ABSTRACT

Objectives: 1) To describe the distribution of adult smokers in an existing cohort according to stages of change theory; and 2) to compare movements of these smokers through the stages of change.

Design: Secondary analysis of existing cohort data

Setting: Eastern Ontario

Participants: Adult smokers who: 1) enrolled in a Quit & Win Challenge, or 2) received smoking cessation information (Quit Kit) from their area health unit, or 3) were randomly selected by telephone survey.

Results: 706 smokers were recruited and followed for one year. Only 2% of the adult smokers selected by random telephone survey were in the "action" stage at baseline, compared with 14% of the Quit and Win Challenge participants, and 14% of the Quit Kit recipients. Variations in movement through the stages of change were observed between groups upon follow-up.

Conclusions: The results suggest a need to use stage-matched approaches when developing population-based smoking cessation interventions.

ABRÉGÉ

Objectifs : 1) présenter la répartition des fumeurs d'âge adulte dans une cohorte existante conformément aux étapes de la théorie du changement; et 2) comparer l'évolution de ces fumeurs tout au long des étapes du changement.

Conception : analyse secondaire des données de la cohorte existante.

Lieu : région est de l'Ontario

Participants : fumeurs d'âge adulte ayant : 1) suivi le programme Quitte et gagne, le défi, ou 2) reçu de la documentation (Trousse anti-tabac) pour cesser de fumer de la part de l'unité de santé de leur région, ou 3) été sélectionnés de façon aléatoire à l'aide d'un sondage téléphonique.

Résultats : 706 fumeurs ont été recrutés et suivis pendant une année. Seulement 2 % des fumeurs sélectionnés par sondage téléphonique étaient à l'étape de l'action au début, par comparaison à 14 % des participants au programme Quitte et gagne, le défi et à 14 % de ceux ayant reçu une trousse anti-tabac. Lors du suivi, on a observé des différences entre les groupes au niveau de l'évolution dans les étapes du changement.

Conclusions : les résultats montrent qu'il est nécessaire de recourir à des approches adaptées aux différentes étapes lorsque l'on conçoit des interventions de cessation du tabagisme dans la population.

Staging of Adult Smokers According to the Transtheoretical Model of Behavioural Change: Analysis of an Eastern Ontario Cohort

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One of the most novel ideas to emerge in the recent tobacco control literature is the transtheoretical model of behavioural change.^{1,2} This idea, otherwise known as the Stages of Change model, provides a conceptual framework from which to study and understand the processes involved in smoking cessation. Specifically, regular smokers are thought to pass through a predictable series or stages of behaviour in their progression towards sustained abstinence from tobacco use.^{1,2} These stages start at precontemplation (where the smoker has no intention of quitting in the subsequent six months), then move through contemplation (contemplating quitting in the subsequent six months), preparation (contemplating quitting in the subsequent month, and has made previous quit attempts), and action (has quit for less than six months), and finally maintenance (sustained abstinence of six months or longer).

Attempts to validate the transtheoretical model have shown that the questions used to categorize smokers by stage have a high level of reliability among adult populations.³ Other studies have demonstrated that the model is capable of accurately distinguishing those smokers who eventually go on to quit from those who continue to smoke.^{4,5} Because it is also common for smokers to relapse in their efforts to quit,

the model accommodates this situation by permitting them to regress through the stages, or to cycle through them on multiple occasions. In general, the transtheoretical model appears to be a useful and flexible tool for assessing behavioural change among smokers who are trying to quit, and has much potential as a planning tool for those involved in tobacco control programs.

While the utility of the transtheoretical model has been well documented in the tobacco control literature, few population-based studies have described patterns of movement through the stages of change among smokers, and this is especially true for Ontario populations.

We had the opportunity to perform a secondary analysis of data from a cohort of 706 cigarette smokers who resided in Eastern Ontario in 1995.⁵ Our analysis describes the distribution of the stages of change among these smokers, and patterns of movement of the smokers through the stages over a one-year study period. We hope that these data provide useful information for the development and targeting of tobacco control initiatives.

OBJECTIVES

This analysis had two objectives. The first objective was to describe the distribution of adult smokers in our Eastern Ontario cohort according to the transtheoretical model of behavioural change. The second objective was to describe and compare movements of these smokers through the stages of change suggested by the transtheoretical model over a one-year study period. Comparisons focused on differences in these movements by: a) stage of change at baseline, b) level of intervention

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received at baseline, c) demographic factors (age, sex, education), and d) smoking history (baseline level of cigarette consumption, previous quit attempts).

METHODS

Study population

The design of our original cohort study, including our study population and sampling methods, is described in detail in a previous Ontario Tobacco Research Unit working paper.⁵ Participants in the cohort study included adult smokers from the general community. Three distinct groups of smokers were recruited: smokers who enrolled in an incentive-based cessation initiative (the Quit and Win Challenge); those who requested and received an information package called a "Quit Kit"; and smokers who were randomly selected by telephone. All of these smokers resided in the following Eastern Ontario Counties: Prince Edward, Hastings, Lennox and Addington, and Frontenac.

To be eligible for inclusion in the cohort, subjects had to: 1) be at least 18 years of age, 2) be a resident of one of the four counties listed above, and 3) smoke, on average, 10 or more cigarettes per day. The latter definition of an adult smoker is somewhat unusual, but was consistent with the definition that has historically been used in Quit and Win contests in our and other settings (D. Mecredy, Director, Health Promotion Division; KFL&A Health Unit, Kingston, ON). We chose to exclude smokers in the maintenance stage at baseline as well as other former smokers, because the original study was designed to evaluate the effectiveness of smoking cessation initiatives directed at current smokers (as per our definition).

Recruitment and follow-up

All smokers who entered the Quit and Win Challenge were asked for identifying information upon entry. They were subsequently contacted by telephone, asked to participate in the cohort study and then administered a baseline interview. Smokers who were provided with a Quit Kit were identified, approached and interviewed in the same manner. Baseline participation rates were 97% in the Quit and Win

Question	Response	Stage
Are you currently smoking? + Time smoked last cigarette	No ≥ 6 months ago	Maintenance
Are you currently smoking? + Time smoked last cigarette	No < 6 months ago	Action
Are you currently smoking? + Are you thinking of quitting in the next month? + Have you made a quit attempt in the past year?	Yes Yes or Maybe Yes	Preparation
Are you currently smoking? + Are you thinking of quitting in the next month? + Have you made a quit attempt in the past year?	Yes Yes or Maybe No	Contemplation
Are you currently smoking? + Are you thinking of quitting in the next month? + Are you thinking of quitting in the next six months?	Yes No Yes or Maybe	Contemplation
Are you currently smoking? + Are you thinking of quitting in the next month? + Are you thinking of quitting in the next six months?	Yes No No	Precontemplation

Appendix A. Questions used in the determination of Stages of Change

group, and 92% among those who received Quit Kits.

All other smokers were selected via a random telephone survey, and interviewed at the time of selection (or shortly thereafter in a subsequent call). Random selection of these smokers was performed using a stratified and random, two-stage approach. Telephone exchanges for the two broad areas served by our health units were identified using the Bell Canada telephone directory.⁶ The two health unit areas were: 1) Frontenac and Lennox and Addington Counties, and 2) Hastings and Prince Edward Counties. A list of 2,000 residential telephone numbers beginning with these exchanges was then generated for each of these two areas using Pro phone (Pro phone, Danvers, Maryland, USA), a database of all Canadian telephone numbers, excluding those numbers which are unlisted.

Each of the two lists of randomly generated telephone numbers were then put in a random order. The first number was then called on each list. If there was no response, the call was terminated. Each telephone number was tried (up to a maximum of eight times at various times of the day) in order to try to reach potential study participants. If there was a response, the number of adult smokers in the household was determined, and one person was then randomly selected for study from these smokers. This procedure was continued until 200 baseline interviews were completed among smokers in each of the two study areas.

Response rates to the random telephone survey can be calculated in a number of ways. In total, 2,153 telephone numbers were dialed as part of the survey (both health unit areas combined). Of these, in 240 cases a response was not obtained (the telephone number was not for a household, not in service, there was no answer after eight attempts, or the person who answered could not communicate in English); in 140 cases the person who answered refused to participate. Of the remaining 1,773 telephone contacts, 1,373 reported no adult smokers in the household. One randomly selected smoker was interviewed from each of the 400 remaining households. Fifteen of these were subsequently excluded because, upon closer scrutiny, the potential smoker(s) did not fulfill the eligibility criteria. The gross response rate at baseline (all completions/all numbers) was therefore 385/2,153 or 18%; and the conservative response rate (all completions/all possible eligible households) was 385/1,913 or 20%. Of the 140 households that refused participation, 23 indicated that there was at least one adult smoker in the household, while in the remaining 117 this information was not provided. Therefore, the range for the most reasonable estimate of the true response rate at baseline (all completions/all eligible households) was between 73% (385/385+140, assuming all refusing households contained smokers) and 94% (385/385+23 refusals, assuming only the 23 refusals contained smokers).

TABLE I
Progression/Regression of Smokers from Baseline Stage (BL) to Stage at Six Months (6m) and One Year (1yr) Follow-up

<i>Quit and Win Challenge Participants</i>								
Progression/ Regression through Stages of Change	Precontemplation n=1		Contemplation n=11		Preparation n=12		Action n=175	
	BL-6m	BL-1yr	BL-6m	BL-1yr	BL-6m	BL-1yr	BL-6m	BL-1yr
Regressed	*	*	1	0	7	7	60%	65%
Remained the same	0	0	8	7	5	5	36%	12%
Progressed	1	1	2	4	0	0	*	23%
Unknown	0	0	0	0	0	0	4%	1
<i>Quit Kit Recipients</i>								
Progression/ Regression through Stages of Change	Precontemplation n=4		Contemplation n=123		Preparation n=29		Action n=26	
	BL-6m	BL-1yr	BL-6m	BL-1yr	BL-6m	BL-1yr	BL-6m	BL-1yr
Regressed	*	*	9%	6%	48%	41%	81%	77%
Remained the same	1	1	53%	43%	52%	59%	19%	8%
Progressed	3	3	33%	50%	0	0	*	4
Unknown	0	0	6%	2	0	0	0	0
<i>Randomly Selected Smokers</i>								
Progression/ Regression through Stages of Change	Precontemplation n=155		Contemplation n=142		Preparation n=20		Action n=8	
	BL-6m	BL-1yr	BL-6m	BL-1yr	BL-6m	BL-1yr	BL-6m	BL-1yr
Regressed	*	*	28%	18%	55%	55%	88%	88%
Remained the same	68%	51%	53%	51%	30%	30%	1	0
Progressed	33%	48%	17%	30%	2	3	*	1
Unknown	1	1	3	1	1	0	0	0

* not applicable/possible

Notes: Persons who were in the action stage at baseline, relapsed, and then subsequently quit smoking again were classified as remaining in the same stage at one year, if they had not been smoke-free for six months at the one-year follow-up.
 In all tables, percentages are only provided when the numerator for the percentage figure is 5 or greater. Where n<5, the actual number is provided.

An original objective of the cohort study was to follow all of these smokers for one year, and then compare rates of quitting between those who had and had not been exposed to the smoking cessation interventions. Interview data were available for 820 smokers at baseline, 756 smokers at six months follow-up (92% of baseline), and 706 smokers (86% of baseline) at one year. Data collected at baseline included demographic information, measures of current smoking habits, and an abbreviated smoking history that including the stages of change questions. Data collected upon follow-up (both interviews) focused on smoking behaviours during the time between interviews, and the stages of change questions. The questions used to classify respondents into the various stages of change are provided in Appendix A.

Secondary data analysis

Consistent with the design of the study, descriptive statistical analyses were used to address the two study objectives.

Objective 1

Frequency distributions were used to describe the baseline cohort by the stages outlined in the Transtheoretical Model of Behavioural Change, for the three groups of smokers (Quit and Win Challenge participants, Quit Kit recipients, randomly selected smokers).

Objective 2

Cross-tabulations were used to compare movement through the stages of change among different groups of smokers. Changes in stage between baseline and follow-up were categorized as follows: the smoker remained in the same stage; the smoker regressed one or more stages between interviews; or the smoker progressed one or more stages. Members of the cohort were classified by their baseline stage (precontemplation, contemplation, preparation and action) in all of these analyses. An initial stratified analysis was performed by smoking group membership

(Quit and Win participants, Quit Kit recipients, randomly selected smokers). Further stratified analyses were performed within selected groups which included: 1) age groups (< 40; 40+ years); 2) sex; 3) education (high school or less; some post-secondary); 4) cigarette consumption at baseline (<25; 25+ cigarettes per day); and 5) smoking cessation attempts in the previous year (none; at least one). Chi-square tests were used to identify any statistically significant differences between the strata with respect to movement of smokers through the stages of change.

RESULTS

Objective 1. Distributions of smokers by stage of change

Distributions of the cohort of smokers by their stages of change are presented in Table I (by baseline group). These analyses are limited to the 706 smokers who provided information at all three interviews. Comparisons of the respondents and non-respondents are available elsewhere.⁵ The three groups of smokers were, in general, at very different stages of the Transtheoretical model. Eighty-eight percent of the Quit and Win Challenge participants were in the action stage (they were actively trying to quit) at baseline, compared to 14% of the Quit Kit recipients and 2% of the randomly selected smokers. Six percent of the Quit Kit recipients were in the preparation stage, 68% were contemplators, and 2% were precontemplators. Among the random sample of smokers, who are likely to be most representative of smokers in the general community, 48% and 44% were in the precontemplation and contemplation stages, respectively, and 6% were in the preparation stage.

Objective 2. Movement of smokers through the stages of change

Distributions of the study subjects in terms of their movement, if any, through the stages of change are presented in Tables I and II. Table I presents the results according to baseline smoking group.

Coincident with the large proportion in the action stage at baseline, the Quit and Win Challenge participants were the most

likely to progress to maintenance at one year (23% progressed). In the randomly selected smokers, there was considerable progression among those in the precontemplation stage (48% progressed), however, the proportion of smokers who progressed at least one stage decreased as the baseline stage got closer to sustained cessation, and only one smoker actually went to the maintenance stage among this group. Similarly, while there was considerable evidence of progress among the Quit Kit recipients who were in the contemplation stage, only a small proportion ($n=4$) of the Quit Kit recipients actually went on to maintenance at one year.

Further stratified analyses are presented in Table II by several covariables that were available for study. We chose not to combine the smokers from different groups in these analyses. Our rationale for this decision was that smokers who were and were not exposed to the smoking cessation interventions might be systematically different from each other, even after controlling for differences in the distribution of stages of change between the groups. These analyses are limited to comparisons made between baseline and one-year interviews, and for illustration are only presented for the following subgroups: a) smokers in the precontemplation and contemplation stages at baseline, identified through the random telephone survey (this represented 91% of participants in the telephone survey); and b) smokers from the Quit and Win Challenge who were in the action stage at baseline (88% of the participants in this intervention). There were insufficient numbers of observations in other subgroup analyses to identify, with confidence, patterns of movement through the stages of change.

Stratified analysis: Random telephone survey participants

There were no strong or statistically significant ($p<0.05$) differences in the movement of younger and older smokers through the stages of change for the two subgroups (precontemplators and contemplators) examined in this stratified analysis. Similarly, no differences were found when these subgroups were examined by daily levels of cigarette consumption.

<i>Stratified Analysis: Age group of smokers (years)</i>						
Progression/Regression through Stages of Change	Smokers Identified by Random Telephone Survey				Quit and Win Participants in the Action Stage	
	Precontemplation		Contemplation			
	18-39 (n=64)	40+ (n=89)	18-39 (n=53)	40+ (n=88)	18-39 (n=105)	40+ (n=70)
Regressed	*	*	15%	19%	60%	71%
Remained the same	48%	53%	55%	50%	11%	14%
Progressed	50%	47%	30%	30%	29%	14%
<i>Stratified Analysis: Sex</i>						
Progression/Regression through Stages of Change	Smokers Identified by Random Telephone Survey				Quit and Win Participants in the Action Stage	
	Precontemplation†		Contemplation			
	Male (n=76)	Female (n=79)	Male (n=59)	Female (n=83)	Male (n=66)	Female (n=109)
Regressed	*	*	20%	17%	61%	67%
Remained the same	42%	60%	53%	51%	18%	8%
Progressed	57%	41%	25%	33%	21%	24%
<i>Stratified Analysis: Average number of cigarettes per day</i>						
Progression/Regression through Stages of Change	Smokers Identified by Random Telephone Survey				Quit and Win Participants in the Action Stage	
	Precontemplation		Contemplation			
	<25 (n=76)	25+ (n=79)	<25 (n=86)	25+ (n=56)	<25 (n=70)	25+ (n=104)
Regressed	*	*	16%	21%	61%	67%
Remained the same	46%	56%	53%	48%	19%	8%
Progressed	53%	44%	29%	30%	20%	25%
<i>Stratified Analysis: Whether or not subject has previously attempted quitting</i>						
Progression/Regression through Stages of Change	Smokers Identified by Random Telephone Survey				Quit and Win Participants in the Action Stage	
	Precontemplation		Contemplation‡			
	Yes (n=29)	No (n=125)	Yes (n=54)	No (n=88)	Yes (n=69)	No (n=106)
Regressed	*	*	22%	2	73%	59%
Remained the same	66%	47%	43%	57%	4	15%
Progressed	34%	52%	35%	39%	19%	26%
<i>Stratified Analysis: By education level, high (some or all of university) or low (high school or less)</i>						
Progression/Regression through Stages of Change	Smokers Identified by Random Telephone Survey				Quit and Win Participants in the Action Stage	
	Precontemplation†		Contemplation			
	low (n=106)	high (n=47)	low (n=98)	high (n=44)	low (n=76)	high (n=97)
Regressed	*	*	19%	16%	68%	62%
Remained the Same	44%	66%	55%	43%	12%	12%
Progressed	55%	34%	26%	41%	20%	25%
* not applicable/possible						
† $p<0.05$						
‡ $p<0.01$						

tion. Larger proportions of males than females in the precontemplation stage at baseline reported that they had progressed at least one stage upon follow-up (57% vs. 41%; $p=0.04$). Similarly, larger proportions of precontemplators with a low versus high level of education reported progression (55% vs. 34%; $p=0.02$). Among contemplators, higher levels of regression of at least one stage were observed among those who had previously

tried to quit smoking compared with those who had not (22% vs. 3%; $p<0.001$).

Stratified analysis: Quit and Win Challenge participants

There were no strong or statistically significant differences in the movement of smokers in the action stage, when examined by each of the five covariables available for the stratified analysis.

DISCUSSION

The present study involved a secondary analysis of data from a cohort of adult smokers in Eastern Ontario. This analysis describes the distribution of the stages of change among these smokers, and patterns of movement of the smokers through the stages over a one-year study period. The intent of this paper was not to definitively test hypotheses with respect to differences in these patterns; rather, its purpose was to describe these patterns in an exploratory fashion.

Past work with the stages of change model in the area of smoking cessation has shown that adult smokers are not, generally, capable of changing a chronic behaviour such as smoking "in a linear fashion."² This means that on only rare occasions can smokers be expected to move through the stages in a consecutive fashion, ending with a successful quit attempt. In their original descriptive work with this model, Prochaska and Goldstein observed that a typical smoker might relapse three to four times before making a successful quit attempt.² Data from the current analysis clearly support this observation. In each of the three subgroups of smokers, relapse of at least one stage was common although it was lowest among contemplators (at baseline) and highest among those in the action stage. In contrast, progression of at least one stage was highest among precontemplators and got consistently lower with higher stages. It also was apparent that it became incrementally more difficult for the smoker to move through, and then maintain progress with respect to the stages as they get closer to maintenance (sustained abstinence).

The random telephone survey of adult smokers indicated that the vast majority in the general study population are either in precontemplation (48%) or contemplation stages (44%), and only eight (2%) of all smokers in this group had actively quit upon follow-up. This leads to two observations. First, others have documented that smokers often substitute thinking for action with respect to cessation,² and public claims about intentions to quit may very well represent this substitutive behaviour. This situation leads to a pool of what

have been called "chronic contemplators", who are unable or unwilling to act upon their convictions. Over one half of the originally identified contemplators were in the same stage at the one-year follow-up, although it is not clear how often these smokers moved in and out of this stage during the interim. It is also possible that many of those labelled as contemplators were, in fact, misclassified at various stages of the study because of a biased response to the stages of change questions. Smoking has a high level of stigma attached to it, and some smokers might provide an incorrect yet socially desirable answer (i.e., they are contemplating quitting) if given the opportunity of responding in such a manner. This may especially be true if it is clear that the questions are coming from a public health agency, such was the case in our situation.

Our data provide additional direction towards the planning of smoking cessation interventions in our setting. In the past, our agencies have relied upon approaches that inform smokers about the hazards of their addiction, and then provide various supports to those who are motivated to quit. This approach was probably serving a small subset of smokers in an appropriate manner, while doing little for others. Stage-matched approaches to cessation, which tailor interventions to the stage in which smokers find themselves, have been developed and tested in other settings.² Our analysis suggests that we should continue to follow this example in Eastern Ontario.

The stratified analysis of participants in the Quit and Win Challenge who were in the action stage at baseline, showed that there were few strong differences in patterns of movement between stages among adult smokers by age, sex, level of education, and two measures of smoking history. This indicates that the transtheoretical model is measuring patterns of behaviour that may be universal across various subgroups of adult smokers who are willing to enroll in a smoking cessation intervention. Factors which best predict movement through the stages in this subpopulation of smokers may not include "static" variables that are easily measured.¹⁻³ The findings associated with Quit and Win participants

are consistent with the historical idea that the most important predictors of cessation are cognitive variables that measure ability to implement a behavioural change.¹⁻³

Results that contradict the above findings were observed among study participants recruited by random telephone survey. Among respondents in the precontemplation stage at baseline, increases in the proportion of smokers who reported progression of at least one stage upon follow-up were observed among males, and among those with a lower (high school or less) education. Among contemplators at baseline, those who had previously tried to quit showed significantly more regression of at least one stage. If one believes that the quality of reporting did not vary by the latter variables (which is impossible to verify from our data), our analyses at least suggest the possibility that differences in movement between the stages of change could be associated with simple, "static"¹⁻³ variables among some populations of smokers. No attempt, however, was made in our analysis to measure and consider behavioural variables that could be confounding these results, and this remains an important limitation of our study.

The three groups of smokers identified within the cohort study clearly varied in their underlying characteristics, and were especially different with respect to their baseline distributions of stages of change. This demonstrates the potential for drawing biased conclusions about the distribution of smokers in various stages if the nature of the sample is not taken into account. Smokers in the Quit and Win group appeared to represent the minority of smokers who were already highly motivated to quit. Those identified by random, telephone survey more closely represented smokers in the general public, the majority of whom were less likely to quit. Smokers in the Quit Kit group showed a more intermediate distribution relative to the former two groups. It was for this reason that the cohort was stratified by smoking group in all of our analyses.

There are a number of additional limitations to this study. The inclusion criteria for smokers in this study was unusual in that it was set at a minimum of 10 cigarettes consumed per day. In hindsight, this

does make it difficult to compare the results from this analysis to those in other studies where smoking is defined using different, and usually more liberal, criteria.^{7,8} The analysis was also limited by small sample sizes in some cells of the analysis. While combining stages was considered and would have alleviated this problem to some extent, the downside would be a loss of information about the distribution of smokers and their movement through the stages of change. We therefore chose not to combine stages, which limited our ability to conduct stratified analyses for all baseline stages in each group of smokers.

CONCLUSION

This paper describes an exploratory analysis of smoking behaviours among a cohort of adult smokers in Eastern Ontario. The first objective was to describe the distribution of adult smokers in this cohort according to the transtheoretical model of behavioural change. The second objective was to describe and compare movements of these smokers through the stages of change

suggested by the transtheoretical model over a one-year study period. This analysis provides new information that should be useful in the development and targeting of smoking cessation interventions, and it is our sincere hope that this information will be applied in this and other settings.

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