RESEARCH ARTICLE

Tobacco Use and Quit Behaviour Assessment in the Global Adult Tobacco Survey (GATS): Invalid Responses and Implications

Pratap Kumar Jena[1]*, Jugal Kishore[2], Sanghamitra Pati[3], Bidyut Kanti Sarkar[4], Sagarika Das[5]

Abstract

Background: Tobacco use and quit attempts are two key indicators of the Global Adult Tobacco Survey (GATS) that assess quit attempts among current as well as former tobacco users. The relevant data have inherent policy implications for tobacco cessation programme evaluation. This study aimed to review the concepts of quit attempt assessment and quantifying invalid responses considering GATS-India data. Materials and Methods: GATS assessment of tobacco use and quit attempts were examined in the current literature. Two categories of invalid responses were identified by stratified analysis of the duration of last quit attempt among current users and duration of abstinence among former users. Category A included absolute invalid responses when time-frame of assessment of current tobacco use and less than former tobacco use were violated. Category B included responses that violated the unit of measurement of time. Results: Current daily use, current less than daily use and former use in GATS were imprecisely defined with overlapping of time-frame of assessment. Overall responses of 3,102 current smokers, 4,036 current smokeless users, 1,904 former smokers and 1,343 former smokeless users were analyzed to quantify invalid responses. Analysis indicated overall 21.2% (category A: 7.32%; category B: 17.7%) and 22.7% (category A: 8.05%; category B: 18.1%) invalid responses among current smokers and smokeless users respectively regarding their duration of last quit attempt. Similarly overall 6.62% (category A: 4.7%; category B: 2.3%) and 10.6% (category A: 8.6%; category B: 3.5%) invalid responses were identified among former smokers and smokeless users respectively regarding their duration of abstinence. Conclusions: High invalid responses for a single assessment are due to the imprecise definition of current use, former use and quit attempt; and failure to utilize opportunity of direct data entry interface use during the survey to validate responses instantly. Redefining tobacco use and quit attempts considering an appropriate timeframe would reduce invalid responses.

Keywords: Quit attempt - validity - global adult tobacco survey - India

Asian Pac J Cancer Prev, **14 (11)**, 6563-6568

Introduction

Quit attempt among tobacco users is an important tobacco cessation behaviour indicator (Starr et al., 2005; Fong et al., 2006; Global Adult Tobacco Survey Collaborative Group, 2011). It has been defined as an activity by a tobacco user in which the person tries to quit (stop using) with the intention of never using it again (IARC, 2008). The numerator of this indicator includes current tobacco users (smokers/smokeless users) who tried to quit during the past 12 months and former tobacco users (smokers/smokeless users) who have been abstinent for <12 months. The denominator includes the total number of current tobacco users, and former tobacco users who have been abstinent for <12 month (GTSS, 2009). This indicator has been derived from two separate questions of the GATS survey asked of current and former tobacco users in order to avoid underestimation when only current users are included for assessment. While tobacco use represents falling into the captive of tobacco dependence, the quit attempt represents its opposite dimension. Both the tobacco use prevalence and quit attempt among tobacco users are the measures of effectiveness of tobacco control policies (IARC, 2008).

IARC (2008) review on natural history of tobacco use indicates that non smoker would undergo a series of steps

*[1]Project STEPS, Public Health Foundation of India, New Delhi, and Heath Systems Research India Initiative, Bangalore, [2]Department of Community Medicine, Maulana Azad Medical College, [4]Department of Epidemiology and Public Health, University College London, U.K. and Public Health Foundation of India (PHFI), PHD House, Siri Fort Institutional Area, New Delhi, [3]Indian Institute of Public Health, Bhubaneswar, India *For correspondence drpratapjena@gmail.com*

like trial, experimentation, established use, attempting to quit, relapse, and/or maintenance of cessation. Smoking behaviour becomes established when a smoker has smoked at least 100 lifetime cigarettes (Starr et al., 2005). After smoking behaviour gets established, discontinuation of smoking involves an attempt to quit. The outcome of each quit attempt may be relapse or maintenance of cessation. Quit attempts can be planned or sudden and may be done abruptly or gradually with or without any assistance of one or more tobacco cessation methods (IARC, 2008).

Quitting tobacco use has definite and immediate health benefits (USDHHS, 2004; Hughes, 2007; IARC, 2007). However, quitting is not easy; and this process requires first trying to quit (quit attempt) and then being successful in quitting i.e. cessation (Jardin et al., 2012). The nil past history of quit attempt is an indicator of inability of quitting by a smoker and is a component construct of hardcore smoking definition (Kishore et al., 2013). Two theories i.e. Stages of Change (DiClemente et al., 1991; Prochaska et al., 1992) and PRIME theory (West, 2006) have been advocated to understand the process of quitting. Former entails that change of smokers from pre-contemplation (not interested in quitting) to established non smoking status requires a series of stages of change. The stages between these two opposite stages (smoking vs. non smoking) are contemplation, preparation, action and relapse/maintenance. Quit attempt is the part of "action stage" as advocated by this model. The arbitrary classification of different stages and limitation in explaining abrupt quitting by this theory was addressed in the Robert West's PRIME theory (McEwen et al., 2006; West, 2006). Robert West suggests that smokers make a quit attempt when the desire to stop exceeds the desire to continue smoking. Quit attempt may or may not be preceded by a plan to quit. Quit attempt becomes a rule when smokers tried not to smoke and then stopped smoking (West, 2006).

A recent review by Jardin et al. (2012) suggests that duration and number of previous quit attempts; and intention to quit are strong predictors and necessary precursors of successful quitting. Availability and type of tobacco cessation services also modulates success in smoking quit attempts (Fiore, 2007). However nicotine dependence is the single most consistent predictor of success following a quit attempt (Vangeli et al., 2011). Various key indicators have been defined for population level monitoring and evaluation of tobacco cessation/control programs, which include classification of smokers by intention and attempts to quit smoking (WHO, 1998; Giovino et al., 2009). Global Adult Tobacco Survey (GATS) is a part of Global Adult Tobacco Surveillance System (GTSS) that monitors tobacco control indicators among adults of 15 years old and above. Quit attempt assessment is a key indicator in GATS to assess tobacco cessation behaviour among current and former users (IIPS, 2010; Global Adult Tobacco Survey Collaborative Group, 2011). Earlier definitional and conceptual problems in GATS have been identified (Jena et al., 2012; 2013). The objective of this study is to examine conceptual issues and validity of responses with the GATS assessment of quit attempt.

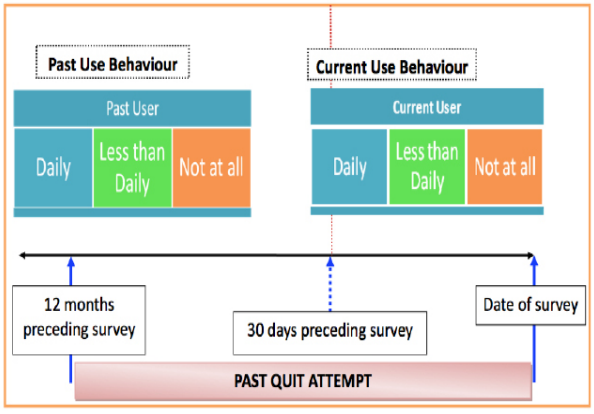
Materials and Methods

GATS-India (IIPS, 2010) survey tool Section B and Section D1assessed smoking tobacco use and its quit attempt behaviour respectively. Similar assessment for smokeless tobacco use was done under section C & D2 of the GATS tool. The concept of tobacco use behaviour and quit attempt assessment as in GATS are graphically represented in Figure 1.

GATS has assessed three category of current (daily, less than daily and not at all) users of tobacco. Current not at all but former users and 'current less than daily' users were assessed for their past tobacco use behaviour. Current daily users were not assessed for their past use behaviour. Unlike other surveys, the definition of current use in GATS does not have definite timeframe of assessment. The term 'current daily smoker' has been referred as the person currently smokes at least one tobacco product every day, over a period of one month or more (IIPS, 2010). Taking cue from this definition, current user would mean that users in the past 30 days or beyond preceding the survey. Thus the time of reference was limited to 30 days preceding the survey to characterize current users in this study, which is similar to other surveys (IARC, 2008).

Items numbered D01 to D03 under cessation section of the GATS questionnaire measured the duration of the last quit attempt among the current smokers considering the quit attempts in the past 12 months preceding the survey. Similar measurement for smokeless users was assessed by the items D09, D10 and D11. GATS had also assessed duration of abstinence (successful quit attempt) among former tobacco users (Items B13 and C13). These items assessed self reported tobacco use behaviour and duration of last quit attempt or abstinence. Such assessment was subjected to stratified analysis to identify invalid responses without using GATS sampling weights.

The measurement of duration of the last quit attempt among current users were collected by recording time units like 'Month', 'Week', 'Day' and 'less than 24 hours' etc and its frequency. Similar time units along with 'Year' were used to assess the duration since abstinence among former users. These time units represent ranked data and sum of fixed number of lower units result in formation of



Source: IIPS (2010)

Figure 1. Assessment of Tobacco Use and Quit Attempt in Global Ault Tobacco Survey

higher unit i.e. seven days would result in one week, four weeks would result in one month and so on. As far as the duration of the last quit attempt during past 12 months among the current users is concerned, it can't be >11 months i.e. one year. More so, the duration of last quit attempt among the less than daily users when expressed in terms of 'less than 24 hours' or 'days', it would also indicate invalid responses, as these users may be weekly user or monthly user etc. The duration of quit attempt when expressed in 'more than 7 days', 'more than 4 weeks', 'more than 12 months' etc., would result in erroneous interpretation owing to variation in unit of measurements of time and inter unit relationship. Therefore for the purpose of this study we assumed logics as in Figure 2 to identify invalid responses. Category A included absolute invalid responses when time-frame of assessment of current tobacco use and less than daily tobacco use were violated. Category B included responses that violated unit of measurement of time.

Results

GATS had assessed both current and past use behaviour of tobacco users. Table 1 represents distribution of respondents according to current and past use of tobacco. These figures in the table clearly indicate that 'daily use' was four times more prevalent than 'less than daily' use among current smokers and smokeless tobacco users. Among the current less than daily users, around one out of four, were daily users in the past. Daily smoking was predominant among former smokers but reverse trend was observed among former smokeless tobacco user.

Table 2 represents invalid responses identified by stratified analysis of duration of the last quit attempt among the current users of tobacco. It is to be noted that, the denominator of current user (use of tobacco within 30 days preceding the survey) and duration of last quit attempt in the past 12 months are different. Responses of 3102 current smokers and 4036 current smokeless users were analyzed to quantify invalid responses. Analysis indicated overall 21.24% (category A: 7.32%; category B: 17.67%) and 22.7% (category A: 8.05%; category B: 18.09%) invalid responses among current smokers and smokeless users respectively regarding their duration of last quit attempt among current users.

Table 3 represents invalid responses identified by stratified analysis of duration of abstinence among the former users of tobacco. Responses of 1904 former smokers and 1343 former smokeless users were analyzed to quantify invalid responses with respect to their duration of abstinence. Analysis indicated overall 6.62% (category A: 4.7%; category B: 2.3%) and 10.57% (category A: 8.6%; category B: 3.5%) invalid responses were identified among former smokers and smokeless users respectively regarding their duration of abstinence.

Discussion

The responses for the duration of last quit attempt by the current users are invalid in 1 out of 5 cases. Similarly the measurement of duration since abstinence among former user has yielded 6.6-10.6% invalid responses. The invalid responses may be due to fact that, the time frame of 'quit attempt', 'current use' and 'former use' are different.

Table 1. Current and Past Tobacco Use Behaviour among Respondents in GATS India Survey (2009-10)

Tobacco use behaviour		Smoking tobacco		Smokeless tobacco	
Current use	Past use	N	%	N	%
Daily	*	9223	13.3	13410	19.4
Less than daily	Daily smoker	669	1	920	1.3
	Not daily smoker	1704	2.5	2482	3.6
	Sub total	2373	3.4	3402	4.9
Not at all	Daily	1158	1.7	698	1
	Less than daily	827	1.2	716	1
	Not at all	55715	80.4	51070	73.7
	Sub total	57700	83.3	52484	75.7
TOTAL		69296	100	69296	100

*Not assessed by GATS; **Source: GATS-India data [IIPS (2010)]

Last quit attempt in the past 12 months among current users (items D02 & D10)	Successful quit attempt (abstinence) among former users (items B13 & C13)
Category A: Duration of last quit attempt among current user should not contradict 1. Timeframe of assessment: Numerical value of any unit indicating duration of quit attempt ≥ 11 months/48 weeks/335 days. 2. Concept of less than daily tobacco use: Numerical value of last quit attempt expressed in 'LESS THAN 24 HOURS' or 'DAY unit having value < 7 days' among less than daily users	**Category A: Duration of abstinence among former user should not contradict** 1. Current use concept: Numerical value of any unit of abstinence indicating duration of abstinence < 30 days (<24 hours/4 weeks/ 1 month) 2. Concept of less than daily tobacco use: Numerical value of abstinence duration expressed in DAY unit having value < 7 days (for less than daily users)
Category B: Unit of measurement of duration of last quit attempt/abstinence should not violate unit of measurement 1. Numerical value of DAY unit exceeding '7' 2. Numerical value of WEEK unit exceeding '4' 3. Numerical value of MONTH unit exceeding '11'	

Figure 2. Logic Used to Identify Invalid Responses in Measurement of Duration

Table 2. Stratified Analysis of Duration of the Last Quit Attempt among Current Tobacco Users to Identify Invalid Responses

Current smoker											
B01. Current smoking status	B02. Past daily use	D02b. Thinking about the last time you tried to quit, how long did you stop smoking? [enter number of units in D02a]								Invalid responses	
		1-4	5-7	8-10	11-12	13-30	31-48	49-335	336-365	Cat A	Cat B
D02a. Thinking about the last time you tried to quit, how long did you stop smoking? [Enter Unit]											
Months	Daily	647	147	39	79					79	79
Less than daily	Yes	110	26	9	19					19	19
	No	171	61	16	17					17	17
Weeks	Daily	428	76	10	2	16	2			0	106
Less than daily	Yes	50	15	1	2	4				0	22
	No	82	14	1	5					0	20
Days	Daily	463	168	88	16	112	9	4	1	1	230
Less than daily	Yes	39	13	7		10		1		26	18
	No	58	25	15	2	19	1			83	37
<24 Hours	Less than daily	no				1				1	0
Don't know	Less than daily	no				1				1	0
Total responses					3102					227 (7.32%)	548 (17.67%)
					Overall invalid responses					559 (21.24%)	

Current smokeless tobacco user											
C01. Current smokeless tobacco use status	C02. Past Daily Use	D10b. Thinking about the last time you tried to quit, how long did you stop using smokeless tobacco? [enter number of units in D10a]								Invalid responses	
		1-4	5-7	8-10	11-12	13-30	31-48	49-335	336-365	Cat A	Cat B
D10a. Thinking about the last time you tried to quit, how long did you stop using smokeless tobacco? [enter unit]											
Months	Daily	847	174	36	94					94	94
Less than daily	Yes	93	25	14	20					20	20
	No	212	62	14	25					25	25
Weeks	Daily	465	78	11	1	30	2			0	122
Less than daily	Yes	52	11	4	1	2				0	18
	No	99	18	4	1	4	1			0	28
Days	Daily	793	234	135	18	182	12	1		0	348
Less than daily	Yes	50	25	11	2	14	2			75	29
	No	77	31	18	1	22	4	1		108	46
<24 Hours	Daily				1					1	0
	Less than daily				1					1	0
Don't know	Daily							1		1	0
Total responses					4036					325 (8.05%)	730 (18.09%)
					Overall Invalid Responses					916 (22.7%)	
Category A Invalid Responses					Category B Invalid Responses					Both Category A & B Invalid Responses	

Table 3. Stratified Analysis of Duration of Abstinence among Former Tobacco Users to Identify Invalid Responses

Former smoker									
B03. Past Smoking behaviour		B13b. How long has it been since you stopped smoking? [Number of UNITS of B13a]						Invalid responses	
		1	2-4	5-7	8-12	13-30	30-360	Cat A	Cat B
B13a. How long has it been since you stopped smoking?									
Years	Daily	83	203	131	192	294	71	5	0
	Less than daily	53	169	98	141	173	35	16	0
Months	Daily	19	33	31	10	9	10	19	19
	Less than daily	13	34	28	20	5	2	13	7
Weeks	Daily	3	3	1	2	1		6	4
	Less than daily	2	9	3	2			11	5
Days	Daily	4		1	2	5	1	12	8
	Less than daily	2	5	1				8	0
Total responses					1904			90 (4.7%)	43 (2.3%)
					Overall invalid responses			126 (6.62%)	

Former smokeless tobacco user									
C03. Past Smokeless tobacco use behaviour		C13b. How long has it been since you stopped smokeless tobacco use? [Number of UNITS of C13a]						Invalid responses	
		1	2-4	5-7	8-12	13-30	30-360	Cat A	Cat B
C13a. How long has it been since you stopped using smokeless tobacco?									
Years	Daily	55	131	90	112	111	11	10	0
	Less than daily	74	156	100	71	77	12	9	0
Months	Daily	18	48	38	15	1	1	18	2
	Less than daily	16	47	41	23	14	3	16	17
Weeks	Daily	1	6		1	2		7	3
	Less than daily	8	16	7	4	1		24	5
Days	Daily		3	4	5	9	1	21	15
	Less than daily		1	4	1	4		10	5
Total responses					1343			115 (8.6%)	47 (3.5%)
					Overall Invalid Responses			142(10.57%)	
Category A Invalid Responses					Category B Invalid Responses			Both Category A & B Invalid Responses	

B03, B13, C03, C13 represents respective items in GATS-India survey (2009-10) tool

This is attributable to the ill defined current use and former use definition which formed the denominator of quit attempt indicator. Overall, the quit attempt indicator needs to be improved to measure what it intended to measure.

If we assume that Category A responses are valid one, these responses would indicate that former user are those who used tobacco just one day or one week or one month before the survey. However, in such instances current daily use definition (daily use for ≥1 month) as well as former use definition in GATS would be contradicted. Similarly if we assume that responses for duration of last quit attempt among current users is ≥11 months, it would defeat the very purpose of assessment of quit attempt in the past 12 months among the current daily users.

The self-reported data of tobacco cessation behaviour like quit attempt is not same as simple answers to the question. Measurement of self-reported duration of quit attempt in the past may stretch the capacity of the respondent to recall the past events and hence this measure is subject to a range of possible biases as indicators of their target constructs (IARC, 2008). The same biases are also applicable to measurement of current or past use of tobacco. However owing to time frame as per definition of various indicators, the biases may also vary. The biases may be less for current use assessment where time frame of assessment is limited to the use of tobacco within 30 days preceding the survey than the measurement of quit attempt in the past 12 months. The ill defined time frame of current use in GATS survey wouldn't help to identify the magnitude of bias in this measurement. It has been observed that respondents appear to forget many quit attempts of short duration, specifically, if the attempt took place more than three months before the interview (Gilpin et al., 1994; West et al., 2007). GATS measured the quit attempt considering past use of tobacco beyond 3 months and also imprecisely defined the current use time frame. This would lead to facilitation of occurrence of bias and failure of measuring the magnitude of the bias.

Having quit for more than 7 days during the previous 12 months has been considered a strong quitting history leading to cessation in future (Pierce et al., 1998). Therefore authors support 12 month timeframe of assessment for quit attempts but not the ill defined time frame of assessment for current and former users in the GATS tool. As per natural history of tobacco use, quit attempt is possible among established user, i.e. lifetime use of 100 cigarettes. These established users may be daily or less than daily. While it is easy to identify short duration of quit attempt among daily users, it won't be the same for less than daily users. Therefore assessment of quit attempt among less than daily users should at least be expressed in week time unit not in day or <24 hr time unit. Moreover GATS being a policy influencing tool, we should avoid recording of micro details of short duration (<7 days) of quit attempt in the global adult survey.

The number of prior quit attempts also predicts the future quit attempts (Zhou et al., 2009; Jardin et al., 2012) and increases the probability of cessation (West et al., 2001; Tobias et al., 2010).The fact that individuals with higher number of quit attempts are repeatedly trying to quit tobacco use indicates that they are motivated (Joseph et al., 2004), but are just unable to maintain long-term abstinence. Successful smoking cessation programs must identify this group of smokers as having many failed attempts may result in frustration, fear, defiance, and loss of interest in quitting (Wolburg et al., 2006). Hence GATS should additionally include number of prior quit attempts in the past 12 months preceding the survey. Spontaneous quit attempt has more success rate than planned one (West et al., 2006). Similarly abrupt quit attempt has more success rate than gradual reduction (Gritz et al., 1999). These assessments have been given importance in ITC (2007) and Smoking Tool Kit Study (West, 2006) but not in GATS tool.

GATS is a nationally representative cross sectional survey and hand held devices were used to record the responses digitally. This digital interface in the hand held device could be used to identify invalid responses during response recording and the 'prompt or pop up' that generated could be used for rectify the responses instantly. However current study results indicate that there was inadequate utilization of the opportunity provided by digital data recording interface to collect the valid responses.

The credibility of a survey tool depends on its ability to collect the valid and reliable data. Therefore it is pertinent to identify the items that failed to collect valid and reliable information. Quit attempt is a measure of tobacco control policy and hence it is important to have credible information on this indicator at all times. GATS has used multiple tobacco control policy measures that could result in increased internal validity of the survey for evaluating tobacco control policies. However unless each indicator captures the true information, it would be difficult to internally validate using various indicators.

In situations where tobacco control evaluation studies have to depend on cross-sectional data collection, measures of quit attempts could be considered as proxies of future behavior. Further, being more responsive to policy changes in the short run compared to population-level prevalence rates of smoking (Fong et al., 2006a; 2006b) quit attempt assessment is taken as intermediate evaluation outcomes. GATS has limitations for assessing quit attempt, similar to assessment of cigarette per day (Jena et al., 2013) due to definitional issues and failure to utilize opportunity of digital interface to record responses in the survey directly. Based on results of this study authors recommend following revisions in the GATS tool for assessment of quit attempt.

In recommendations, *i*) Quit attempt should be redefined considering the appropriate time-frame of assessment of current use, former use and quit attempt; *ii*) The GATS should assess the number of quit attempts that could be used as a proxy for their future success in quitting; *iii*) Validity and reliability of the tool should be tested before the actual survey; *iv*) The digital interface should be validated using predefined logic for each cell used for data recording. The digital data collection interface should be designed to convert all time units (year, month, week, day) into single time unit like day to avoid confusion.

References

DiClemente CC, Prochaska JO, Fairhurst SK, et al (1991). The processes of smoking cessation: an analysis of precontemplation, contemplation, and preparation stages of change. *J Consulting Clin Psychol,* **59**, 285-304.

Fiore MC, Keller PA, Curry SJ (2007). Health system changes to facilitate the delivery of tobacco-dependence treatment. *Am J Prev Med*, **33**, 349-56.

Fong GT, Cummings KM, Borland R, et al (2006a). The conceptual framework of the International Tobacco Control (ITC) policy evaluation project. *Tob Control*, **15**, 3-11.

Fong GT, Cummings KM, Shopland DR, et al (2006b). Building the evidence base for effective tobacco control policies: the international tobacco control (ITC) policy evaluation project. *Tob Control*, **15**, 1-2.

Global Adult Tobacco Survey - GATS (2007). The Global Adult Tobacco Survey.

Gilpin E, Pierce JP (1994). Measuring smoking cessation: problems with recall in the 1990 california tobacco survey. *Cancer Epidemiol Biomarkers Prev*, **3**, 613-7.

Giovino GA, Biener L, Hartman AM, et al (2009). Monitoring the tobacco use epidemic. Overview: optimizing measurement to facilitate change. *Prev Med*, **48**, 4-10.

Global Adult Tobacco Survey Collaborative Group (2011). Tobacco Questions for Surveys: A subset of key Questions from the Global Adult Tobacco Survey (GATS), 2nd Edition. Atlanta, GA: Centers for Disease Control and Prevention.

Global Tobacco Surveillance System (GTSS) (2009). Global Adult Tobacco Survey (GATS): Indicator Guidelines: Definition and Syntax. Geneva: World Health Organization.

Gritz ER, Schacherer C, Koehly L, et al (1999). Smoking withdrawal and relapse in head and neck cancer patients. *Head Neck*, **21**, 420-7.

Hughes JR (2007). Effects of abstinence from tobacco: valid symptoms and time course. *Nicotine Tob Res*, **9**, 315-27.

International Institute for Population Sciences-IIPS (2010). The Global Adult Tobacco Survey (GATS) India, 2009-2010. New Delhi: IIPS, Ministry of Health and Family Welfare, Government of India.

International Agency for Research on Cancer- IARC (2007). IARC Handbooks of Cancer Prevention, Tobacco Control, Vol. 11: Reversal of Risk after Quitting Smoking. Lyon: IARC.

International Tobacco Control (ITC) Policy Evaluation Project (2007). ITC Surveys Tool for India.

Jardin BF, Carpenter MJ (2012). Predictors of quit attempts and abstinence among smokers not currently interested in quitting. *Nicotine Tob Res*, **14**, 1197-204.

Jena PK, Kishore J, Bandyopadhyay C (2012). Prevalence and patterns of tobacco use in Asia. *Lancet*, **380**, 1906.

Jena PK, Kishore J, Sarkar BK (2013). Global Adult Tobacco Survey: a case for change in definition, analysis and interpretation of "Cigarette" and "Cigarettes per Day" in completed and future surveys. *Asian Pac J Cancer Prev*, **14**, 3299-304.

Joseph AM, Rice K, An LC, et al (2004). Recent quitters' interest in recycling and harm reduction. *Nicotine Tob Res*, **6**, 1075-77.

Kishore J, Jena PK, Bandyopadhyay C, et al (2013). Hardcore smoking in three South East Asia countries and its implication: results from global adult tobacco survey. *Asian Pac J Cancer Prev*, **14**, 625-30.

McEwen A, Hajek P, McRobbie P, West R (2006). Manual of smoking cessation: a guide for counsellors and practitioners. London: Wiley-Blackwell.

Pierce JP, Farkas AJ, Gilpin EA (1998). Beyond stages of change: the quitting continuum measures progress towards successful smoking cessation. *Addiction*, **93**, 277-86.

Prochaska JO, DiClemente CC, Norcross JC (1992). In search of how people change: Applications to addictive behaviors. *Am Psychol*, **47**, 1102-14.

Starr G, Rogers T, Schooley M, et al (2005). Key Outcome Indicators for Evaluating Comprehensive Tobacco Control Programs. Atlanta, GA, Centers for Disease Control and Prevention.

Tobias MI, Cavana RY, Bloomfield A (2010). Application of a system dynamics model to inform investment in smoking cessation services in New Zealand. *Am J Public Health*, **100**, 1274-81.

US Department of Health and Human Services (2004). The health consequences of smoking: a report of the Surgeon General. Atlanta, Ga: USDHHS, CDC, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Vangeli E, Stapleton J, Smit ES, et al (2011). Predictors of attempts to stop smoking and their success in adult general population samples: a systematic review. *Addiction*, **16**, 2110-21.

West R, Mcewen A, Bolling K, Owen L (2001). Smoking cessation and smoking patterns in the general population: A 1-year follow-up. *Addiction*, **96**, 891-902.

West R, Sohal T (2006). "Catastrophic" pathways to smoking cessation: findings from national survey. *Br Med J*, **332**, 458-60.

West R, Zatonski W, Przewozniak K, et al (2007). Can we trust national smoking prevalence figures? Discrepancies between biochemically assessed and self-reported smoking rates in three countries. *Cancer Epidemiol Biomarkers Prev*, **16**, 820-2.

West R (2006). Feasibility of a national longitudinal study ("The Smoking Toolkit Study") to monitor smoking cessation and attempts at harm reduction in the UK, 1-35.

West R (2009). The multiple facets of cigarette addiction and what they mean for encouraging and helping smokers to stop. *COPD*, **6**, 277-83

West R (2006). Theory of Addiction. Oxford: Blackwells.

Wolburg (2006). College students' responses to antismoking messages: Denial, defiance, and other Boomerang Effects. *J Consumer Affairs*, **40**, 294-323.

World Health Organization (1998). Guidelines for controlling and monitoring the tobacco epidemic. Geneva, Switzerland: World Health Organization.

Zhou X, Nonnemaker J, Sherrill B, et al (2009). Attempts to quit smoking and relapse: Factors associated with success or failure from the ATTEMPT cohort study. *Addict Behaviors*, **34**, 365-73.