

3.1 Measuring tobacco use behaviours

Introduction

The majority of tobacco control policies are designed to reduce tobacco use or exposure to tobacco smoke in the environment; strategies that are clearly supported by the scientific literature (US Department of Health and Human Services, 2004, 2006; IARC, 2004, 2007a). Preventing initiation and promoting quitting are the two major tobacco control strategies designed to reduce use. To facilitate progress, article 20 of the WHO Framework Convention on Tobacco Control (FCTC) calls for Parties to:

- “(a) establish progressively a national system for the epidemiological surveillance of tobacco consumption and related social, economic and health indicators
- (b) cooperate with competent international and regional inter-governmental organizations and other bodies, including governmental and nongovernmental agencies, in regional and global tobacco surveillance and exchange of information on the indicators specified in paragraph 3(a) of this Article
- (c) cooperate with the World Health Organization in the development of general guidelines or procedures for defining the collection, analysis and dis-

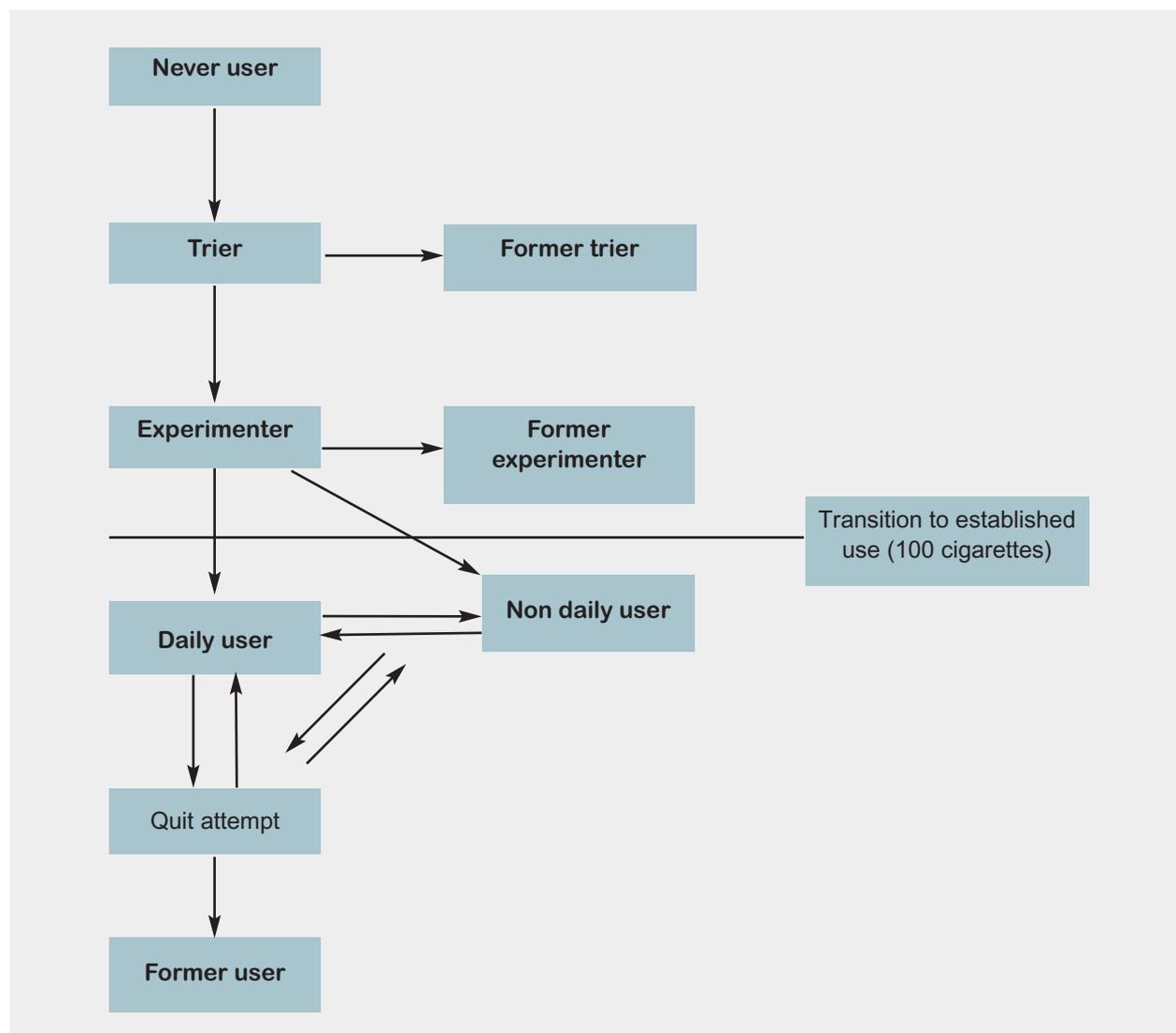
semination of tobacco-related surveillance data.”

In addition, Section 1-d of Article 21 requires each ratifying nation to provide periodic updates on surveillance and research as specified in Article 20. Article 22 calls for cooperation among the Parties to promote the transfer of technical and scientific expertise on surveillance and evaluation, among other topics (WHO, 2003).

This section will first review the natural history of tobacco use (e.g. initiation, current use, cessation). In epidemiologic studies of disease etiology, such as those discussed in IARC Monographs (e.g. IARC 2004) and reports of the Surgeon General (US Department of Health and Human Services, 2004), tobacco use behaviours (e.g. number of years smoked, number of cigarettes consumed each day) serve as independent variables. In the evaluation of the tobacco policies discussed in this Handbook, tobacco use behaviours serve as dependent variables. The section will then discuss factors that can influence the validity of self-report and factors that can influence comparability across surveys. The section will end by describing several measures to assess use, providing examples from cross-national surveillance and evaluation systems (Section 4.3), as well as national sources.

Natural history of tobacco use

The natural history of tobacco use is often conceptualized as a series of steps that can progress from never use, to trial, experimentation, established use, attempting to quit, relapse, and/or maintenance of cessation (Figure 3.1 and Table 3.1) (US Department of Health and Human Services, 1990, 1994; Marcus *et al.*, 1993; Pierce *et al.*, 1998b; Mayhew *et al.*, 2000; Choi *et al.*, 2001; Hughes *et al.*, 2003). Prior to actual initiation of use, never users often think about use, a step in the process that is described in Section 3.2. After initial trial, users can either continue to experiment or discontinue and become former triers. Experimenters can either progress to established user or discontinue use and become former experimenters. Recent research suggests that nicotine dependence may appear during the experimentation phase, before use becomes established (DiFranza *et al.*, 2002a; O’Loughlin *et al.*, 2003; Fidler *et al.*, 2006). Use becomes established when a threshold of cumulative lifetime exposure is surpassed. The exact threshold of established use is unknown and likely varies considerably, but is often considered as having smoked at least 100 lifetime cigarettes, or being exposed to a similar amount



Note: “Use” involves consumption of cigarettes, other forms of smoked tobacco products, and/or various smokeless tobacco products.

Figure 3.1 The natural history of tobacco use

- I. **Initiation**
 - a. Intention to try (Section 3.2)
 - b. Initial trial
 - i. Discontinuation after initial trial
 - c. Experimentation
 - i. Discontinuation of experimentation
- II. **Transition to established use**
 - a. Ever daily versus never-daily
- III. **Current use**
 - a. Frequency of use (daily versus non-daily)
 - b. Type of product used
 - c. Brand used
 - d. Intensity of use (units/day)
 - e. Topography (for smoked products)
 - f. Purchase patterns (partly covered in Section 5.1)
- IV. **Cessation**
 - a. Intention to quit (Section 3.2)
 - b. Quit attempt
 - i. Intentionality
 - 1. Planned
 - 2. Spontaneous
 - ii. Dose management
 - 1. Abrupt discontinuance
 - 2. Gradual reduction
 - iii. Methods (Section 5.7)
 - 1. Assisted
 - 2. Unassisted
 - c. Maintenance of abstinence versus return to use

†Here the term “use” means consumption of cigarettes, other forms of smoked tobacco products, and/or various forms of smokeless tobacco

Table 3.1 The Natural History of Tobacco Use†: Key Constructs

of other tobacco products. Established use is generally manifested as daily use. However, persistent, regular non-daily use can also take place (Evans *et al.*, 1992; Husten *et al.*, 1998; Troscclair *et al.*, 2005). Once past the threshold of established use, discontinuance involves an attempt to quit, with the outcome of each quit attempt being either relapse or maintenance of cessation (US Department of Health and Human

Services, 1990; Gilpin & Pierce, 1994; Hughes *et al.*, 2003; West, 2006). Quit attempts can be planned or spontaneous, involve abrupt discontinuance or gradual reduction in use before quitting, and may or may not be assisted by one or more of several available treatment strategies (Fiore *et al.*, 1990; Giovino *et al.*, 1993; West, *et al.*, 2001).

Validity of self-report of current tobacco use behaviours

Survey-based measures of current tobacco use behaviours, assessed in samples that are representative of a given population, allow researchers and policy-makers to estimate patterns of and trends in use overall and for subgroups in the population. National prevalence estimates have, in the vast majority of cases,

been based on self-reports of personal behaviours. Self-report, however, may be subject to misclassification bias. Survey respondents can either state that they do not currently use tobacco, when in fact they do (misclassification of use as non-use), or that they do currently use tobacco when, in fact they do not (misclassification of non-use as use). Each of these misclassification biases can compromise the validity of a survey estimate.

Determining validity:

Validation of self-report is generally conducted using biomarkers of exposure to tobacco or tobacco smoke as criteria. Biomarkers of exposure that have been used in studies include nicotine; cotinine, a major metabolite of nicotine; carbon monoxide; and thiocyanate (Society for Research on Nicotine and Tobacco, 2002; Al-Delaimy, 2002). Nicotine and cotinine are almost exclusively specific to tobacco products. Very low levels of nicotine can be found in some vegetables, but their impact on cotinine levels is insignificant (Pirkle *et al.*, 1996; Society for Research on Nicotine and Tobacco, 2002). Cotinine is preferred over nicotine as a biomarker, because it has a longer half-life in biological fluids than nicotine (~16 hours versus ~2 hours), thus reflecting use over the previous three days for the general population (Society for Research on Nicotine and Tobacco, 2002). Cotinine can be obtained from saliva, urine, and blood (serum).

Saliva is the biological fluid of choice in population-based surveys, because it is the easiest to obtain. Hair nicotine levels reflect exposure over a longer period of time (Al-Delaimy, 2002). Hair samples are even easier to obtain than saliva. However, measurement of nicotine in hair can be influenced by hair color, treatment, and growth rate and identifying nicotine from actual tobacco use versus exposure to environmental sources can be problematic (Al-Delaimy, 2002).

Unfortunately, the use of biomarkers as indicators of actual use is also subject to error. Studies using cotinine to validate self-report must determine a cut-off for discriminating users from non-users. Cut-offs generally range from 10.0-20.0 ng/ml for serum or saliva cotinine among adults (Pirkle *et al.*, 1996; Caraballo *et al.*, 2001, 2004; Society for Research on Nicotine and Tobacco, 2002) and 5.0-11.4 ng/ml saliva or serum for adolescents (McNeill *et al.*, 1987; Caraballo *et al.*, 2004; Post *et al.*, 2005). Optimally, a cut-off is selected in a manner that results in the highest accuracy, defined as the best combination of sensitivity and specificity (Caraballo *et al.*, 2001, 2004). However, actual users may have cotinine levels below the cut-off if their most recent use was not recent enough or of sufficient intensity (in terms of units/day) to generate adequate levels of cotinine to exceed the cut-off, and thus be incorrectly classified as deceivers (Dolcini *et al.*, 1996; Caraballo *et al.*, 2004). Alter-

natively, some actual non-users of a product (e.g. cigarettes) may be exposed to extremely high doses of secondhand smoke, or they may use other tobacco products or nicotine replacement therapy, and thus may test positive for cotinine. Exposure to secondhand smoke, and use of other tobacco products that are available in a given nation, should be determined by questionnaire assessment and accounted for in validity assessments. In addition, cotinine levels may be influenced by racial/ethnic differences in the rate of nicotine metabolism and intake of nicotine per cigarette smoked (Caraballo *et al.*, 1998; Perez-Stable *et al.*, 1998; Benowitz *et al.*, 2002), suggesting that different cut-offs may be needed for different racial/ethnic groups. Furthermore, the cut-off for pregnant women is lower (e.g. 10 ng/ml) than for the general adult population (Rebagliato *et al.*, 1998; Owen & McNeil, 2001; Society for Research on Nicotine and Tobacco, 2002).

Self-reports from studies with a high demand for abstinence can be biased (Velicer *et al.*, 1992; Patrick *et al.*, 1994; Benowitz *et al.*, 2002). Misclassification of use and non-use has been observed in clinical studies of adult smokers who have been advised to quit and subsequently interviewed about their smoking, often times by persons associated with the intervention. This is particularly true among subjects who have diseases or conditions that would benefit from quitting. For example, it was reported that 15 (65%) of 23

self-reported quitters in a cessation trial of chronic obstructive pulmonary disease patients in the Netherlands misreported use as non-use (Monninkhof *et al.*, 2004). In a US study to increase smoking cessation among pregnant women, 49% of self-reported quitters receiving the intervention misclassified use as non-use (Kendrick *et al.*, 1995). In the UK, 11 (22%) of 51 myocardial infarction survivors who had been advised to quit smoking misclassified use as non-use when followed-up during the year after infarction (Sillet *et al.*, 1978). In the same report, 40% of subjects in a trial of nicotine gum misclassified their use as non-use.

Population-based surveys, however, are, in general, comprised of people who experience smoking-attributable morbidity at approximately the rate of the general population, are not linked to advice to quit, and administered by interviewers or data collectors who are not known to the respondent. In general, self-reports of current use from surveys are reasonably accurate, providing estimates of prevalence that are comparable to those obtained from use of a biomarker (Pierce *et al.*, 1987; Velicer *et al.*, 1992; Patrick *et al.*, 1994; Caraballo *et al.*, 2001, 2004; Vartiainen *et al.*, 2002). Data from the surveys used to evaluate the North Karelia project indicate very little misclassification of use as non-use, with no difference in misclassification in North Karelia, where the community-based inter-

vention took place, compared to three other Finnish communities (Vartiainen *et al.*, 2002).

However, in cultures in which smoking among women is socially unacceptable, misclassification appears to be more common. Household interviews were conducted on 1403 Southeast Asian adult immigrants who resided in the USA (Wewers *et al.*, 1995). The cotinine-adjusted estimates of current smoking prevalence were substantially higher than those based on self-report for Cambodian females (21.5% versus 6.6%) and Laotian females (10.8% versus 4.2%). In 1992, health surveys were conducted among 1000 adults residing in Pitkäranta in the District of Karelia, Russia and among 2000 adults residing in North Karelia, Finland (Laatikainen *et al.*, 1999). The cotinine-adjusted estimates of current smoking prevalence were substantially higher than estimates based only on self-report among women from Pitkäranta (21% versus 10%) than among women from North Karelia (16% versus 13%). The researchers attributed the difference to misclassification of actual use as non-use, most likely because of the social unacceptability of smoking among women in that region of Russia. More recently, concerns were raised about misclassification of use as non-use in population-based surveys conducted in the UK and Poland (West *et al.*, 2007). For the UK, cotinine-adjusted prevalence estimates were 2.8 percentage points higher than estimates based on self-

report (27.5% versus 24.7%); for Poland, the difference was 4.2 percentage points (41.8% versus 37.6%).

Misclassification of use as non-use is also more likely in household interviews with adolescents, where privacy may be compromised and disclosure is lessened among those who do not want their parents to learn about their behaviour (Turner *et al.*, 1992; US Department of Health and Human Services, 1994; Brittingham *et al.*, 1998; Fowler & Stringfellow, 2001; Kann *et al.*, 2002). The prevalence of seven tobacco use behaviours was studied (e.g. lifetime cigarette use, current cigarette use, current smokeless tobacco use, current cigar use) in an experiment that varied mode of administration (paper-and-pencil instrument (PAPI) with computer-assisted self-interview (CASI) and survey setting (school versus home)) (Brener *et al.*, 2006). Prevalence differed only for smoking a whole cigarette before age 13 (lower in the PAPI condition) and current smokeless tobacco use (higher in the school setting). Thus, for most of the tobacco-use behaviours measured, home settings can provide prevalence estimates as high as school settings if privacy is increased (both PAPI and CASI afford more privacy than either face-to-face or telephone interviews). It was also demonstrated that when adequate privacy is provided, estimates of cigarette smoking from adolescent surveys conducted in households are similar to those obtained from

surveys conducted in school settings (Gfroerer *et al.*, 1997). Privacy in these studies is afforded by computer-assisted technology, which may not be available in all countries. The four major surveys of adolescents discussed in this Handbook (see Section 4.3) are conducted in schools, which afford even more privacy than homes and provide more efficient venues for data collection.

Self-reports of the number of cigarettes smoked each day appear to be underreported in surveys (Hatziafreu *et al.*, 1989; Section 4.2). Even though cotinine levels increase with increasing number of cigarettes smoked each day (Caraballo *et al.*, 2001; Blackford *et al.*, 2006), survey respondents demonstrate evidence of digit bias towards round numbers (e.g. 10, 15, 20, 30 cigarettes per day) (Klesges *et al.*, 1995), and appear to round down more often than they round up. Comparisons between consumption data and survey-based estimates of consumption should be conducted routinely in countries to provide a crude indicator of the discrepancies between the two sources of information.

Some adolescent survey respondents may indicate they smoke or use smokeless tobacco when they actually do not, perhaps to impress their friends (Cohen *et al.*, 1988; Fowler & Stringfellow, 2001; Stein *et al.*, 2002). However, misclassifying non-use as use appears to be far less common than misclassifying use as non-use (Stein *et al.*, 2002). Adolescent reports that

they have smoked during a recent period of time, even when cotinine levels are below threshold values, may still be accurate, because nicotine dosing from infrequent smoking may not result in levels of cotinine that are high enough to exceed the cut-off value (Caraballo *et al.*, 2004, Dolcini *et al.*, 1996). The Centers for Disease Control and Prevention conducted a test-retest study of reporting and found that answers were reasonably stable over a two-week period, with estimates of prevalence being virtually identical (Fowler & Stringfellow, 2001; Brener *et al.*, 1995). The reliability of answers does not prove that they were not distorted on both occasions, but remembering an exaggerated answer is likely more difficult than remembering a true one (Fowler & Stringfellow, 2001).

Methods to enhance validity:

Methodological techniques have been developed to enhance privacy in survey settings, such as having the respondent complete a paper-and-pencil survey form instead of answering a face-to-face interview, which can be overheard (Brittingham *et al.*, 1998); listen to survey questions using headphones connected to a laptop computer, providing answers via the keyboard (Horm *et al.*, 1996; Brener *et al.*, 2006); and respond to questions posed in a telephone interview by pressing the appropriate number button on the keypad instead of replying verbally (Biener *et al.*, 2004). An experiment was conducted to determine

if estimates of adolescent drug use obtained from data collected confidentially would differ from those based on data that were collected anonymously (O'Malley *et al.*, 2000). They observed no differences in prevalence estimates, but cautioned that any work conducted without anonymity must convince respondents that all their answers will be kept completely confidential. If a survey respondent believes that the veracity of their self-report will be checked biochemically, then they may be more likely to disclose use (Murray & Perry, 1987; Cohen *et al.*, 1988; Aguinis *et al.*, 1993).

Question wording can also influence the validity of self-report (Babor *et al.*, 1990; Brener *et al.*, 2003; Section 2.2). Survey respondents must first understand a question, interpret it properly, and then encode it into memory. The outputs from this process are then used to search memory and retrieve relevant information, which is evaluated in the decision-making stage of the process. If the information retrieved is considered to be an adequate response, then a response will be generated. If not, then additional retrieval attempts will be made, sometimes involving estimation strategies or adoption of simple rules of thumb that people use to make judgments quickly and efficiently.

If questions are difficult to understand, for example by asking about more than one concept, then the accuracy of response will be compromised. If questions are biased, for example by presenting tobacco use in a negative context,

then answers will also likely be biased. Survey questions must be clear and objective, and constructed in a manner that involves the use of cognitive interviewing techniques, such as those described in Section 2.2.

In an experiment involving the use of three different sets of questions assessing smoking behaviours that held all other conditions constant, researchers obtained similar estimates of adolescent smoking prevalence from the three conditions (Brener *et al.*, 2004). Using a convenience sample of 4140 high school students (most were 14-18 years old), approximately equal numbers were randomly assigned to receive questions assessing 14 tobacco use behaviours, based on the actual questions or adapting the question styles of one of these three US surveys: Monitoring the Future Survey, Youth Risk Behaviour Survey, or National Household Survey on Drug Abuse. Questionnaire type was significantly associated with three tobacco-use behaviours: lifetime cigarette use, smoking a whole cigarette before age 13, and purchasing cigarettes at a store or gas station. Nine other measures, including those assessing prevalence of cigarette smoking and smokeless tobacco use, did not vary by questionnaire type. No one questionnaire type proved superior in this experiment. Each set of questions was written in a clear and objective manner.

Question wording can also influence the prevalence estimate obtained depending on what is

being measured. Adult respondents to the 1992 National Health Interview Survey (NHIS) who had ever smoked 100 lifetime cigarettes were randomly assigned to be asked, "Do you smoke now?" (the question used prior to 1992) or "Do you now smoke cigarettes every day, some days, or not at all?" (the question used since 1992). Prevalence was 25.6% for those who were asked the first question and 26.5% for those asked the second (Centers for Disease Control and Prevention, 1994a). Including an option on non-daily smoking expanded the range of possible affirmative options, and by doing so provided data on an important behaviour, that of occasional smoking.

The effect of question wording on self-disclosure of smoking in a multiethnic prenatal population in the USA was studied (Mullen *et al.*, 1991). Questions about smoking were embedded in a survey instrument assessing multiple risk behaviours. In one condition, subjects were asked "Do you smoke?" and were forced to answer either "yes" or "no." All other subjects were asked, "Which of the following statements best describes your cigarette smoking. Would you say: 1) I smoke regularly now, at about the same amount as before finding out I was pregnant; 2) I smoke regularly now, but I've cut down since I found out I was pregnant; 3) I smoke every once in a while; 4) I have quit smoking since finding out I was pregnant; or 5) I wasn't smoking around the time I found out I was pregnant, and I don't currently smoke cigarettes."

The prevalence of smoking was higher in the group given multiple response options (14.0%), compared to the group given the usual question with the dichotomous response categories (9.2%). Most of the women given the multiple choice question reported that they had cut down since learning that they were pregnant, a response option that allows them to disclose their smoking and still display a partially positive image. The researchers estimated that this increase in disclosure would identify an additional 55000 pregnant smokers in the USA each year. In a survey conducted among pregnant women in the UK, cigarette smokers were identified as those who answered "yes" to the question, "Do you smoke at all nowadays?" Approximately 4% of pregnant women misclassified use as non-use (Owen & McNeill, 2001). Widespread adoption of the question used by Mullen and colleagues might reduce such misclassification.

The overall content of a questionnaire may also influence disclosure. Respondents answering a questionnaire that allows them to portray some positive attributes may be more likely to disclose negative attributes, than if they were answering a questionnaire that only assessed negative attributes (Fowler & Stringfellow, 2001).

In 2002, the Society for Research on Nicotine and Tobacco Subcommittee on Biochemical Verification concluded that the added precision gained by biochemical verification is not

required and may not be feasible in large-scale population-based studies with limited face-to-face contact (Society for Research on Nicotine and Tobacco, 2002). Nevertheless, strategic assessment of validity in situations in which social desirability may lead to substantial underreporting, could be beneficial (Wewers *et al.*, 1995; Laatikainen *et al.*, 1999). In addition, data collected in countries that routinely gather bio-specimens for cotinine validation and assessment of exposure to secondhand smoke, could provide a sense of the scope and nature of underreporting, especially as tobacco control progresses and tobacco use becomes increasingly undesirable in a given society.

Issues to consider when comparing different survey estimates

Surveillance and evaluation systems will provide comparable estimates of tobacco use behaviours to the extent that they use similar methods. The factors that influence validity (e.g. assurance of privacy and that answers will remain completely confidential, question wording, social desirability) will influence estimates of prevalence and thus comparisons between surveys. Factors that can influence prevalence estimates in ways that do not influence validity are described below.

Definition of a user:

Differing definitions of a “user” will often yield differing estimates of

prevalence of use. For example, in a country where multiple forms of tobacco are available, as in India and the USA, a survey providing an estimate of a *tobacco use* would result in a higher estimate of prevalence than one that only reports on the prevalence of *tobacco smoking*. Similarly, an estimate of *cigarette smoking* prevalence would be lower than estimates of tobacco use and of tobacco smoking. In the same way, estimates of *current daily smoking* would be lower than estimates of *current smoking*, which include both daily and non-daily smoking.

Sample frame:

The sample frame of a survey can influence the prevalence estimates generated. For example, prevalence could differ substantially for surveys of persons aged 15 years and older, aged 25 years and older, and 25 to 64 years old. Likewise, a frame drawn only from major metropolitan areas in a given country would likely produce substantially different prevalence estimates than if the entire population were sampled. Each of the estimates from the sample frames discussed here could be valid for the population covered by the respective sample frame. Thus, knowledge of each survey’s sample frame is important when making comparisons across surveys.

Another sample frame issue deals with telephone coverage. Telephone surveys are frequently conducted in developed countries. The major advantage of such sur-

veys is that they are less expensive to conduct than household interviews. Telephone surveys are generally not conducted in developing countries, where coverage does not permit the drawing of a representative sample. In developed countries, however, the increasing prevalence of adults who own a wireless telephone, but live in a household with no landline telephone, presents a potential for bias, because sample frames for telephone surveys are drawn from numbers for landline telephones. According to data from the 2004 and 2005 US National Health Interview Survey (NHIS), approximately 1.7% of adults lived in households that did not have any telephone service, 5.6% of adults lived in households with only wireless telephones, and 92.8% of adults lived in households with landline telephones (Blumberg *et al.*, 2006). The prevalence of cigarette smoking was 19.7% (95% CI: 19.2-20.2) among adults living in households with landline telephones, 32.9% (95% CI: 30.9-35.0) among adults in households with only wireless telephones, and 36.9% (95% CI: 33.4-40.3) among adults in households with no telephone service. Thus, all other things being equal, the prevalence of cigarette smoking that would have been estimated from a telephone survey, that only reached households with landline telephones, would have been 19.7%, whereas the prevalence in all households in the NHIS was 20.9%, a difference of 1.2 percentage points ($P < 0.05$). Telephone surveys provide valu-

able information. Rates of coverage will likely vary across nations. The small difference in cigarette smoking prevalence estimates seen in the USA suggest that comparisons of prevalence estimates from telephone and household surveys should consider the possible influence of coverage bias.

Samples for surveys of adolescents are drawn either from school-based frames, providing access to enrolled students, or from household lists and subsequent enumerations of household members. Only household frames provide access to school dropouts, who are more likely to smoke cigarettes than students of the same age (Gfroerer *et al.*, 1997). This issue poses greater concern for older (i.e. ages 16-17 years) adolescents than for their younger counterparts, who are less likely to have dropped out of school. Another comparability issue is that household surveys may not report data for an age group that is comparable to one found in a school survey. For example, if a household survey reports estimates for young people who are 12-17 years old, and a school survey reports estimates for students enrolled in grades 9-12 (most of whom are 14-18 years old), then the school survey will likely have higher prevalence estimates simply because there are no 12-13 year olds enrolled in schools in this frame, and the household age group does not include 18 year olds. Consumers of survey data should consider these and other factors when comparing data from school and household surveys.

Editing procedures:

Surveys that are administered via self-administered questionnaires, such as the youth surveys described in Section 4.3, require decision rules for dealing with inconsistent answers. The effects of five approaches for handling such inconsistencies in the 1998 Florida Youth Tobacco Survey were described (Bauer & Johnson, 2000). The approaches ranged from doing nothing, which ignored inconsistencies and analyzed each item as a separate entity, to a "preponderance" approach, which evaluated each record and assigned values based on the weight of the evidence for each respondent. The cigarette smoking prevalence estimates generated from these approaches ranged from 25.6% (95% CI: 24.1-27.1) to 29.7% (95% CI: 28.2-31.2). Boys exhibited more inconsistencies and therefore more variability across approaches. While recognizing the impossibility of discerning which approach is the most valid, the authors suggested that editing procedures be described when findings are reported. Approaches for handling inconsistencies can influence prevalence estimates and survey comparability (Brittingham *et al.*, 1998; Bauer & Johnson, 2000).

Type of survey:

Recent reports indicate that prevalence estimates obtained from surveys in California (Cowling *et al.*, 2003) and New Hampshire (Ramsey *et al.*, 2004) in the USA

are lower in surveys with a tobacco focus than in general health surveys. The phenomenon was studied using a factorial design and concluded, after a series of multivariate analyses, that the introduction to the tobacco survey cued some people, mainly women, who didn't want to spend the time on the survey, to misclassify themselves as non-users (Cowling *et al.*, 2003). The researchers argued that the social stigmatization of tobacco use in California may have contributed to the misclassification bias they observed.

Type of parental consent in school-based surveys of adolescents:

In most countries, letters are sent home notifying parents that their children will participate in a survey (parental notification). In some countries, such as the USA and Australia, two types of parental permission are required for school-based survey research. In both systems, a letter is sent to parents describing the upcoming survey research project and requesting their child's participation. In active parental permission, a form must be returned, signed by a parent, granting the child permission to participate. If no signed form is returned, disapproval is assumed. In passive permission, parents send back a signed form only if they do not want their child to participate. If no form is returned, parental approval is assumed. In the USA, selected state and municipal governments require active

permission. Three US reports have noted that estimates of tobacco use are lower when active parental permission is required (Severson & Ary, 1983; Dent *et al.*, 1993; Anderman *et al.*, 1995). It is suggested that active permission laws exclude high risk students because they are less likely to return signed permission forms. Differences were not observed in ever smoking or smoking during the previous week in a study of active versus passive consent conditions in Australia (White *et al.*, 2004).

An analysis of the 2001 Youth Risk Behaviour Survey (YRBS) data was undertaken to determine if type of parental consent was related to the magnitude of estimates for 26 behaviours, including lifetime cigarette smoking, current cigarette smoking, and current smokeless tobacco use (Eaton *et al.*, 2004). Of 13195 eligible students, 65% lived in passive conditions. In passive condition schools, 86.7% of sampled students participated; 77.3% of students in active condition schools did so. The difference was due to the 9.5% of students in the active condition who did not return a permission form. Type of consent did not influence any of the tobacco measures; in fact, it was related to only two of the 26 behaviours measured. The conclusion was that the requirement for active consent will not influence prevalence estimates if participation rates are sufficiently high (Eaton *et al.*, 2004). It was also argued that the anonymity offered by the YRBS might have

lessened any concerns students had about their parents' negative attitudes about certain risk behaviours and facilitated disclosure. Thus, comparisons of estimates from school surveys in various countries should assess the degree to which active consent is required and the participation rate in each condition.

Response rates:

Concern has been raised about the effects of declining response rates in telephone surveys, especially in the USA. As the US rates declined in the 1990s, no differences in the degree of representation in samples of population subgroups were observed (Biener *et al.*, 2004). The researchers also compared cigarette smoking prevalence estimates from telephone surveys conducted in Massachusetts and California, where response rates dropped substantially, with those from the Tobacco Use Supplement to the Current Population Survey (TUS-CPS), in which response rates dropped only very slightly and were substantially higher in 1998-1999 (76%-81% in the TUS-CPS versus 69% in Massachusetts and 51% in California). The smoking prevalence estimates obtained from the Massachusetts and California surveys remained reasonably close (as judged by overlapping confidence intervals) to those from the TUS-CPS, with no evidence of an increasing disparity over time.

Despite the findings from this study, researchers should work

diligently to maximize response rates, and continue to monitor response rates, sample characteristics, and prevalence estimates across surveys with differing response rates to identify variables that might compromise comparisons.

Survey-based measures of tobacco use behaviours

A general outline of the variables used to monitor the natural history of tobacco use is presented in Table 3.1. A description of detailed question items for almost every component of the process, and some commentary on each, are provided in Tables 3.2 through 3.18. Intention to try (I.a. in Table 3.1) and intention to quit (IV.a. in Table 3.1) are discussed in Section 3.2. The methods used in cessation attempts (IV.b.iii. in Table 3.1) are discussed in Section 5.7. Topography (as an indicator of smoke intake) (III.e. in Table 3.1) is discussed in the text below; however, no survey items are recommended for this topic, as questionnaire assessments of smoking topography have not been shown to be valid.

Tables 3.2 through 3.18 list questions relevant for each topic that is either used in the cross-national surveys described in Section 4.3, or in country-specific surveys. The latter are added in instances where they supplement the items used in the cross-national surveys. In reliability assessments shown in the tables, kappa statistics of 61-80% were considered substantial and 81-100% were almost perfect (Brenner

Construct	Construct l.b. on Table 3.1 (Initial Trial)
Measure	<p>“On how many occasions (if any) during your lifetime have you smoked cigarettes?” Number of occasions: 0, 1-2, 3-5, 6-9, 10-19, 20-39, 40 or more (ESPAD)</p> <p>“How old were you when you first tried a cigarette?” I have never smoked cigarettes; 7 years old or younger; 8 or 9 years old; 10 or 11 years old; 12 or 13 years old; 14 or 15 years old; 16 years old or older (GSHS)</p> <p>“Have you ever tried or experimented with cigarette smoking, even one or two puffs?” (GYTS)</p> <p>“Have you ever smoked tobacco?” (at least one cigarette, cigar or pipe) (HBSC)</p>
Sources	ESPAD, GSHS, GYTS, HBSC
Validity	Face validity. Kappa for ever use of cigarettes was 83.8% in CDC 14-day reliability study among high school students (Brener <i>et al.</i> , 1995). 81.5% agreement in a two year study (Shillington & Clapp, 2000). 92.3% of baseline ever users reported consistently at follow-up survey, with consistency decreasing with increasing time between assessments (Huerta <i>et al.</i> , 2005).
Variation	Items are adaptable for assessments of other tobacco products. For example, a survey could ask, “On how many occasions (if any) during your lifetime have you used smokeless tobacco?” Number of occasions: 0, 1, 2-3, 4-9, 10-19, 20-39, 40 or more
Comments	This variable is assessed mostly in youth surveys. The only cross-national adult survey which conceptually can indicate ever use is the GATS, which asks non-current users: “In the <u>past</u> , have you smoked tobacco (cigarettes, cigars or pipes) on a daily basis, less than daily, or not at all?”
Definitions	<u>Ever users</u> have tried one or more smoke or smokeless tobacco products. <u>Never users</u> have not tried tobacco, even the least amount asked about. Definitions more specific to product type(s) can be employed (e.g. ever smoker, ever cigarette smoker, ever user of smokeless tobacco, ever user of betel quid).
<p>GYTS: Global Youth Tobacco Survey HBSC: Health Behaviour of School-aged Children ESPAD: European School Survey Project on Alcohol and Other Drugs GSHS: Global School Health Survey GATS: Global Adult Tobacco Survey CDC: Centers for Disease Control and Prevention</p>	

Table 3.2 Initial Trial - Ever Use of Cigarettes or Smoked Tobacco

et al., 1995). Also, intraclass correlation coefficients (ICC) of 0.75 and higher were considered excellent, and 0.60 to 0.74 were considered good (Johnson & Mott, 2001). Most of the measures are listed in terms of smoking behaviour. Modifications of each item can be made for smokeless tobacco use.

Initial trial:

This construct distinguishes persons who have never used from those who have ever used tobacco (Table 3.2). The proportion of young people who have never tried a cigarette is one of the Center for Disease Control and Prevention’s (CDC) key outcome

indicators (Starr *et al.*, 2005). Reducing the number of people who ever try tobacco will reduce the number who become established users (US Department of Health and Human Services, 1994; Starr *et al.*, 2005). Best measured in school surveys of adolescents, initial trial can be assessed for whichever tobacco

products are of most relevance in a particular country. Trends in this measure have been studied for more than 30 years in the USA, where lifetime use of cigarettes among high school seniors (i.e. 12th grade students, the vast majority being 17-18 years old) was 73.6% in 1975 and 50% in 2005 (Johnston *et al.*, 2006). Cross-national findings on initial use have been reported in several reports (Warren *et al.*, 2000; Global Youth Tobacco Survey Collaborative Group, 2002; Godeau *et al.*, 2004; Hibell *et al.*, 2004; Global

Tobacco Surveillance System Collaborating Group, 2005; White & Hayman, 2006). Here we define a “*trier*” as someone who has tried smoking, but has only taken one or more puffs, but never a whole cigarette/cigar/pipe, or as someone who has tried smokeless tobacco, but only on one occasion (Table 3.3).

The age of first use is another CDC key outcome indicator (Starr *et al.*, 2005). The younger people are when they start using tobacco, the more likely they are to use it as adults (US Department of Health

and Human Services, 1994). Trends over time in average age or grade of first use have been reported (Kopstein, 2001; Johnston *et al.*, 2006). Measures of actual age of first use have been used to calculate the incidence of initiation of first use (Centers for Disease Control and Prevention, 1998; Kopstein, 2001). The average age of first use varies across countries, likely reflecting the influence of media and of cultural values (Warren *et al.*, 2000; Global Youth Tobacco Survey Collaborative Group, 2002; Global

Construct	Construct I.b. and I.c. on Table 3.1 (Initial Trial and Experimentation)
Measure	“How many cigarettes have you smoked in your entire life?” None; 1 or more puffs, but never a whole cigarette; 1 cigarette; 2 to 5 cigarettes; 6 to 15 cigarettes (about ½ pack total); 16 to 25 cigarettes (about 1 pack total); 26 to 99 cigarettes (more than 1 pack but less than 5 packs); 100 or more cigarettes (5 or more packs) (GYTS – OPTIONAL)
Source	GYTS
Validity	Face validity. 10-18 year old US smokers who had smoked 20-98 lifetime cigarettes were more likely to report that they smoked because it “relaxes or calms” them and because “it’s really hard to quit” than were smokers who had smoked fewer than 20 lifetime cigarettes (Centers for Disease Control and Prevention, 1994a).
Variation	Items are adaptable for assessments of other tobacco products. For example, a survey could ask, “On how many occasions (if any) during your lifetime have you used smokeless tobacco?” Number of occasions: 0, 1, 2-3, 4-9, 10-19, 20-39, 40 or more The parenthetical examples of the number of packs listed in the item above for cigarettes apply only in countries in which there are 20 cigarettes in each package.
Comments	Definitions for cigarette smoking are based on Choi <i>et al.</i> , 2001.
Definitions	A <i>trier</i> is someone who has tried smoking, but has only taken a few puffs or someone who has tried smokeless tobacco, but only once. An <i>experimenter</i> is someone who has smoked more than a few puffs, but fewer than 100 cigarettes. For other tobacco products, the US National Center for Health Statistics uses cut-offs of from 1-49 cigars or pipes full of tobacco or having used smokeless tobacco on from 1-19 occasions.

GYTS: Global Youth Tobacco Survey

Table 3.3 Trial versus Experimentation

Tobacco Surveillance System Collaborating Group, 2005). Table 3.4 describes the construct “Age of First Use.”

Discontinuation after initial trial:

Some young people will try tobacco, for example, by taking a few puffs on a cigarette, and then never use again. Tobacco control

policies aim first to prevent initial trial and, if initial use has occurred, to prevent progression beyond such use. Researchers used one month with or without use to distinguish “recent” from “non-recent” experimenters (Choi *et al.*, 2001). However, approximately three in 10 non-recent experimenters, according to their definition, progressed to estab-

lished use. The question recommended in Table 3.5 permits use of other time periods after initial trial. Three months since initial use can be used to define former triers. This strategy, while somewhat arbitrary, is based on the assumption that triers who have not used for at least three months, would be less likely to progress to established user than

Construct	Construct I.b. on Table 3.1 (Initial Trial)
Measure	<p>“When (if ever) did you first do each of the following things?” A) Smoke your first cigarette? Never; 9 years old or less; 10 years old; 11 years old; 12 years old; 13 years old; 14 years old; 15 years old; 16 years or older (ESPAD)</p> <p>“How old were you when you first tried a cigarette?” I have never smoked cigarettes; 7 years old or younger; 8 or 9 years old; 10 or 11 years old; 12 or 13 years old; 14 or 15 years old; 16 years old or older (GSHS)</p> <p>“How old were you when you first tried a cigarette?” I have never smoked cigarettes; 7 years old or younger; 8 or 9 years old; 10 or 11 years old; 12 or 13 years old; 14 or 15 years old; 16 years old or older (GYTS)</p> <p>“At what age did you first do the following things? Smoke a cigarette:” Never, ___ (write in age). (HBSC)</p>
Sources	ESPAD, GYTS, GSHS, HBSC
Validity	Face validity. Kappa for smoking first whole cigarette before age 13 years was 68.1% in CDC 14-day reliability study among high school students (Brenner <i>et al.</i> , 1995). Intraclass correlation coefficient (ICC) was good (range = .637 - .666) in three tests of children and moderate (0.517) in a fourth in a two year reliability study (Johnson & Mott, 2001). The ICC was 0.73 for males and 0.76 for females in an Israeli study (Huerta <i>et al.</i> , 2005). Forward telescoping (producing older estimates of age of first use upon re-interview) has been observed (Shillington & Clapp, 2000; Johnson & Mott, 2001).
Variation	Items are adaptable for assessments of other tobacco products.
Comments	The NSDUH asks adolescents and adults, “How old were you the first time you smoked part or all of a cigarette?” (http://oas.samhsa.gov/nsduh.htm). This measure has been used to assess incidence of initiation (Centers for Disease Control and Prevention, 1998); NSDUH even assesses month of first use in recent initiators (http://www.oas.samhsa.gov/2k4/season/season.htm).
<p>ESPAD: European School Survey Project on Alcohol and Other Drugs GSHS: Global School Health Survey GYTS: Global Youth Tobacco Survey HBSC: Health Behaviour of School-aged Children CDC: Centers for Disease Control and Prevention NSDUH: US National Survey on Drug Use and Health</p>	

Table 3.4 Age of First Use

would those abstinent for less than three months.

Experimentation:

Experimentation occurs when someone progresses beyond initial trial. Experimentation with cigarettes can be distinguished from initial trial and from established use with the question recommended in Tables 3.3 and 3.6. Experimenters are those who have consumed from 1-99 cigarettes. Regarding the use of other tobacco products, experimentation can be operationalised as smoking from 1-49 cigars or pipes full of tobacco, or having used smokeless tobacco on from 2-19 occasions. These are somewhat arbitrary cut-offs; the US National Center for Health Statistics uses 50 cigars, 50 pipes full of tobacco,

and use of smokeless tobacco on at least 20 occasions to measure established use in a manner similar to the 100 cigarette question. Indicators of nicotine dependence have been observed during the experimentation process (Centers for Disease Control and Prevention, 1994b; DiFranza *et al.*, 2002b; O'Loughlin *et al.*, 2003).

Discontinuation of experimentation:

Another goal of tobacco control is to prevent the progression from experimentation to established use. As discussed above, a cut-off of three months of abstinence since experimenting can be used to define former experimenters (see Table 3.5).

Transition to established use:

Young people who have become established users are, compared to those who have not, at far greater risk of continuing to smoke as adults (US Department of Health and Human Services, 1994; Choi *et al.*, 2001). Preventing progression to established use is a goal of tobacco control. CDC has identified the proportion of young people who have smoked 100 cigarettes or more during their lifetimes as a key outcome indicator for evaluating comprehensive tobacco control programmes (Starr *et al.*, 2005). Similar indicators for other tobacco products are recommended in Table 3.6. Several other measures of transition have been described as well (Johnston, 2001).

Construct	Construct I.b.i and I.c.i. on Table 3.1 (Discontinuation)
Measure	"When was the last time you smoked a cigarette, even one or two puffs?" I have never smoked a cigarette; today; not today, but some time during the past week; not in the past week, but some time in the past month; 2-3 months ago; 4-6 months ago; 7-12 months ago; 1 or more years ago (GYTS – OPTIONAL)
Source	GYTS
Validity	Face validity. In one study, non-recent experimenters (those experimenters who had not smoked within the previous 30 days) were less likely to progress to established smoking than were current experimenters (Choi <i>et al.</i> , 2001).
Variation	Items are adaptable for assessments of other tobacco products.
Definitions	A <i>former trier</i> is someone who has smoked only a few puffs or who has tried smokeless tobacco only once who has not used it for ≥ 3 months. A <i>former experimenter</i> is someone who has experimented (defined in Table 3.3) and has not smoked/used tobacco for ≥ 3 months.
GYTS: Global Youth Tobacco Survey	

Table 3.5 Time Since Last Use Among Triers or Experimenters

Construct	Construct II. on Table 3.1(Transition to established use)
Measure	<p>“How many cigarettes have you smoked in your entire life?” None; 1 or more puffs, but never a whole cigarette; 1 cigarette; 2 to 5 cigarettes; 6 to 15 cigarettes (about ½ pack total); 16 to 25 cigarettes (about 1 pack total); 26 to 99 cigarettes (more than 1 pack but less than 5 packs); 100 or more cigarettes (5 or more packs) (GYTS – OPTIONAL)</p> <p>“Have you smoked 100 cigarettes or more in your lifetime?” (ITC)</p> <p>“Have you smoked at least 100 cigarettes in your entire life?” (NHIS, BRFSS, NSDUH, ATS, TUS-CPS)</p>
Sources	GYTS, ITC, NHIS, BRFSS, NSDUH, ATS, TUS-CPS
Validity	Evidence of utility – predictive validity. Adolescents who have smoked at least 100 lifetime cigarettes are more likely to be established smokers in the future than those who have not (Choi <i>et al.</i> , 2001).
Variation	Items are adaptable for assessments of other tobacco products. “On how many occasions (if any) during your lifetime have you used smokeless tobacco?” Number of occasions: 0, 1, 2-3, 4-9, 10-19, 20-39, 40 or more
Comments	Having ever smoked 100 cigarettes is considered “established” use (Choi <i>et al.</i> , 2001; Starr <i>et al.</i> , 2005). It is a useful measure because it can be used as a marker for a threshold even for never daily users. However, some people have difficulty understanding the concept of having ever smoked a total of 100 lifetime cigarettes. For other tobacco products, the use of ≥ 50 cigars or pipes full of tobacco or having used smokeless tobacco on ≥ 20 or more occasions can be used as cut-offs to define established use.

GYTS: Global Youth Tobacco Survey
ITC: International Tobacco Control Policy Evaluation Survey
NHIS: US National Health Interview Survey
BRFSS: US Behavioural Risk Factor Surveillance System
NSDUH: US National Survey on Drug Use and Health
ATS: US Adult Tobacco Survey
TUS-CPS: US Tobacco Use Supplement to the Current Population Survey

Table 3.6 Threshold for Transition to Regular Use*Ever daily versus never-daily:*

In the USA in 1991, approximately 7.5% of established smokers had never smoked on a daily basis (Husten *et al.*, 1998). Among all established smokers, never daily smoking was more common among non-Whites (range = 12-17%) than among Whites (6%); among current smokers, never daily smoking was also more common among non-Whites (range = 11-17%) than among Whites (4%).

The average age of first daily use can vary among ethnic groups within a country and over time (Centers for Disease Control and Prevention, 1991). Compared with younger age of first daily use, starting at an older age has been associated with slightly lower rates of subsequently developing tobacco-attributable disease (US Department of Health and Human Services, 2004). Description of ever daily use constructs and age of first daily use are found in Tables 3.7 and 3.8.

Current use:

Current use is influenced primarily by rates of initiation and quitting, as well as by mortality, and to a far lesser extent, immigration into and emigration out of a given population. Current use is the most important construct because of its importance as an outcome variable in policy evaluation studies. CDC rates it a key outcome indicator (Starr *et al.*, 2005).

Each of the seven surveys described in Section 4.3 measures current use (Table 3.9). In

three (European School Survey Project on Alcohol and Other Drugs (ESPAD), Global School Health Survey (GSHS), Global Youth Tobacco Survey (GYTS)) of the four surveys of young people, a current user is someone who used tobacco at least once during the previous 30 days (month) (Warren *et al.*, 2000, 2006; Hibell *et al.*, 2004; WHO, 2007a). In the Health Behaviour of School-aged Children (HBSC) survey, a current user is someone who uses either daily or weekly (Godeau *et al.*, 2004; Hublet *et al.*, 2006). Current use is defined slightly differently in

the adult surveys. In the Global Adult Tobacco Survey (GATS) and the STEPwise Approach to Chronic Disease Factor Surveillance (STEPS) survey, a current smoker is someone who currently smokes tobacco products daily or less than daily. GATS and STEPS can distinguish between current daily and current non-daily smoking (Table 3.9). GATS can also classify current non-daily smokers as ever daily or never daily smokers. The International Tobacco Control Policy Evaluation Survey (ITC) classifies current cigarette smokers as those

who had ever smoked ≥ 100 lifetime cigarettes who currently smoke daily, weekly, or monthly.

Trends in and patterns of current use have been reported in numerous reports and publications (US Department of Health and Human Services, 1994, 1998, 2001; Warren *et al.*, 2000; Kopstein, 2001; Giovino, 2002; White & Hayman, 2006). The WHO Global InfoBase documents prevalence of current use of various indicators, including current smoking, current daily smoking, and current tobacco use for countries throughout the world

Construct	Construct II.a. on Table 3.1 (Ever daily and never daily)
Measure	<p>"When (if ever) did you first do each of the following things? B) Smoke cigarettes on a daily basis:" Never; 9 years old or less; 10 years old; 11 years old; 12 years old; 13 years old; 14 years old; 15 years old; 16 years or older (ESPAD)</p> <p>"Have you ever smoked cigarettes daily, that is, at least one cigarette every day for 30 days?" (NYTS)</p> <p>"In the <u>past</u>, have you smoked tobacco (cigarettes, cigars or pipes) on a daily basis, less than daily, or not at all?" (GATS)</p> <p>"In the past, did you ever smoke daily?" (STEPS)</p>
Sources	ESPAD, NYTS, GATS, STEPS
Validity	Face validity. Kappa for ever daily use was 86.6% in CDC 14-day reliability study among high school students (Brenner <i>et al.</i> , 1995).
Variation	In GATS, current non-daily smokers are asked, "Have you smoked tobacco daily in the past?" Items are adaptable for assessments of other tobacco products.
Comments	The prevalence of never daily smoking among adult smokers in the USA was documented (Husten <i>et al.</i> , 1998).
Definitions	An <u>ever daily user</u> is someone who has ever smoked tobacco or used smokeless tobacco on a daily basis. A <u>never daily user</u> has never smoked tobacco or used smokeless tobacco on a daily basis.
<p>ESPAD: European School Survey Project on Alcohol and Other Drugs NYTS: National Youth Tobacco Survey GATS: Global Adult Tobacco Survey STEPS: STEPwise Approach to Chronic Disease Factor Surveillance CDC: Centers for Disease Control and Prevention</p>	

Table 3.7 Ever daily versus Never Daily Use

Construct	Construct II.a. on Table 3.1 (Ever daily and Never Daily)
Measure	<p>"When (if ever) did you first do each of the following things? Smoke cigarettes on a daily basis:" Never; 9 years old or less; 10 years old; 11 years old; 12 years old; 13 years old; 14 years old; 15 years old; 16 years or older (ESPAD)</p> <p>"How old were you when you first started smoking daily?" (GATS, STEPS)</p>
Sources	ESPAD, GATS, STEPS
Validity	Face validity. Kappa for first smoking daily before age 13 years was 71.8% in CDC 14-day reliability study among high school students (Brener <i>et al.</i> , 1995). ICC was excellent for adults' assessments of age of first daily use (.815) in a two year reliability study (Johnson & Mott., 2001). Forward telescoping (producing older estimates of age of first daily use upon re-interview) has been observed (Johnson & Mott., 2001).
Variation	Items are adaptable for assessments of other tobacco products.
Comments	The NSDUH asks adolescents and adults, "How old were you when you first started smoking every day?" (http://oas.samhsa.gov/nsduh.htm). This measure has been used to assess incidence of initiation of daily use (Centers for Disease Control and Prevention, 1998). Measures like this have been used to calculate incidence of initiation of cigarette smoking (Pierce <i>et al.</i> , 1994; Pierce & Gilpin, 1995; Centers for Disease Control and Prevention, 1998).
<p>ESPAD: European School Survey Project on Alcohol and Other Drugs GATS: Global Adult Tobacco Survey STEPS: STEPwise Approach to Chronic Disease Factor Surveillance CDC: Centers for Disease Control and Prevention NSDUH: US National Survey on Drug Use and Health</p>	

Table 3.8 Age at first daily use

(http://www.who.int/ncd_surveillance/infobase/web/InfoBaseCommon).

Frequency of use:

Frequency of use refers to the number of days when tobacco is used during a given time period (e.g. the previous seven days or the previous 30 days). Frequency of use is often dichotomized as either current daily or current non-daily use (Table 3.9). In the USA, current non-daily smoking is more common among African Americans and Hispanics than it is among non-Hispanic Whites (US Department of Health and Human Services, 1998). Overall, current

non-daily smoking remained stable at about 18-19% of all current smokers from 1993 to 2004 (Troscclair *et al.*, 2005).

In surveys of young people, current frequent users are those who smoked on ≥ 20 or more of the previous 30 days. Frequency of use is a predictor of quitting (with more frequent use associated with a lower probability of subsequent quitting than less frequent use) (Hyland *et al.*, 2004).

Type of product used:

It is important to measure the type of product consumed, particularly

in countries, such as India, where there exists a variety of commonly used forms of tobacco products. The variety of forms available, and the possibility of switching or multiple concurrent uses may influence the probabilities of quitting and of disease risk. Country-specific lists of products to be monitored should be incorporated into each country's survey. Examples of items used in the various cross-national surveys are provided in Table 3.10.

Per capita consumption (by weight) of various tobacco products is often documented by government agricultural agencies (Capehart, 2007). A useful rule of

Construct	Constructs III. and III.a. on Table 3.1 (Current use)
Measure	<p data-bbox="420 256 583 280">Surveys of Youth</p> <p data-bbox="420 311 1377 384">“How frequently have you smoked cigarettes during the LAST 30 DAYS?” Not at all; less than 1 cigarette per week; less than 1 cigarette per day; 1-5 cigarettes per day; 6-10 cigarettes per day; 11-20 cigarettes per day; more than 20 cigarettes per day (ESPAD)</p> <p data-bbox="420 414 1377 462">“During the past 30 days, on how many days did you smoke cigarettes?” 0 days; 1 or 2 days; 3 to 5 days; 6 to 9 days; 10 to 19 days; 20 to 29 days; all 30 days (GSHS)</p> <p data-bbox="420 493 1377 540">“During the past 30 days (one month), on how many days did you smoke cigarettes?” 0 days; 1 or 2 days; 3 to 5 days; 6 to 9 days; 10 to 19 days; 20 to 29 days; all 30 days (GYTS)</p> <p data-bbox="420 571 1377 644">“Do you smoke now?” Not at all; occasionally, but less than once a month; some time each month, but less than one cigarette per week; sometime per week, but less than one cigarette per day; every day at least one cigarette? (GYTS – OPTIONAL)</p> <p data-bbox="420 675 1377 722">“How often do you smoke at present?” Every day; at least once a week, but not every day; less than once a week; I do not smoke (HBSC)</p> <p data-bbox="420 753 601 777">Surveys of Adults</p> <p data-bbox="420 808 1377 837">“Do you <u>currently</u> smoke tobacco (cigarettes, cigars or pipes) on a daily basis, less than daily, or not at all?” (GATS)</p> <p data-bbox="420 868 1377 940">“Do you smoke every day, less than every day, or not at all?” (including factory-made cigarettes or hand-rolled cigarettes). NON-DAILY SMOKERS ARE ASKED: “Do you smoke at least once a week?” THOSE WHO ANSWER NO ARE ASKED: “Do you smoke at least once a month?” (ITC)</p> <p data-bbox="420 971 1377 1015">“Do you currently smoke any tobacco products, such as cigarettes, cigars, or pipes?” IF YES: “Do you currently smoke tobacco products daily?” (STEPS)</p>
Sources	ESPAD, GSHS, GYTS, HBSC, GATS, ITC, STEPS
Validity	Evidence of utility. Self-reports of current use have been shown to be reasonably valid for adults and youths, when adequate privacy is afforded (Turner <i>et al.</i> , 1992; Velicer <i>et al.</i> , 1992; Patrick <i>et al.</i> , 1994; US Department of Health and Human Services, 1994; Gfroerer <i>et al.</i> , 1997; Brittingham <i>et al.</i> , 1998; Caraballo <i>et al.</i> , 2001; Fowler & Stringfellow, 2001; Kann <i>et al.</i> , 2002; Caraballo <i>et al.</i> , 2004; Brener <i>et al.</i> , 2006). Kappa for smoking on ≥ 14 days during the previous 30 days was 80.1% in CDC 14-day reliability study among high school students (Brener <i>et al.</i> , 1995). Evidence indicated that for persons aged ≥ 18 years, current smoking prevalence estimates based on proxy reports are virtually identical to those based on self-report (Gilpin <i>et al.</i> , 1994).
Variation	Items are adaptable for assessments of other tobacco products.
Definitions	<p data-bbox="420 1397 1377 1445">Among Youth: A <u>current user</u> is someone who used tobacco at least once during the previous 30 days (month). A <u>current frequent user</u> is someone who used tobacco on > 20 of the previous 30 days. Among Adults: A <u>current user</u> is someone who consumes tobacco daily or less than daily (GATS, STEPS) or someone who consumes tobacco daily or less than daily during the previous month (ITC). A <u>current daily user</u> is someone who reports using on a daily basis.</p> <p data-bbox="420 1530 1291 1554">Among both Youth and Adults: Frequency refers to the number of days smoked each month.</p>

Table 3.9 Current Use (Daily versus Non-Daily)

Comments

Comparisons of adolescent prevalence estimates with those of adults can be problematic. For example, estimates of current use among adolescents are often considerably higher than those among adults. However, adolescents who smoke generally do so on fewer days each month than do adult smokers. Ideally, comparisons of use among youth and adults would be made with a measure of the number of days smoked during the previous 30 days (e.g. ≥ 20 of 30 days). In countries where adult surveys do not measure the number of days smoked out of the previous 30 days, then comparing adult prevalence of current use with the prevalence of current frequent use among adolescents would be preferred to comparisons of past month use, because the vast majority of adult users consume tobacco on ≥ 20 of the previous 30 days. Some countries measure use during the previous week. Comparisons of weekly use among adolescents and adults would provide more comparable estimates than past month use.

ESPAD: European School Survey Project on Alcohol and Other Drugs

GSHS: Global School Health Survey

GYTS: Global Youth Tobacco Survey

HBSC: Health Behaviour of School-aged Children

GATS: Global Adult Tobacco Survey

ITC: International Tobacco Control Policy Evaluation Survey

STEPS: STEPwise Approach to Chronic Disease Factor Surveillance

CDC: Centers for Disease Control and Prevention

Table 3.9 Current Use (Daily versus Non-Daily)

thumb is that when the amount of tobacco consumed in a particular product (e.g. snuff) comprises less than 1% of total tobacco consumed, then use of that product need not be assessed in surveys. Exceptions to that rule may occur when use of a product that is rarely consumed in the overall population is more common among a subgroup of the population. In the USA, for example, the use of bidis is rare in the adult population, but of concern among young people (National Youth Tobacco Survey (NYTS) data, US National Survey on Drug Use and Health (NSDUH) data).

Brand used:

The prevalence of use of specific brands among users of a particular product type (e.g. manufactured cigarettes) reflects the influence of both marketing campaigns and product design

(Centers for Disease Control and Prevention, 1994c; Tomar *et al.*, 1995; Slade, 2001; Cummings *et al.*, 2002a; Wayne & Connolly 2002; Carpenter *et al.*, 2005; Lewis & Wackowski, 2006). Tobacco control practitioners can use this information to implement policies (e.g. counter-marketing campaigns, tobacco product regulation) designed to reduce overall use. Survey-based measures of brand used are presented in Table 3.11; measures of brand switching are described in Table 3.12.

Sub-brand characteristics (e.g. strength, flavoring, length) are often determined by either asking for the name of the specific brand purchased or asking the name of a brand family, followed by each of several possible sub-brand characteristics (Table 3.11). Strength has often been described by industry terms such as “light” and “mild.” Because these terms are misleading (National Cancer Institute,

2001), they have been banned in a number of countries (e.g. European Union countries, Australia) and replaced either by other terms or specific color schemes that indicate strength based on machine-measured yields. All of these indicators are still misleading, since the tests used to determine strength do not reflect actual human exposure (National Cancer Institute, 2001; Hammond *et al.*, 2006b). Thus, it is important to capture the extent of use of these terms, either via survey-based questions (Table 3.11), or via documentation of what is on the actual package.

Detailed measurement of information about tobacco product packaging is important in order to determine the variant of product type used, movement between price sectors, and, potentially, to assess the use of tobacco from illicit sources. Interviewers can either collect empty packages or

take digital photographs of a given respondent's current pack. Package characteristics to document include: brand name, strength, flavoring, length, pack type (hard pack versus soft pack), package color, color in words (e.g. Silk Cut Silver, Silk Cut Purple), filter (e.g. non-filter, charcoal [if designated]), UPC code, number of cigarettes per pack, constituents measured and levels, text, warning label(s) (words, picture [if applicable], and location[s]), and the presence or absence of a tax stamp.

In addition to survey based measures, governments should make available to researchers and policy makers sub-brand-specific sales data on a region-specific basis. This will allow researchers to better document the influence of tobacco product marketing practices.

Intensity of use:

Intensity of use reflects the average number of cigarettes, cigars, or pipes full of tobacco smoked each day for daily smokers, or on the days during which the respondent smoked for non-daily smokers. Selected questionnaire items used to assess intensity are listed in Table 3.13. Intensity decreases following the implementation of smoke-free policies (Fichtenberg & Glantz, 2002a; Section 5.2) and price increases (Chaloupka *et al.*, 2001; Warner, 2006; Section 5.1). Intensity is inversely associated with the probability that a respondent will quit (Hyland *et al.*, 2004), and is directly related to the

probability of developing a tobacco-attributable disease (US Department of Health and Human Services, 2004; IARC, 2004).

Smoke intake:

The intake of smoke from a cigarette is generally determined in laboratory studies of smoking topography, which assess how cigarettes are smoked. Variables measured include the number of puffs taken per cigarette, the duration of each puff, inter-puff interval, puff volume, the draw rate of each puff, the unsmoked butt length, and the amount of obstruction of filter ventilation holes (Pechacek *et al.*, 1984). Unfortunately, questionnaire assessments of this construct have not proven to be valid. Two alternative techniques have been developed that estimate smoke intake from the study of cigarette filter butts: one measures the amount of solanesol, a naturally occurring component of tobacco that is deposited during smoking in the cigarette filter butt (Watson *et al.*, 2004a); and the other studies the staining pattern on filter butts as a proxy measure for total smoke volume (O'Connor *et al.*, 2005; Strasser *et al.*, 2006; O'Connor *et al.*, 2007). Either of these techniques would require the collection of filter butts from survey respondents.

Purchase patterns:

Some policies influence how people obtain cigarettes. The ways in which adults change their pur-

chase patterns after price increases, may influence the probability of subsequent quitting, with those switching to less expensive cigarettes appearing to be less likely to quit than those who do not (Hyland *et al.*, 2005; see Section 5.1 for items assessing adult purchase patterns). Among young people, policies are often enacted to reduce sales to minors (underage persons) (Lantz *et al.*, 2000). These policies are not considered effective on their own (Fichtenberg & Glantz, 2002b; Fielding *et al.*, 2005), in part because young people are more likely to give other people money to purchase cigarettes for them when restrictions on sales to minors are implemented (Everett Jones *et al.*, 2002; White & Hayman, 2006). See Table 3.14 for questionnaire items on adolescent purchase patterns.

Quit attempts

A key outcome indicator of a policy is whether it leads to an attempt to discontinue use (Starr *et al.*, 2005; Fong *et al.*, 2006a). As shown in Table 3.15, questionnaire items that assess whether a respondent has ever tried to quit, the number of lifetime quit attempts, and the duration and recency of the last quit attempt are drawn from the ITC baseline survey. ITC follow-up assessments determine whether a respondent has tried to quit since the prior assessment and the longest period of abstinence during that time period. The GATS question assesses whether a quit

Construct	Construct III.b. on Table 3.1(Type of product use)
Measure	<p>“During the past 30 days, on how many days did you use any other form of tobacco, such as [COUNTRY SPECIFIC EXAMPLES]?” 0 days; 1 or 2 days; 3 to 5 days; 6 to 9 days; 10 to 19 days; 20 to 29 days; all 30 days (GSHS)</p> <p>“During the past 30 days (one month), did you use any form of smoked tobacco products other than cigarettes (e.g. cigars, water pipe, cigarillos, little cigars, pipe)?” (GYTS)</p> <p>“During the past 30 days (one month), did you use any form of smokeless tobacco products (e.g. chewing tobacco, snuff, dip)?” (GYTS)</p> <p>“Do you <u>currently</u> use smokeless tobacco on a daily basis, less than daily, or not at all?” (GATS)</p> <p>“On average, how many times a day do you use the following: [snuff by mouth, snuff by nose, chewing tobacco, betel quid, any others]?” (GATS)</p> <p>“In the past month, have you used any other tobacco product besides cigarettes?” IF YES: “What did you use?” FOR EACH PRODUCT USED, “How often do you currently smoke/use [PRODUCT]? Would that be daily, less than daily but at least once a week, less than weekly but at least once a month, less than monthly, or have you stopped altogether?” (ITC)</p> <p>“Do you currently use any smokeless tobacco such as [snuff, chewing tobacco, betel quid]?” IF YES: “Do you currently use smokeless tobacco products daily?” (STEPS – EXPANDED)</p> <p>“On average, how many times a day do you use [snuff by mouth, snuff by nose, chewing tobacco, betel quid, other]?” (STEPS – EXPANDED)</p>
Source	GSHS, GYTS, GATS, ITC, STEPS
Validity	Evidence of utility. Only 2% of adolescents in Sweden who reported that they did not use cigarettes or snus during the previous month had cotinine levels ≥ 5 ng/ml (Post, 2005). It was shown that the use of cotinine and thiocyanate could distinguish smokers from smokeless tobacco users (Noland <i>et al.</i> , 1988). Kappa for use of chewing tobacco during the previous 30 days was 72.3% in CDC 14-day reliability study among high school students (Brener <i>et al.</i> , 1995).
Variation	Country-specific lists are used. In general, use of a product need not be measured in surveys if consumption of tobacco in that product is by weight $< 1\%$ of the total tobacco consumed in the country, as reported by government agricultural statistics. Exceptions to this rule can occur as, for example, when use of a particular product among youth is of concern.
<p>GSHS: Global School Health Survey GYTS: Global Youth Tobacco Survey GATS: Global Adult Tobacco Survey ITC: International Tobacco Control Policy Evaluation Survey STEPS: STEPwise Approach to Chronic Disease Factor Surveillance CDC: Centers for Disease Control and Prevention</p>	

Table 3.10 Type of Tobacco Product Used

Construct	Construct III.c. on Table 3.1 (Brand use)
Measure	<p>“During the past 30 days (one month), what brand of cigarettes did you usually smoke?” (SELECT ONLY ONE RESPONSE) Did not smoke cigarettes during the past 30 days; no usual brand; Add 5 most common brands; other (GYTS)</p> <p>“What brand did you buy when you last purchased cigarettes? Were these cigarettes filtered or non-filtered? Were these cigarettes light, mild, or low-tar?” (GATS)</p> <p>“Do you smoke factory-made cigarettes, roll-your-own cigarettes, or both?” IF BOTH: “For every 10 (ten) cigarettes you smoke, how many are roll-your-own? In the last month, what brand of [cigarettes/roll-your-own cigarettes] did you smoke more than any other?” [SUB-BRAND CHARACTERISTICS ARE IDENTIFIED AS NECESSARY FOR EACH NATION] (ITC)</p>
Sources	GYTS, GATS, ITC
Validity	Face validity.
Variation	<p>In ITC, sub-brand characteristics (e.g. length, filter versus non-filter) are identified in one of two possible ways. In many countries, such as Canada, Australia, and the United Kingdom, lists of every possible brand are developed and a code is given to each brand. The interviewer needs to determine the complete name of the brand the respondent is using. Often, the prompt, “How do you ask for your specific brand in the store?” is used to try to elicit the full name. In other countries (e.g. USA, China), where the variety of sub-brands is too great, brand names are given specific codes and interviewers determine specific sub-brand characteristics (e.g. menthol versus non-menthol, King Size, 100’s, or some other length).</p> <p>Country-specific terms that communicate concepts similar to “light,” “mild,” or “low-tar” should be substituted as appropriate. These can include colour, as well as terms such as “Fine” or “Smooth.”</p> <p>Items are adaptable for assessments of other tobacco products and for non-cigarette potential reduced exposure products (PREPs).</p>
Comments	<p>If necessary, country representatives should generate a list of all the brands on the market and have it available for interviewers to use to code answers. Observation of packaging to assess colour(s), presence of a legal tax stamp, and/or counterfeit brands would complement self-report.</p>
<p>GYTS: Global Youth Tobacco Survey GATS: Global Adult Tobacco Survey ITC: International Tobacco Control Policy Evaluation Survey</p>	

Table 3.11 Brand Characteristics

attempt of at least 24 hours was made during the previous 12 months. A baseline question from the Smoking Toolkit Study (West, 2006) assesses whether a serious quit attempt (i.e. whether the person decided to make sure they never smoked another cigarette) was ever made and, if so, the duration and recency of the last quit attempt. The follow-up ques-

tionnaires assess whether a serious attempt was made during the previous 12 months, the number of attempts, and, for up to three attempts, the recency and duration of each.

Intentionality:

Spontaneous quit attempts appeared to be more successful

than those that were planned (Larabie, 2005; West & Sohal, 2006). Items assessing this construct from ITC and from the Smoking Toolkit Study (West, 2006) are presented in Table 3.16.

Dose management:

People who quit abruptly (sometimes referred to as “cold turkey”)

Construct	Construct III.c. on Table 3.1 (Brand Use)
Measure	<p>“About how long have you been smoking [current brand]?” IF UNKNOWN: “Would that be less than one year, or at least one year?” (ITC)</p> <p>“Approximately how long have you been smoking [NAME OF CURRENT BRAND]? Before the [NAME OF CURRENT BRAND] that you smoke now, what brand did you smoke?” (AUTS)</p>
Sources	ITC, AUTS
Validity	Face validity.
Variation	Items are adaptable for assessments of other tobacco products.
Comments	Using data from the USA, it was demonstrated that 9.2% of smokers switched cigarette brands and 6.7% switched companies during the previous year (Siegel <i>et al.</i> , 1996). Rates of switching may be higher in locations where high prices lead to smokers searching out less expensive brands. During a three year cohort study, it was observed that US adolescents who used snuff were more likely to switch from a brand with low nicotine dosage to a brand with high, than to switch from a high dosage brand to a low dosage brand (Tomar <i>et al.</i> , 1995).

AUTS: Adult Use Tobacco Survey
ITC: International Tobacco Control Policy Evaluation Survey

Table 3.12 Brand Switching

appear more likely to succeed than those who gradually reduce the number of cigarettes they smoke each day (Fiore *et al.*, 1990; Gritz *et al.*, 1999). Items assessing this construct from the ITC and the Smoking Toolkit Study (West, 2006) are presented in Table 3.17.

Maintenance of abstinence versus return to use:

Discontinuing use of tobacco and maintaining abstinence are the most important disease preventing actions a user can take (US Department of Health and Human Services, 2004; Dresler *et al.*, 2006). Items assessing duration of abstinence are presented in Table 3.18.

Key constructs to measure

Several reports describe important constructs for tracking progress in reducing smoking prevalence (US Department of Health and Human Services, 1989, 1990, 1994, 1998, 2001; WHO, 1998a; Husten *et al.*, 1998; Pierce *et al.*, 1998b; Warren *et al.*, 2000; Burns *et al.*, 2000; Johnston, 2001; Kopstein, 2001; Giovino, 2002; Global Youth Tobacco Survey Collaborating Group, 2002; Godeau *et al.*, 2004; Hibell *et al.*, 2004; Global Tobacco Surveillance System Collaborating Group, 2005; Starr *et al.*, 2005; Troclair *et al.*, 2005; Hublet *et al.*, 2006; Johnston *et al.*, 2006; Mochizuki-Kobayashi *et al.*, 2006; Warren *et al.*, 2006; White & Hayman, 2006; WHO, 2007a). Table 3.19 contains a list of key constructs to measure in

prevalence surveys. The key constructs involve current use. Since current use is influenced primarily by initiation and cessation, these constructs are included as well.

Two constructs, both used in adult surveys, that are too complex to include in Table 3.19 will be presented here. GATS questions permit a six category classification of use status: 1) current daily use; 2) current non daily use – formerly daily; 3) current use - never daily; 4) former daily use; 5) former use - never daily; and 6) never used. These categories can be defined based on answers to three questions: 1) “Do you *currently* smoke [use smokeless] tobacco on a daily basis, less than daily, or not at all?;” 2) “Have you smoked [used smokeless] tobacco daily in the

Construct	Construct III.D. on Table 3.1(Intensity of use)
Measure	<p data-bbox="420 280 560 302">Youth Surveys</p> <p data-bbox="420 334 1381 411">“How frequently have you smoked cigarettes during the LAST 30 DAYS?” Not at all; less than 1 cigarette per week; less than 1 cigarette per day; 1-5 cigarettes per day; 6-10 cigarettes per day; 11-20 cigarettes per day; more than 20 cigarettes per day (ESPAD)</p> <p data-bbox="420 444 1381 542">“During the past 30 days (one month), on the days you smoked, how many cigarettes did you usually smoke?” I did not smoke cigarettes during the past 30 days (one month); less than 1 cigarette per day; 1 cigarette per day; 2 to 5 cigarettes per day; 6 to 10 cigarettes per day; 11 to 20 cigarettes per day; more than 20 cigarettes per day (GYTS)</p> <p data-bbox="420 575 553 596">Adult Surveys</p> <p data-bbox="420 629 1381 680">“On average, how many of the following do you smoke each <day/week>?” Manufactured cigarettes; hand-rolled cigarettes; pipes full of tobacco; cigars, cheroots, cigarillos; water pipe rocks (GATS)</p> <p data-bbox="420 713 1381 764">“On average, how many cigarettes do you smoke each <day/week/month>, including factory-made cigarettes and roll-your-own cigarettes?” (ITC)</p> <p data-bbox="420 797 1381 844">“On average, how many of the following do you smoke each day?” Manufactured cigarettes; hand-rolled cigarettes; pipes full of tobacco; cigars, cheroots, cigarillos; other (STEPS)</p>
Sources	ESPAD, GYTS, GATS, ITC, STEPS
Validity	Evidence of utility. In several countries, cotinine levels increased with increasing cigarettes per day (CPD) and levelled off between 10-20 CPD (Caraballo <i>et al.</i> , 1998; Blackford <i>et al.</i> , 2006). Indicators of nicotine dependence are associated with smoking intensity in adolescents (O’Loughlin <i>et al.</i> , 2003) and adults (Shiffman <i>et al.</i> , 2004). Kappa for smoking ≥ 1 cigarette/day during the previous 30 days was 76.2% in CDC 14-day reliability study among high school students (Brenner <i>et al.</i> , 1995).
Variation	Items are adaptable for assessments of other tobacco products. Smokeless tobacco is measured in GATS in terms of the number of times the respondent uses a given product each day.
Comments	<u>Intensity</u> is the number of cigarettes/cigars/pipes full of tobacco smoked each day for daily smokers and on the days smoked for less than daily smokers (Marcus <i>et al.</i> , 1993; Centers for Disease Control and Prevention, 1994a).
<p data-bbox="127 1281 712 1303">ESPAD: European School Survey Project on Alcohol and Other Drugs</p> <p data-bbox="127 1306 439 1328">GYTS: Global Youth Tobacco Survey</p> <p data-bbox="127 1332 435 1354">GATS: Global Adult Tobacco Survey</p> <p data-bbox="127 1357 628 1379">ITC: International Tobacco Control Policy Evaluation Survey</p> <p data-bbox="127 1383 704 1405">STEPS: STEPwise Approach to Chronic Disease Factor Surveillance</p> <p data-bbox="127 1408 545 1430">CDC: Centers for Disease Control and Prevention</p>	

Table 3.13 Intensity of Use (Number of Cigarettes or Other Tobacco Products Smoked During a Selected Time Period)

Construct	Construct III.f. on Table 3.1(Purchase patterns)
Measure	<p>“During the past 30 days (one month), how did you usually get your own cigarettes?” (SELECT ONLY ONE RESPONSE) I did not smoke cigarettes during the past 30 days (one month); I bought them in a store, shop or from a street vendor; I bought them from a vending machine; I gave someone else money to buy them for me; I borrowed them from someone else; I stole them; an older person gave them to me; I got them some other way (GYTS)</p> <p>“During the past 30 days (one month), did anyone ever refuse to sell you cigarettes because of your age?” I did not try to buy cigarettes during the past 30 days (one month); yes, someone refused to sell me cigarettes because of my age; no, my age did not keep me from buying cigarettes (GYTS)</p> <p>“In the area where you live, do you know of any places that sell single or loose cigarettes?” Yes; No (GYTS – OPTIONAL)</p> <p>“Where, or from whom, did you get the last cigarette you smoked?” Tick only one box: I didn't buy it... My parents gave it to me; my brother or sister gave it to me; I took it from home without my parent(s) permission; friends gave it to me; I got someone to buy it for me; other (specify) OR I bought it...at a hotel, pub, bar, tavern, RSL club; at a supermarket; at a news agency; at a milk bar or delicatessen; at a convenience store (e.g. Food Plus); at a tobacconist/tobacco shop; at a take-away food shop; at a petrol station; through the internet; other (specify) (ASSAD)</p> <p>“If you bought your last cigarette, was it from a coin-operated (vending) machine?” (ASSAD)</p> <p>“Sometimes people break open a packet of cigarettes and sell single cigarettes. In the last four weeks, have you bought cigarettes that were not in a full packet (for example, buying one or more cigarette(s) at a time)?” IF YES: “Thinking of the last time you bought cigarettes that were not in a full packet, where did you buy the cigarette(s) from?” I bought the cigarette(s) at a shop; I bought the cigarette(s) from a friend or relative; I bought the cigarette(s) from someone else (ASSAD)</p>
Sources	GYTS, ASSAD (White & Hayman, 2006)
Validity	Face validity.
Variation	Items are adaptable for assessments of other tobacco products.
Comments	Those who purchase in locations that provide less expensive cigarettes are less likely to quit (Hyland <i>et al.</i> , 2005). Young people are more likely to have other people purchase cigarettes for them in regions where sales to minors are restricted (Everett Jones <i>et al.</i> , 2002; White & Hayman, 2006).
<p>GYTS: Global Youth Tobacco Survey ASSAD: Australian Secondary Students' Alcohol and Drug Survey</p>	

Table 3.14 Purchase Patterns

Construct	Construct IV.b. on Table 3.1 (Quit attempts)
Measure	<p>Ever: ITC BASELINE: “Have you ever tried to quit smoking?” IF YES: “How many times have you ever tried to quit smoking? How long ago did your most recent serious quit attempt end? Thinking about your last serious quit attempt, how long did you stay smoke free?” (ITC)</p> <p>“Have you ever made a serious attempt to stop smoking? By serious attempt I mean you decided that you would try to make sure that you never smoked another cigarette.” Yes; No; Don’t know IF YES: “Thinking back to your most recent attempt to quit smoking, how long ago was it?” SHOW SCREEN: Within the last week; within the last 2-3 weeks; a month ago; more than 1 month and up to 2 months; more than 2 months and up to 3 months; more than 3 months and up to 6 months; more than 6 months and up to a year; more than one year and up to 5 years; longer than 5 years; don’t know. AND: “How long ago did your most recent quit attempt last?” Less than a day; more than a day but less than 3 days; more than 3 days up to a week; more than a week up to a month; more than 1 month and up to 2 months; more than 2 months and up to 3 months; more than 3 months and up to 6 months; more than 6 months and up to a year; more than one year and up to 5 years; more than 5 years; don’t know; I am still not smoking (STS Baseline Questionnaire)</p> <p>Past 12 months: “During the past year, have you ever tried to stop smoking cigarettes?” I have never smoked cigarettes; I did not smoke during the past year; yes; no (GYTS)</p> <p>“During the past 12 months, have you tried to stop smoking?” IF YES: “Thinking about the last time you tried to quit, how long did you stop smoking?” (GATS)</p> <p>Follow-up assessments in a cohort study: ITC FOLLOW-UP WAVES: FOR RESPONDENTS WHO WERE CURRENTLY SMOKING AT THE PREVIOUS WAVE: “Have you made any attempts to stop smoking since we last spoke with you in [month of last interview]?” IF YES: “Are you back smoking or are you still stopped?” IF BACK SMOKING: “What is the longest time that you stayed smoke free since [month of last interview]?” IF STILL STOPPED: “When did you quit?” (ITC)</p> <p>FOR RESPONDENTS WHO WERE ABSTINENT AT THE PREVIOUS WAVE: “The last time we spoke with you in [month of last interview] you had quit smoking. Are you back smoking or are you still stopped?” IF BACK SMOKING: “What is the longest time that you stayed smoke free since [month of last interview]?” IF STILL STOPPED: “So you have quit smoking since [quit date reported previously] – is that correct?” IF NO: “When did you quit?” (ITC)</p> <p>“Have you made a serious attempt to stop smoking in the past 12 months? By serious attempt I mean you decided that you would try to make sure that you never smoked another cigarette. Please include any attempt that you are currently making.” Yes; no; don’t know. IF YES: “How many serious attempts to stop smoking have you made in the last 12 months?” (Choose <u>one</u> option only) 1 attempt; 2 attempts; 3 attempts; more than 3 attempts; don’t know. “How long ago did your quit attempt start?” (assessments are made for up to 3 attempts). “How long ago did your quit attempt last before you went back to smoking?” (assessments are made for up to 3 attempts; “still not smoking” is an option) (STS Wave 1 and 2 postal questionnaires)</p>
Sources	ITC; STS (West, 2006); GATS

Table 3.15 Quit Attempts

Validity	Face validity. However, respondents appear to forget many short quit attempts, especially those that took place more than three months before the interview (Gilpin & Pierce, 1994; West <i>et al.</i> , 2007). Having ever quit for ≥ 12 months or having quit for ≥ 7 days during the previous 12 months has been classified as a strong quitting history and is predictive of subsequent cessation (Pierce <i>et al.</i> , 1998b).
Variation	Items are adaptable for assessments of other tobacco products.
Comments	ITC items are specifically crafted to assess change in a cohort study.
Definitions	A <u>quit attempt</u> is an activity by a user in which the person tries to stop using with the intention of never using again. Some surveys only classify periods of abstinence as quit attempts that last for ≥ 24 hours.
GYTS: Global Youth Tobacco Survey GATS: Global Adult Tobacco Survey ITC: International Tobacco Control Policy Evaluation Survey STS Smoking Toolkit Study	

Table 3.15 Quit Attempts

past?;" and 3) "In the past, have you smoked [used smokeless] tobacco on a daily basis, less than daily, or not at all?" (Note that respondents are skipped past questions that do not apply to them, as indicated by their answer(s) to initial item(s).)

The second construct involves a technique that assesses tobacco use activity during the 12 months prior to being interviewed. The US Tobacco-Use Supplement to the Current Population Survey asks current daily smokers, current non-daily smokers, and former smokers abstinent ≤ 12 months, "Around this time 12 months ago were you smoking cigarettes every day, some days, or not at all?" This question, which can be adapted to smokeless tobacco use, enables a retrospective cohort assessment of cessation activity, transitioning from daily to non-daily use, transitioning from non-daily to daily use, and relapse to daily or non-daily use (Gilpin & Pierce, 1994; US Department of Health and Human

Services, 1998; Burns *et al.*, 2000).

Summary

This section describes the key concepts within the natural history of tobacco use, providing a conceptual model to guide measurement of key constructs. Current tobacco use is the most important construct because of its importance as an outcome in policy evaluation studies. Studies that have examined the validity of self-reported measures of current use generally find these measures to be valid, although there are conditions where the validity may be reduced.

It is important to measure the type of tobacco used, particularly in those countries in which there exists a variety of forms. The variety of forms available, and the possibility of switching, or multiple concurrent use may influence the probability of quitting and disease risk.

Detailed measurement of information about tobacco product packaging is important in order to determine the variant of product type used, movement between price sectors, and, potentially, to assess the use of tobacco from illicit sources.

Other important constructs in the measurement of tobacco use behaviour include early use, frequency and intensity of current use, quit attempts, and duration of abstinence among former smokers.

Consumers of survey data, in which tobacco use measures are included, should be aware of factors that can influence population estimates of tobacco use and take those into consideration when comparing estimates from surveys conducted within and across countries.

Construct	Construct IV.b.i on Table 3.1 (Intentionality)
Measure	<p>“When you made your last quit attempt, when did you choose your quit day?” Chose it on the actual day when you stopped; chose it on the day before you stopped; chose it more than one day before; or actually decided to quit after having not smoked for some other reason (ITC)</p> <p>“Had you been seriously thinking about quitting in the days before you finally decided to stop, or was it a spur-of-the-moment decision?” I had already been seriously thinking about quitting; it was a spur-of-the-moment decision (ITC)</p> <p>“Which of the following statements best describes how your most recent quit attempt started?” SHOW SCREEN: I did not plan the quit attempt in advance; I just did it; I planned the quit attempt for later the same day; I planned the quit attempt the day beforehand; I planned the quit attempt a few days beforehand; I planned the quit attempt a few weeks beforehand; I planned the quit attempt a few months beforehand; none of these (other specify) (STS Baseline Questionnaire)</p> <p>Please circle which applies to each quit attempt. (Choose <u>one</u> response for each quit attempt) I planned the quit for later the same day or for a date in the future; I planned to quit as soon as I made the decision (STS Wave 1 & 2 postal questionnaires)</p>
Sources	ITC; STS
Validity	Face validity. Unplanned quit attempts were more likely to succeed than planned attempts (Larabie, 2005; West & Sohal, 2006)
Variation	Items are adaptable for assessments of other tobacco products.
<p>ITC: International Tobacco Control Policy Evaluation Survey STS: Smoking Toolkit Study</p>	

Table 3.16 Quit Attempts – Intentionality

Construct	Construct IV.b.ii on Table 3.1 (Dose management)
Measure	<p>“On your most recent quit attempt, did you stop smoking suddenly or did you gradually cut down on the number of cigarettes you smoked?” Stopped suddenly; cut down gradually (ITC)</p> <p>“Did you cut down gradually by delaying the first cigarette you had each day for longer and longer, or just by trying to smoke less and less?” By delaying the first cigarette of the day; by trying to smoke less and less; both (ITC)</p> <p>“Did you cut down the amount you smoked before trying to stop completely?” (Choose <u>one</u> response for each quit attempt) Cut down first; stopped without cutting down; cannot remember (STS)</p>
Sources	ITC; STS
Validity	Face validity. Abstainers were more likely to stop without cutting down than were relapsers, who were more likely to quit using gradual reduction (Fiore <i>et al.</i> , 1990; Gritz <i>et al.</i> , 1999).
Variation	Items are adaptable for assessments of other tobacco products.
<p>ITC: International Tobacco Control Policy Evaluation Survey STS: Smoking Toolkit Study</p>	

Table 3.17 Quit Attempts – Dose Management

Construct	Construct IV.c. on Table 3.1 (Maintenance of abstinence)
Measure	<p>“How long ago did you stop smoking?” I have never smoked cigarettes; I have not stopped smoking; 1-3 months; 4-11 months; 1 year; 2 years; 3 years or longer (GYTS)</p> <p>“When was the last time you smoked a cigarette, even one or two puffs?” I have never smoked a cigarette; today; not today, but some time during the past week; not in the past week, but some time in the past month; 2-3 months ago; 4-6 months ago; 7-12 months ago; 1 to 4 years ago; 5 or more years ago (GYTS – OPTIONAL)</p> <p>“How long has it been since you last smoked regularly?” (GATS)</p> <p>ITC FOLLOW-UP WAVES: FOR RESPONDENTS WHO WERE CURRENTLY SMOKING AT THE PREVIOUS WAVE: “Have you made any attempts to stop smoking since we last spoke with you in [month of last interview]?” IF YES: “Are you back smoking or are you still stopped?” IF BACK SMOKING: “What is the longest time that you stayed smoke free since [month of last interview]?” IF STILL STOPPED: “When did you quit?” (ITC) ALTERNATIVE METHOD: “Have you made any attempts to stop smoking since we last spoke with you in [month of last interview]?” IF YES: “The last time we spoke with you in [month of last interview] you said that you smoked [daily/less than daily but at least once a week/less than once a week but at least once a month]. Do you still smoke [daily/less than daily but at least once a week/less than once a week but at least once a month]?” IF NO AND RESPONDENT SMOKED DAILY AT LAST INTERVIEW: “Are you now smoking at least once a week, or less than once a week, but at least once a month?” IF NO AND RESPONDENT SMOKED WEEKLY AT LAST INTERVIEW: “Are you now smoking daily or are you smoking less than once a week, but at least once a month?” IF NO AND RESPONDENT SMOKED MONTHLY AT LAST INTERVIEW: “Are you now smoking daily or less than daily, but at least once a week?”</p> <p>FOR RESPONDENTS WHO WERE ABSTINENT AT THE PREVIOUS WAVE: “The last time we spoke with you in [month of last interview] you had quit smoking. Are you back smoking or are you still stopped?” IF BACK SMOKING: “What is the longest time that you stayed smoke free since [month of last interview]?” IF STILL STOPPED: “So you have quit smoking since [quit date reported previously] – is that correct?” IF NO: “When did you quit?” (ITC)</p> <p>“How long ago did you stop smoking daily?” (STEPS)</p>
Sources	GYTS, GATS, ITC, STEPS
Validity	Evidence of utility. Self-reports of having quit are reasonably valid when adequate privacy is afforded and demand for abstinence is not high (Velicer <i>et al.</i> , 1992).
Variation	Items are adaptable for assessments of other tobacco products.
Comments	ITC items are specifically crafted to assess change in a cohort study.
Definitions	A <u>former user</u> is someone who has used more than the threshold level of established use and who no longer uses. <u>Sustained former use</u> occurs when a former user has been abstinent for at least 12 months (6 to 12 months, Starr <i>et al.</i> , 2005; ≥ 12 months, Giovino & Borland, personal communication).
<p>GYTS: Global Youth Tobacco Survey GATS: Global Adult Tobacco Survey ITC: International Tobacco Control Policy Evaluation Survey STEPS: STEPwise Approach to Chronic Disease Factor Surveillance</p>	

Table 3.18 Duration of Abstinence in Former Smokers

Construct	Numerator	Denominator	Comments
Initiation of Use			
Ever use	Number of ever users	Total number of respondents	A similar construct could be assessed for ever daily use.
Early initiation	Number of ever users who tried using before a given age	Number of ever users	GYTS uses 10 years old as cut-off. A similar construct could be measured for initiation of daily use before a given age.
Transition to established use	Number of current daily users	Number of ever users	Indicates probability of transition to and maintenance of more established use. (See Johnston, 2002 for other indicators of transition)
Discontinuance	Number of former triers	Number of ever users	A similar construct could be assessed for former experimenters.
Maintenance of Use			
Current use	Number of current users	Total number of respondents	Various measures include current smoking, current smokeless tobacco use, current tobacco use, and current use of individual products. Similar constructs could be assessed for current daily use.
Frequency of use	Number of daily users	Number of current users	An "inverse" construct would define the percentage of current users who do not use on a daily basis. Some surveys describe frequent use as use on ≥ 20 of the previous 30 days.
Intensity of use	Number of current users who use more than a given amount	Number of current users	Cut-offs should be standardised to permit comparisons. For example, for adult cigarette smokers, use of ≥ 15 cigarettes/day could serve as a measure of heavy smoking. Mean numbers can also be presented.
Brand use	Number of current users who use a given brand	Number of current users	Variants could involve descriptors of roll-your-own cigarettes, Western versus domestic brands, and sub-brand characteristics as appropriate to a given nation (e.g. "light/mild," "menthol")
Purchase location	Number of current users who purchase in a given location	Number of current users	For adults, type of venue could indicate tax avoidance strategies. For youth, source of tobacco could indicate efforts

Table 3.19 Suggested Prevalence Indicators of Tobacco Use Behaviours

Cessation of Use			
Former use among ever users	Number of former uses	Number of ever users	Often called the “quit ratio” or “prevalence of cessation” this is a crude measure of quitting (Pierce <i>et al.</i> , 1989; US Department of Health and Human Services, 1989, 1990).
Sustained abstinence	Number of former users abstinent for ≥ 6 months	Number of ever users	Relapse is less likely after being abstinent for ≥ 12 months.
Making a quit attempt	Number of current users who tried to quit during the previous 12 months plus the number of former users abstinent for ≤ 12 months	Number of current users plus the number of former users abstinent for ≤ 12 months	Making a quit attempt is a dependent variable in many policy analyses
Former use for ≥ 1 months among anyone who used during the previous 12 months and made a quit	Number of former users abstinent for 1-12 months	Number of current users who tried to quit during the previous 12 months plus the number of former users abstinent for 1-12 months	Indicates ≥ 1 month of abstinence among those who tried to quit during the previous 12 months. People abstinent for < 1 month would be not included in this analysis (Centers for Disease Control and Prevention, 1993)

Notes: The numbers in the numerator and denominator could be either the actual number of respondents in the survey or the weighted population estimate. Also, fractions would be multiplied by 100 to obtain percentages.

Table 3.19 Suggested Prevalence Indicators of Tobacco Use Behaviours