

Factors related to abstinence in a telephone helpline for smoking cessation

ÁSGEIR R. HELGASON, TANJA TOMSON, KARL E. LUND, ROSARIA GALANTI, STAFFAN AHNVE, HANS GILLJAM *

Background: Studies indicate that shortage of cessation counsellors may be a major barrier for tobacco prevention among physicians. Telephone helplines (quitlines) may be an option. The effectiveness of the Swedish quitline and factors related to abstinence from smoking 12 months after the first contact were assessed. **Method:** Subjects included 694 smokers calling a reactive (no contact initiated by the counsellors) and 900 smokers calling a proactive (four or five contacts initiated by the counsellors after the first call) quitline for smoking cessation. The subjects were followed up 12 months after the first call using a mailed questionnaire assessing current abstinence, stages of change and factors potentially related to abstinence rates. **Results:** The questionnaire was returned by 70% of the subjects. Women receiving the proactive treatment reported 34% abstinence rates compared with 27% for those receiving the reactive treatment ($p=0.03$). For men the abstinence rates were 27% and 28%, respectively ($p=0.80$). Factors significantly related to abstinence in the adjusted analysis included no nicotine use at base-line, the adjusted odds ratio with 95% confidence interval being 6.4 (2.1–19.4), additional support from a health care professional 3.5 (1.0–12.3), additional social support 3.1 (1.6–6.1), stress or depressive mood 2.7 (1.6–4.7), nicotine replacement therapy for five weeks or more 2.1 (1.1–4.0), and exposure to second-hand smoke 1.9 (1.1–3.3). The use of oral tobacco did not significantly increase current abstinence. **Conclusion:** Quitlines are effective as an adjunct to the health care system. For women a proactive treatment may be more effective than a reactive treatment.

Keywords: helpline, quitline, smokeless tobacco, smoking cessation, snus, stage of change

Clinical tobacco prevention (helping smokers to quit) is one of the most effective treatments for improving public health.^{1–3} Encouraging smoking cessation is crucial if the projected mortality and morbidity from tobacco use is to be reduced in the first half of this century.^{4,5} Reported 12-month abstinence rates for motivated smokers trying to quit without assistance are approximately 7%.⁶ One way to assist smokers who want to quit is to establish telephone helplines (quitlines) easily available to all. Professionally run quitlines are effective in a real-world setting⁷ and have been reported to enhance 12-month abstinence rates by up to approximately 30%.^{8–11} A randomized study showed that brief advice from physicians followed by telephone counselling from a nurse trained in smoking cessation was as effective as follow-up visits at the clinic.¹² Factors related to abstinence rates in different smoking cessation programmes include the number of previous attempts, lower baseline smoking consumption, and stage of change (pre-contemplation versus others).^{13,14} Also, the number and duration of treatment sessions, training in coping skills, and social support have been related to prolonged abstinence in subgroups of smokers.^{8,15} In the present study we assessed the relationship between a number of factors and the probability of being abstinent 12 months after first contact with the Swedish quitline.

MATERIAL AND METHODS

Study populations

The present study is based on a 12-month follow-up of two different study populations. To assess variables related to 12-month abstinence, we included all 694 smokers who had called the toll-free Swedish quitline and signed up for smoking

cessation treatment from April to October 1999. At that time the counsellors initiated no contact but patients signing up for support were encouraged to call the service whenever they needed (reactive treatment). To assess if the abstinence rate might be improved further with more intensive treatment (proactive treatment) we identified a second cohort of 900 smokers who had been recruited for proactive treatment and had received the 12-month follow up questionnaire at the time. The proactive treatment consists of four to five counselling calls at previously agreed intervals. Not every caller accepted the proactive approach, but in the present assessment we analysed the material as 'intention to treat'. The same data collection methods and definition of study base (see below) were applied for both cohorts (reactive and proactive). Self-reported abstinence was defined as 'not a single puff of smoke during the last week'.

The Swedish quitline

The Swedish quitline is a nation-wide service operated by the Centre for Tobacco Prevention (CTP) in Stockholm a part of the Stockholm County Health service. Financial support is provided by the Swedish Cancer Society, the National Institute of Public Health, the Swedish Heart and Lung Association and Apoteket AB (Swedish Pharmacies). The quitline operates three or four lines 51 hours per week. All smokers signing up for cessation support are registered in patient records subject to common rules of confidentiality. The records are computerized ensuring that information is retrieved efficiently when patients make repeated calls. Thus, treatment follow-up is possible without burdening the patient with repeated background questions. Printed material tailored to the patient's motivation to quit (stages of change) is offered free of charge. At present (summer 2002) the service employs 18 counsellors. They are all trained health professionals such as nurses, dentists, dental hygienists or psychologists with previous experience of primary and secondary prevention. Additionally, all counsellors receive approximately six months of training in smoking cessation methods. The treatment protocol is best described as a mixture of motivational interviewing,¹⁶ cognitive behaviour therapy, and pharmacological consultation.

* Á.R. Helgason¹, T. Tomson¹, K.E. Lund², R. Galanti¹, S. Ahnve³, H. Gilljam¹

¹ Stockholm Centre of Public Health, Centre for Tobacco Prevention, Karolinska Institutet, Stockholm, Sweden

² National Institute for Alcohol and Drug Research, Oslo, Norway

³ Stockholm Centre of Public Health, Preventive Medicine, Karolinska Institutet, Stockholm, Sweden

Correspondence: Ásgeir R. Helgason, PhD, Stockholm Centre of Public Health – CTP, BOX 175 33, SE-118 91 Stockholm, Sweden,

tel. +46 8 51778057, fax +46 8 51778075, e-mail: asgeir@ks.se

Data collection

In the present study, information registered in the patient records at first call, included gender, age, basic information regarding tobacco use, and several aspects of smoking behaviour considered relevant for the treatment. Also, the intention to quit within a given time frame was registered at the first call, based on the 'stages of change' model.¹⁷ Callers not interested in trying to quit within the next 6 months were registered as 'pre-contemplators'. Those interested in trying to quit within the next 6 months were registered as 'contemplators'. Patients planning to quit within the next four weeks were registered as being in 'preparation'. Those who had been smoke-free for less than 6 months were registered as being in 'action', and those who had been smoke-free for 6 months or more were registered as being in 'maintenance'.

Immediately after the first call all patients expressing an interest in being registered as clients (patients) received a registration form by mail confirming their identity. Also, additional questions assessing background factors not registered in the database at first call were enclosed with the registration form. *Patients returning the registration form comprise the subjects included in the study base.*

Twelve to thirteen months after the first contact, all patients received a follow-up questionnaire. To increase response rate a reminder letter was sent out to those who had not responded within two weeks. Also, those who had not returned the questionnaire at five weeks received a reminder telephone call when possible. The questions assessed current tobacco use and factors that may affect abstinence. These comprised nicotine replacement therapy (NRT), present stage of change (no distinction was made between the action and maintenance stages), self-reported compliance with the advice given by the counsellors and the treatment material (treatment compliance), exposure to second-hand smoke from first call to follow-up, depressive mood and/or periods of stress after first call, and if the patients had access to other professional or social support.

Nicotine use at baseline was calculated from milligrams of nicotine consumed per day at first call using number of units (cigarettes, cigars, NRT, oral tobacco portions, etc.) and nicotine content per unit consumed per day. The registration comprised all forms of nicotine delivery systems available in Sweden at the time.

In the follow-up questionnaire, the patients were asked if they had access to additional professional support other than the quitline. However, at this stage we did not specify the kind or extent of additional professional cessation support. In order to obtain this information, 30 randomly selected patients answering that they had received additional professional support, were interviewed by telephone.

We analysed how the callers had moved between the stages of change from first contact to follow-up (table 3). At follow-up we assessed only current abstinence and thus were not able to distinguish between the action and maintenance stages in the analysis.

Statistical methods

Logistic regression analysis was used to calculate crude and adjusted odds ratios (ORs) with 95% confidence interval controlling for covariates.¹⁸ The analysis of the relationship between current abstinence and predictors was done in two steps. We first analysed the association between each factor and current abstinence separately and then adjusted the analysis for age, gender and all factors significantly related to current abstinence in the crude analysis. When assessing the relationship between abstinence at 12 months on the one hand and nicotine replacement therapy or oral tobacco use on the other hand, the assessed variables were excluded from the 'nicotine at baseline' index. Age was adjusted for as a three-category variable (<41 years,

41–53 years, >53 years). Cut-off levels for age and nicotine use at baseline were chosen in order to obtain approximately equal numbers of respondents (one third) in each category. When comparing current abstinence in the reactive cohort with the proactive cohort a two-sided *p*-value was calculated using Fisher's exact test.

RESULTS

Reactive cohort

Of the 694 eligible smokers recruited for the reactive quitline service 496 (71%) participated in the 12-month follow-up (table 1). No significant difference was noted in response rate between men and women (not in table). Age distribution and classification into 'stages of change' at first call are presented in table 1.

Factors significantly related to abstinence in the crude analysis at follow-up included nicotine use and stage of change at first call, nicotine replacement therapy, exposure to second-hand smoke, treatment compliance, periods of depressive mood or stress and the use of additional support (table 2). Most of these relationships remained statistically significant in the adjusted analysis. The importance of access to additional professional support became more apparent in the multivariate analysis. In all 30 cases assessed in the telephone interviews, the 'additional professional support' involved being referred to the quitline by a physician, a nurse, a dentist, dental hygienist or pharmacy personnel after brief advice (not in table). The positive association of abstinence with referral by a health care professional on abstinence rate persisted when the analysis excluded patients with severe smoking-related symptoms (not in table).

Of those who were in the pre-contemplation stage, five out of ten had advanced to contemplation or action/maintenance (table 3). Out of those classified as contemplators at baseline, approximately one in ten had regressed, four in ten were still contemplators while five out of ten had progressed to preparation or action/maintenance. Of those who were in preparation at first call, five out of ten had regressed to contemplation or pre-contemplation, and four in ten had progressed to the action/maintenance stages. Of those who were in action/maintenance at first

Table 1 Response rate and population characteristics of 496 smokers registering for a reactive smoking cessation telephone support at the Swedish quitline

Response rate	71%	(496/694)
Gender		
Male	25%	(125/496)
Female	75%	(371/496)
Age distribution		
≤20	2%	(10/492) ^a
21–30	13%	(64/492)
31–40	18%	(88/492)
41–50	23%	(114/492)
51–60	24%	(116/492)
61–70	16%	(78/492)
≥71	5%	(22/492)
Stage distribution at recruitment		
Pre-contemplation	2%	(8/494) ^b
Contemplation	38%	(189/494)
Preparation	38%	(186/494)
Action	22%	(108/494)
Maintenance	1%	(3/494)

a: Four people did not give their age.

b: Two people were not properly staged at baseline.

Percentages do not add up to 100% due to rounding.

call, seven out of ten were still there at follow-up, but three in ten had regressed (table 3).

Proactive cohort

Of the 900 smokers treated with a proactive approach, 629 (70%) returned the follow-up questionnaire. The 12-month

overall abstinence was somewhat higher in the proactive group compared with the reactive group, 33% and 28% respectively, but the difference was not statistically significant (table 4). However, when men and women were assessed separately, women were significantly more likely to be abstinent in the proactive group compared with the reactive group, 34% and 27%

Table 2 Factors related to abstinence in the reactive cohort 12–14 months after first contact

	Abstinence % (n/N) ^a	Crude OR (95% CI)	Adjusted OR (95% CI) ^b
Female (ref.) ^c	27 (101/371)	1.0	1.0
Male	28 (36/125)	1.1 (0.7–1.7)	1.1 (0.6–2.1)
Age			
<41 years (ref.)	25 (40/161)	1.0	1.0
41–53 years	31 (49/157)	1.4 (0.8–2.2)	1.5 (0.8–2.9)
>53 years	27 (45/168)	1.1 (0.7–1.8)	0.9 (0.4–1.8)
Nicotine at baseline			
>18 mg/day (ref.)	15 (19/129)	1.0	1.0
11–18 mg/day	24 (43/178)	1.8 (1.0–3.3)*	1.7 (0.8–3.5)
0.1–10 mg/day	33 (49/148)	2.9 (1.6–5.2)*	1.9 (0.9–4.0)
No nicotine at baseline	63 (26/41)	10.0 (4.5–22.3)*	6.4 (2.1–19.4)*
Stage at baseline			
Contemplation (ref.)	19 (35/189)	1.0	1.0
Preparation	22 (41/186)	1.2 (0.8–2.1)	1.1 (0.6–2.0)
Action	53 (57/108)	4.9 (2.9–8.3)*	2.0 (0.9–4.2)
Nicotine replacement			
No nicotine replacement (ref.)	25 (48/193)	1.0	1.0
Nicotine replacement <5 weeks	18 (33/182)	0.7 (0.4–1.1)	0.5 (0.3–1.0)
Nicotine replacement ≥5 weeks	46 (56/121)	2.6 (1.6–4.2)*	2.1 (1.1–4.0)*
Exposed to second hand smoke (ref.)	23 (47/205)	1.0	1.0
Not exposed to second hand smoke	33 (64/193)	1.7 (1.1–2.6)*	1.9 (1.1–3.3)*
No smokeless tobacco at follow-up (ref.)	27 (106/400)	1.0	1.0
Using smokeless tobacco at follow-up	36 (21/59)	1.5 (0.9–2.7)	1.5 (0.7–3.3)
No previous attempts (ref.)	23 (29/127)	1.0	1.0
Previous attempts	27 (62/227)	1.3 (0.8–2.1)	1.2 (0.6–2.3)
Treatment compliance			
Moderate/Low/No (ref.)	22 (80/358)	1.0	1.0
High	46 (50/108)	3.0 (1.9–4.7)*	2.6 (1.4–4.7)*
Depressed/stressed (ref.)	23 (68/296)	1.0	1.0
Not depressed/stressed	37 (65/177)	1.9 (1.3–2.9)*	2.7 (1.6–4.7)*
No other support (ref.)	17 (31/178)	1.0	1.0
Professional support only	22 (6/27)	1.4 (0.5–3.6)*	3.5 (1.0–12.3)*
Social support only	34 (79/230)	2.5 (1.5–4.0)*	3.1 (1.6–6.1)*
Social and professional support	34 (21/61)	2.5 (1.3–4.8)*	2.8 (1.1–7.0)*

a: Variations in denominators are owing to missing information.

b: The analysis is adjusted for age, gender and all variables significantly related to outcome in the crude analysis.

c: ref. = the reference group for the OR analysis.

* Difference statistically significant

Table 3 Movement between stages of change in 376^a callers in the reactive cohort who were staged both at baseline and follow-up^b

		Stage at follow-up			
		Pre-contemplation	Contemplation	Preparation	Action/maintenance
Stage at baseline	Pre-contemplation (N=8)	50% (4/8)	38% (3/8)	0% (0/8)	13% (1/8)
	Contemplation (N=136)	14% (19/136)	38% (51/136)	12% (16/136)	37% (50/136)
	Preparation (N=141)	12% (17/141)	35% (49/141)	13% (19/141)	40% (56/141)
	Action/ maintenance (N=91)	2% (2/91)	17% (15/91)	11% (10/91)	70% (64/91)

a: Reliable information on 'stage' was missing from 120 subjects at follow-up. Those subjects are excluded from table 3.

b: Percentage does not always add up to 100% owing to rounding.

respectively (table 4). No change was noted for men between the two treatment protocols.

There were no significant differences between the reactive and proactive cohorts in any of the assessed background variables that may explain the difference in 12-month abstinence (not in table). Comparing available variables gathered at first call including age, gender, stage of change and nicotine use did not show any statistically significant differences between responders and non-responders in the present study. This was true for both reactive and proactive cohorts (not in table).

DISCUSSION

Approximately one out of three patients who returned the follow-up questionnaire reported being smoke-free. Important factors that were related to abstinence included no nicotine use at base-line, additional support from a health care professional, additional social support, stress or depressive mood, nicotine replacement therapy for five weeks or more, and exposure to second-hand smoke (table 2). Increasing the treatment intensity (proactive treatment) significantly enhanced abstinence rates in women but not in men (table 4). The use of smokeless tobacco at follow-up was not significantly related to abstinence (table 2).

Being referred to the quitline by a health care professional appeared to be an important factor for enhancing quit rates when the analysis was adjusted for other factors (table 2). This indicates that a quitline service may be effective as an adjunct to the health care system. Comparing the present results with previously reported findings, combining doctor's brief advice and a quitline service appears to have an important synergetic effect. On the one hand, previous data have shown that doctors 'brief advice' may significantly enhance smoking cessation in a motivated patient population reaching 12-month abstinence rates of approximately 8–10%^{6,8,19,20} and that referring patients for professional telephone counselling may further enhance the quit rate to approximately 20–30%.^{8–12} On the other hand, the present data indicate that the efficacy of a quitline treatment is significantly enhanced when health care personnel refer patients. Several barriers have been identified for physician's engagement in smoking cessation support and it is probably unrealistic to expect physicians to work with state of the art smoking cessation consultation as a routine.^{8,21} However, the physicians role in screening for tobacco use in their patient population, encourage smokers to quit, and give brief cessation advice is both cost-effective and an invaluable part of an effective smoking cessation policy on the aggregate level.⁸ Support from family or friends (social support) was related to higher abstinence rates (table 2) and should be encouraged in quitline smoking cessation programmes. Social support has been associated with higher abstinence rates in other settings.^{8,22–25}

People reporting having experienced periods of depressive mood or stress after first call, were less likely to be abstinent at follow-up. One practical implication of this finding may be to emphasize the importance of stress management in the treatment protocol and encourage those experiencing depressive moods to contact their family physician for possible treatment with anti-depressive medication or bupropion. At the time of recruitment to the

present study bupropion had not yet been launched as an option for smoking cessation treatment in Sweden.

The well-documented effect of nicotine replacement therapy in combination with support from a trained counsellor^{8,26} doubled the abstinence rates in the present population. Also, those reporting to be abstinent from smoking were somewhat more likely to report using the Swedish oral tobacco 'snus' at follow-up, the adjusted odds ratio being 1.5 but the association was not statistically significant (table 2). However, snus was not a major contributor to a higher abstinence rate in the Swedish quitline. Contrary to popular belief, there are no published data suggesting that snus has been an important factor in reducing smoking in Sweden. New data from a national survey indicate only a modest effect of snus as a predictor for prolonged abstinence from smoking at the aggregate level and the authors conclude that snus 'is certainly not a necessary component of smoking cessation at the population level' in Sweden.²⁷ Although the counsellors at the Swedish quitline do not recommend snus as a smoking cessation method the policy has been not to discourage snus as an alternative to smoking in determined patients. The main reason for this policy has been based on 'harm reduction' arguments and, the belief that snus may be an effective smoking cessation method. The present results do not support that snus is an effective smoking cessation method, at least not in a clinical setting, and it was clearly inferior to nicotine replacement therapy. Studies on the harmful effects of snus are presently relatively few and the statistical power is low especially regarding cancer.²⁸ Also, the possible positive effect at the aggregate level of actively encouraging snus use as an alternative to smoking is highly questionable.^{8,27} Increasing the availability of nicotine replacement therapy is probably a better option.

Not being exposed to second-hand smoke appeared to almost double the chance of being abstinent at follow-up when the analysis had been adjusted for other factors (table 2). Accordingly, people trying to give up smoking should be advised to avoid second-hand smoke. The clinical experience from the Swedish quitline is that this may be a sensitive issue in counselling situations when the patient is living with a smoker. However, this is a positive challenge for the smoking cessation counsellor. Both because second-hand smoke decreases the clients' probability of staying smoke-free and reports from the USA indicate that smoke-free homes and workplaces enhance smoking cessation at the aggregate level.^{29,30} Presently, in Sweden personnel working in bars and restaurants are frequently exposed to second-hand smoke. The relationship between exposure to second-hand smoke and the probability of giving up smoking may be an important additional aspect in the ongoing debate regarding smoke-free restaurants and bars.

In accordance with previous studies^{14,31} stage of change at baseline was associated with abstinence at follow-up in the crude analysis (table 2). The high success rate of those who were in the action stage at baseline is probably an indicator of high motivation at first call. Approximately one in three were still at their baseline stage at follow-up (table 3).

Those claiming to have complied well with the treatment counselling and treatment material were more than twice as likely to be abstinent compared with those who stated that they

Table 4 Comparing the reactive treatment to a proactive treatment (intention to treat)

	Point-prevalence abstinent at 12 months		Fisher's exact test for significance
	'Reactive' treatment N=496	'Proactive' treatment N=629	
All	28% (137/496)	33% (205/629)	p=0.08
Men	28% (36/125)	27% (38/142)	p=0.80
Women	27% (101/371)	34% (167/487)	p=0.03

had not. Whereas this may be an indicator of the effectiveness of the treatment it may also primarily be an indicator of baseline motivation to give up smoking or the effect of positive self-appraisal.

According to the present data a more costly and time-consuming proactive quitline service appears to enhance abstinence in women who represent approximately 75% of callers to the Swedish quitline but not in men (table 4). To increase cost-effectiveness one option may be to offer the proactive service only to women. However, at the present time we feel that we need more data on possible confounding factors before we decide to tailor the service according to gender.

No difference in background variables was noted between the responders and non-responders in the present study. However, we have no knowledge about the smoking status of non-responders at the time of follow-up. A careful assessment of smoking status among non-responders to a postal questionnaire in a Swedish population revealed that non-responders were somewhat more likely to be daily smokers.³² It is therefore probable that the true level of abstinence in the present study population may be somewhat lower.

In summary, the present results indicate that a professionally run reactive quitline may significantly increase 12-month abstinence rates in motivated smokers trying to quit from an overall expected quit rate of approximately one out of ten⁹ to approximately three out of ten. A more resource demanding proactive service may further enhance quit rates in female smokers. According to our results smokers attempting to quit with alternative nicotine delivery systems should be advised to use medical nicotine replacement therapy (NRT) and avoid using smokeless tobacco like the Swedish 'snus'.

REFERENCES

- 1 World Bank. Curbing the epidemic-measures to reduce the demand for tobacco. Washington DC: Library of Congress, 1999.
- 2 Doll R, Peto R, Wheatley K, Gray R, Sutherland I. Mortality in relation to smoking: 40 years observation on male British doctor. *BMJ* 1994;309:901-11.
- 3 US Department of Health and Human Services. The health consequences of smoking cessation: a report of the US Surgeon General. (Rockville, MD: Public Health Service, Office on Smoking and Health) 1990.
- 4 Peto R, Darby S, Deo H, Sillocks P, Whitley E, Doll R. Smoking, smoking cessation, and lung cancer in the UK since 1950: combination of national statistics with two case-control studies. *BMJ* 2000;321:323-8.
- 5 Lancaster T, Stead L, Silagy C, Sowden A. Effectiveness of interventions to help people stop smoking: findings from the Cochrane Library. *BMJ* 2000;321:355-8.
- 6 Zhu S-H, Melcer T, Sun J, Rosbrook B, Pierce MS. Smoking cessation with and without assistance a population-based analysis. *Am J Prev Med* 2000;18(4):305-11.
- 7 Zhu S-H, Anderson CM, Tedeschi GJ, et al. Evidence of real-world effectiveness of a telephone quitline for smokers. *N Engl J Med* 2002;347(14):1087-93.
- 8 Fiore MC, Bailey WC, Cohen SJ, et al. Teating tobacco use and dependence. Clinical practice guideline. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, June 2000.
- 9 Stead LF, Lancaster T. Telephone counselling for smoking cessation. (Cochrane Review.) In: The Cochrane Library, Issue 3, 2001. Oxford: Update Software.
- 10 Lichtenstein E, Glasgow RE, Lando HA, Ossip-Klein DJ, Boles SM. Telephone counseling for smoking cessation: rationales and meta-analytic review of evidence. *Health Educ Res* 1996;11:243-57.
- 11 Zhu S-H, Strech V, Balabanis M, Rosbrook B, Sadler G, Pierce JP. Telephone counseling for smoking cessation: effects of single-session and multiple-session interventions. *J Consult Clin Psychol* 1996;64:202-11.
- 12 Wadland WC, Stöffelmayr B, Berger E, Crombach A, Ives K. Enhancing smoking cessation rates in primary care. *J Fam Pract* 1999;48(9):711-18.
- 13 Borland R, Segan CJ, Livingston PM, Owen N. The effectiveness of callback counselling for smoking cessation: a randomised trial. *Addiction* 2001;96:881-9.
- 14 Curry SJ, Mc Bride C, Grothaus LC, Loie D. A randomised trial of self-help materials, personalized feedback, and telephone counselling with nonvolunteer smokers. *J Consult Clin Psychol* 1995;63:1005-14.
- 15 Brandon TH, Collins BN, Juliano LM, Lavez AB. Preventing relapse among former smokers: a comparison of minimal interventions through telephone and mail. *J Consult Clin Psychol* 2000;68:103-13.
- 16 Miller WR, Rollnick S. Motivational interviewing: preparing people to change addictive behaviour. New York: The Guilford Press, 1991.
- 17 Prochaska JO, Di Clemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol* 1983;51:390-5.
- 18 Hosmer DW, Lemeshow S. Applied logistic regression. New York: John Wiley & Sons, 1989.
- 19 Sippel JM, Osborne ML, Bjornson W, Goldberg B, Buist AS. Smoking cessation in primary clinics. *J Gen Intern Med* 1999;14(11):670-6.
- 20 Prochazka AV. New developments in smoking cessation. *Chest* 2000;117(4):169-75 Suppl.
- 21 Helgason AR, Lund KE. General practitioners' perceived barriers to smoking cessation: results from four Nordic countries. *Scand J Public Health* 2001;30:141-7.
- 22 Cohen S, Lichtenstein E. Partner behaviours that support quitting smoking. *J Consult Clin Psychol* 1990;58:304-9.
- 23 Coppotelli H, Orleans CT. Partner support and other determinants of smoking cessation maintenance among women. *J Consult Clin Psychol* 1985;53(4):455-60.
- 24 Mermelstein R, Cohen S, Lichtenstein E, Baer JS, Kamarck T. Social support and smoking cessation and maintenance. *J Consult Clin Psychol* 1986;54:447-53.
- 25 Mermelstein R, Lichtenstein E, McIntyre K. Partner support and relapse in smoking cessation programs. *J Consult Clin Psychol* 1983;51:465-6.
- 26 Silagy C, Lancaster T, Stead L, Mant D, Fowler G. Nicotine replacement therapy for smoking cessation (Cochrane Review). In: The Cochrane Library, 1 2002. Oxford: Update Software.
- 27 Gilljam H, Galanti MR. Role of snus (oral moist snuff) in smoking cessation and smoking reduction among Swedish men. *Addiction* 2003;98(9):1183-9.
- 28 Sanner T, Dahl JE, Andersen A. Cancer risks using snuff (Norwegian). *Tidsskr Nor Laegeforen* 2000;120:1669-71.
- 29 Gilpin EA, White MM, Farkas AJ, Pierce JP. Home smoking restrictions: which smokers have them and how they are associated with smoking behavior. *Nicotine Tob Res* 1999;1(2):153-62.
- 30 Fichtenberg CM, Glantz SA. Effect of smoke-free workplaces on smoking behavior: systematic review. *BMJ* 2002;325(7357):188.
- 31 Rohren C, Croghan I, Hurt R, Offord K, Marusic Z, McClain F. Predicting smoking cessation outcome in a medical center from readiness: contemplation versus action. *Prev Med* 1994;23:335-44.
- 32 Bostrom G, Hallqvist J, Haglund BJ, Romelsjo A, Svanstrom L, Diderichsen F. Socioeconomic differences in smoking in an urban Swedish population: the bias introduced by non-participation in a mailed questionnaire. *Scand J Soc Med* 1993;21(2):77-82.

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