (D2) estimates ranged from 1.1 to 2.2, providing evidentiary support for a unidimensional tobacco dependence construct. The Spanish-language TDS module used in this study could serve as a valuable tool in future studies for evaluating public health outreach and early intervention programs directed toward community residents who have begun smoking tobacco.*

Key words Tobacco use disorder; epidemiologic methods; Colombia.

The primary aim of this study was to shed new light on the epidemiology of tobacco smoking and tobacco dependence in Colombia, with a focus on the occurrence and covariation of inter-correlated clinical features (CFs) of tobacco dependence syndrome (TDS) occurring within five years of smoking onset. Located in the northwest region of South America, Colombia is one of the many emerging market economies where tobacco use is recognized as a growing public health challenge of major importance, as reflected in epidemiological estimates from community surveys and studies conducted among teenagers and students entering medical school. The community surveys of adult smokers indicate that 1) more than 50% of men and 25% of women smoke tobacco cigarettes, and 2) among individuals who have ever smoked during their lifetime, 35%–40% remain smokers (1–3). Results of studies among Colombian medical students indicate more than one in four are current smokers (4). Cross-national comparisons based on the Global Youth Tobacco Surveys (GYTS) of 13–15 year olds conducted in the capital city of Bogotá in 2001 and 2007 indicate Colombia has an exceptionally high prevalence of youthful tobacco smoking (5). Precocious tobacco cigarette smoking among teens in Colombia predicts other health-compromising behaviors, consistent with adolescent research elsewhere (6).

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In addition to conventional tobacco prevention and control initiatives based on taxation; social policy change (e.g., restrictions on smoking in restaurants); mass media campaigns; school-based drug education programs; and the establishment of smoking cessation programs, public health authorities in Colombia are considering the use of aggressive programs of early intervention and outreach to smokers during the initial months and years of smoking onset. Effective planning of early intervention programs will depend in part on educating both the public and health professionals on the effects of TDS, which can complicate an individual's efforts to quit smoking, and may require prescription medicines or nicotine replacement therapy, in addition to brief interpersonal interventions (7, 8). Other than the current study no community assessments of TDS have been conducted in Colombia, and there is no prior research on the psychometric performance of TDS indicators in general community samples of Colombia's smokers. The current study used a Spanish-language version of a TDS assessment module developed and tested in the recently completed Colombian National Study of Mental Health (NSMH). This report is the first publication on this topic, which builds on prior research conducted among current and former smokers identified in the NSMH (3).

To increase the science base of the epidemiological evidence that is required to design and plan early interventions for smokers within the first months and years of initial onset of smoking (9), the current research focused on individuals who had started smoking no more than five years prior to the date of their recruitment and assessment in the community survey. Studying those who had commenced smoking in the five years preceding the study ("recent-onset" smokers) versus all-lifetime ("ever") or current ("now-active") smokers helps minimize recall bias, as well as survival biases, which become common concerns when lifetime data are collected from cross-sectional surveys. The current study had a clearly predefined source population—community-dwelling adults (i.e., those who are not in assisted living or nursing homes) living in Colombia—so the study results are directly applicable to that population. The assessment examined 1) the epidemiology of tobacco smoking and tobacco dependence in Colombia as manifest in the population-level occurrence of specific inter-correlated clinical features of tobacco dependence occurring in the first five years after smoking onset, and 2) the dimensionality of the TDS assessment scale used in the research. Understanding the dimensionality of the TDS among recent-onset smokers is crucial for effective planning of new research to evaluate early public health interventions among smokers, as well as the quantification of program impact.

The survey methods used in the NSMH, which were approved by boards specialized in the protection of human subjects in research, have been described in detail in previous studies (2, 3, 10). In brief, 4 426 Spanish-speaking household-dwelling adults were recruited cross-sectionally for standardized assessments via multistage probability sampling at 1) the primary sampling unit level (the neighborhood), 2) the household level, and 3) the individual (designated-respondent) level. The survey had a participation level of 88%. All respondents with a history of daily smoking for at least two months completed a multi-item TDS module as part of the World Mental Health (WMH) Survey Initiative Composite International Diagnostic Interview (CIDI), which was based on a translation, back-translation, and harmonization protocol. Fourteen CIDI TDS questions were used to assess eight CFs of tobacco dependence, which were measured as categorical indicators of the underlying TDS construct. The eight CFs were "tolerance" (needed to use tobacco more than before to get desired effects or noticed that same amount of tobacco use had less effect than before), "withdrawal" (experienced four or more withdrawal symptoms after abrupt cessation or reduction of tobacco use), "smoking more than intended," "difficulty cutting down," "salience" (spent a great deal of time getting or using tobacco or recovering from the effects of tobacco), "giving up activities for smoking," "smoke despite physical/psychological problems," and "strong desire to smoke." The CIDI tobacco module also collected information about respondents' age of smoking onset. The analytical sample for this study consisted of individuals who began smoking during the five years prior to the assessment (n = 237).

Confirmatory factor analysis (CFA) for a unidimensional TDS provided discrimination and difficulty parameter estimates. To account for survey design effects, as well as variations in both selection probabilities (e.g., in relation to household size) and subgroup survey participation levels resulting from the use of multistage sampling, Mplus statistical software (Version 6, Muthen & Muthen, Los Angeles, CA, USA) was used to incorporate sampling probability weights and post-stratification factors for nonparticipation. Two of the eight CFs ("smoking despite physical/psychological problems" and "giving up activities for smoking") occurred very infrequently (affecting only 8 and 2 smokers, respectively) and were therefore dropped from the CFA. The remaining six CFs qualified as "categorical" indicators of TDS. When these indicators have discrete categorical values and are not Gaussian, discrimination ("factor-loading") estimates are not constrained to equal or exceed 1.0. Therefore, as shown in the tables, some discrimination parameter estimates exceeded 1.0, with no implication of over-extraction in the unidimensional model.

Table 1 shows selected characteristics of the study sample (adults who began smoking daily for at least two months during the five years prior the study). Table 2 shows epidemiological estimates of the cumulative occurrence of the six CFs associated with tobacco dependence (with a Kuder-Richardson estimate of Cronbach's reliability coefficient for the unidimensional TDS scale of 0.82), and CFA discrimination (D1) and difficulty (D2) parameter estimates for each CF, along with model fit indices for the unidimensional model. The corresponding item characteristic curves (ICCs) are shown in Figure 1. D1 estimates ranged from 1.1 to 6.0 (compatible with the categorical nature of the items), and item difficulty estimates ranged from 1.1 to 2.2. An exploratory factor analysis (EFA) bi-dimensional model yielded suboptimal discrimination parameter estimates (D1), with a suboptimal set of factor loadings for all but one item, as well as an uninterpretable second dimension (Table 2). Model fit statistics did not favor the two-factor model over the one-factor model.

The main findings may be summarized succinctly. First, among tobacco-smoking adult community survey participants, all with fairly recent smoking onset, there was evidence that "smoking

TABLE 1. Selected characteristics of adult recent-onset smokers[a] in epidemiological assessment of tobacco dependence syndrome (TDS), Colombia, 2003[b]

Selected characteristics	No.	Adult recent-onset smokers (n = 327) %	95% CI[c]
Sex			
Female	137	47.5	39.3–55.8
Male	100	52.5	44.2–60.7
Age (years)			
18–29	207	93.0	89.9–95.2
≥ 30	30	7.0	4.5–14.1
Education level			
No/some secondary school	184	73.7	65.2–8.07
Completed secondary school	23	12.7	7.5–20.7
Some college and above	30	13.6	8.9–21.1
Marital status			
Married/cohabiting	72	24.0	19.5–29.2
No longer married	16	3.4	1.9–6.2
Never married	149	72.6	67.1–77.4
Employment status			
Working	118	45.3	37.9–52.8
Student	41	25.5	17.0–36.3
Homemaker	33	9.1	5.6–14.4
Retired	1	0.4	0.1–2.8
Other	44	20.0	14.0–27.2

[a] Those who reported first onset of daily smoking for at least two months during the five years prior to the study.
[b] Data from the Colombian National Study of Mental Health (NSMH) (1, 3).
[c] CI: confidence interval.

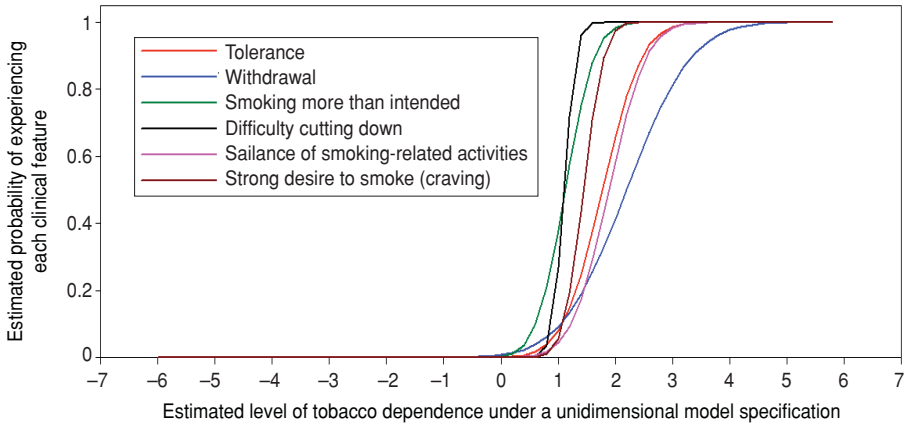
more than intended" and "difficulty cutting down" were the most commonly experienced clinical features associated with tobacco dependence. There was also evidence to support a unidimensional tobacco dependence construct, consistent with unidimensional solutions reported for community samples of smokers studied elsewhere (mainly in the United States). Second, despite the study's focus on recent-onset smokers, expectations based on prior research among other types of samples were met with regard to two CFs: "tolerance," which was found to occur at lower levels of tobacco dependence, and "giving up activities for smoking," which was found too infrequently to estimate occurrence. On the other hand, the estimated occurrence of the CF "smoking more than intended" was found to occur at lower TDS levels versus the medium TDS level observed in studies of U.S. ever-smokers (11, 12), a variation that may be attributable to the study's focus on individuals who began smoking daily in the five years directly preceding the study. The CIDI TDS mod-

TABLE 2. Epidemiological estimates for cumulative occurrence of six clinical features associated with tobacco dependence syndrome (TDS) among adult recent-onset smokers,[a] results of one- and two-factor analysis, and model-fitting indices, Colombia, 2003[b]

Clinical feature	Occurrence (%)	Confirmatory factor analysis (CFA) D1[c] Coefficient	D1[c] Standard error	D2[d] Coefficient	D2[d] Standard error	Bi-dimensional exploratory factor analysis (EFA) Factor 1 Factor loading	Factor 2 Factor loading
Tolerance[e]	6.0	1.82	0.67	1.78	0.37	0.11	0.81
Withdrawal[f]	5.1	1.11	0.29	2.20	0.34	0.12	0.66
Smoking more than intended	14.8	2.47	0.85	1.13	0.18	0.43	0.50
Difficulty cutting down	13.8	5.99	6.81	1.10	0.16	0.91	0.001
Salience[g]	4.7	1.92	0.67	1.89	0.37	0.001	0.876
Strong desire to smoke	8.2	3.56	2.11	1.45	0.22	1.06	–0.04
Model-fitting indices							
Chi-square (DF,[h] P-value)			9.287 (9, 0.411)				2.785 (4, 0.594)
CFI[i] / TLI[j]			1.000 / 0.999				1.000 / 1.007
RMSEA[k]			0.003				< 0.001

[a] Those who reported first onset of daily smoking for at least two months during the five years prior to the study.
[b] Data from the Colombian National Study of Mental Health (NSMH) (1, 3).
[c] D1: discrimination parameter.
[d] D2: difficulty parameter.
[e] Needed to use tobacco more than before to get desired effects or noticed that same amount of tobacco use had less effect than before.
[f] Experienced four or more withdrawal symptoms after abrupt cessation or reduction of tobacco use.
[g] Spent a great deal of time getting or using tobacco or recovering from the effects of tobacco.
[h] DF: degrees of freedom.
[i] CFI: comparative fit index.
[j] TLI: Tucker Lewis index.
[k] RMSEA: root mean square error of approximation.

FIGURE 1. Clinical features of tobacco dependence syndrome (TDS): estimated item characteristic curves for adult recent-onset smokers[a] (*n* = 237), Colombia, 2003[b]



[a] Those who reported first onset of daily smoking for at least two months during the five years prior to the study.
[b] Data from the Colombian National Study of Mental Health (NSMH) (1, 3).

ule appears to have performed as expected, underscoring its potential as a unidimensional tool for future research projects in Colombia. The results of this brief assessment could prove useful in evaluating public health outreach and early intervention programs in Colombia and elsewhere, although adaptations may be required for use among adolescent daily smokers (13).

The authors of the current study had hoped to study newly incident smokers (those who had started smoking during the two years directly preceding the assessment), as in Barondess et al. (9), but there were too few smokers in the Colombia sample with that characteristic. The ultimate study focus on recent-onset smokers (those commencing smoking in the five years preceding the study) was a departure from prior [U.S.] investigations of the dimensionality of tobacco dependence, which have concentrated on all-lifetime (ever) smokers (11, 12), and which have not attempted to study TDS latent structure in relation to the developmental character of smoking trajectories or elapsed time since the first cigarette. Nonetheless, one might expect to find some similarities in the cross-study results. For example, Strong and colleagues (12) produced evidence that tolerance might develop at very low levels of tobacco dependence severity, whereas withdrawal and giving up or reducing activities in order to smoke might develop only at higher levels. Accordingly, in this initial investigation of the tobacco dependence dimension in Colombia, estimates were produced for difficulty as well as discrimination parameters, with an expectation that the difficulty parameter estimates for withdrawal and reducing activities to smoke would be larger than the corresponding estimate for tolerance.

Several study limitations deserve mention, including the fact that the number of recent-onset smokers in this community sample is too constrained for detailed research on subgroup variation in parameter estimates (e.g., male–female differences) and detailed differential item functioning analyses, as conducted by others (12). Also, due to the small number of recent-onset smokers (237), a few estimates may not be very precise. It should also be noted that the current study sample did not include smokers reporting "no sustained daily smoking" (only those who had smoked daily for at least two months). For future research, the authors recommend administering the TDS to all smokers, given the possibility of very early TDS onsets (13).[6] Counterbalancing strengths of the study include the use of 1) community sampling, to overcome potential biases in clinical research on help-seeking patients, and 2) the CIDI assessment module.

Future research should include testing the dimensionality of the TDS module in community surveys of newly incident smokers (those who had started smoking during the two years preceding the study), including adolescent smokers, with differentiation of persistent daily smokers. With some additional work-up, the Spanish version of this WMH CIDI TDS module might serve a useful purpose in screening and in brief interventions to promote smoking cessation soon after onset.

In conclusion, based on a sample of recent-onset daily tobacco smokers in Colombia, the authors of the current study found evidence in support of a unidimensional TDS construct as well as evidence that may support the use of this TDS scale in future smoking prevention and control efforts in Colombia, and possibly elsewhere. As in prior research among U.S. samples, tolerance occurred at lower TDS levels; at higher TDS levels, there were withdrawal symptoms. Given these results, the Spanish-language TDS module used in the current study, which is available free of charge, deserves consideration as a potential assessment tool for evaluation of future public health outreach and early intervention programs.

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RESUMEN

Dimensión de la dependencia del tabaco en Colombia

En el presente estudio epidemiológico de una muestra de fumadores de la población general de Colombia se examinó la distribución y la magnitud de ocho características clínicas interrelacionadas en forma hipotética, que se asocian con el síndrome de dependencia del tabaco. Los datos se extrajeron de las entrevistas realizadas a 4 426 fumadores en una encuesta nacional en Colombia, que formó parte de la Iniciativa de la Encuesta de Salud Mental Mundial. Los fumadores habituales completaron un módulo de evaluación del síndrome de dependencia del tabaco y se escogieron los 237 fumadores que habían comenzado el consumo de tabaco en los cinco años que precedieron a la evaluación. El análisis factorial confirmatorio del modelo unidimensional del síndrome de dependencia del tabaco proporcionó los índices de discriminación y de dificultad de cada variable. Dos características clínicas que se notificaron con muy poca frecuencia en la muestra del estudio se excluyeron del análisis factorial. El índice de discriminación de las seis características restantes osciló entre 1,1 y 6,0, y el índice de dificultad fluctuó entre 1,1 y 2,2, con lo cual se demostró la validez de un modelo unidimensional de la dependencia. El módulo de evaluación en español del síndrome de dependencia del tabaco usado en este estudio podría constituir un instrumento valioso en estudios futuros destinados a evaluar los programas de salud pública de divulgación y de intervención temprana dirigidos a los residentes de la comunidad que han comenzado a fumar.

Palabras clave Trastorno por uso de tabaco; métodos epidemiológicos; Colombia.