
The English smoking treatment services: one-year outcomes

Janet Ferguson¹, Linda Bauld², John Chesterman¹ & Ken Judge¹

Public Health and Health Policy¹ and Department of Urban Studies², University of Glasgow, Glasgow, UK

Correspondence to:

Professor Ken Judge
Public Health and Health Policy
University of Glasgow
1 Lilybank Gardens
Glasgow G12 8RZ, UK
Tel: 0141 330 5008
Fax: 0141 330 5008
E-mail: k.judge@clinmed.gla.ac.uk

ABSTRACT

Aims To assess the impact of English treatment services on CO-validated quit rates at 52-week follow-up, to explore the relationship between service-related characteristics and socio-demographic and behavioural factors with cessation outcomes, and to compare the characteristics of service users lost to follow-up with CO-validated quitters.

Design Observational study of administrative information linked with survey data for 2069 recipients of smoking treatment services who set a quit date between May and November 2002.

Setting Two contrasting areas of England, Nottingham and North Cumbria, consisting of nine primary care trust (PCT) localities.

Measurements Routine monitoring data specified by the Department of Health included information about basic demographic characteristics, postcode of residence from which a deprivation category was identified, nature of intervention, and smoking status at 4-week follow-up. These data were supplemented with information about smoking status at 52 weeks, referral pathways, relapse experiences, number of follow-up contact attempts, socio-economic status and smoking-related behaviours obtained from consenting service recipients by treatment advisers.

Findings One user in seven (14.6%) reported prolonged abstinence and was CO-validated as a successful quitter at 52 weeks. This rose to 17.7% when self-report cases were included. Relapse rates between 4 and 52 weeks were almost identical between the two study areas—75%. Relapse was most likely to occur in the first 6 months following treatment. Users who self-reported quitting at 4 weeks were less likely (13.7%) than those with biochemical verification of smoking status at 4 weeks (25.2%) to be CO-validated quitters at 52 weeks ($P=0.004$). Older users (OR 1.023; CI 1.014–1.032), people who smoke mainly for pleasure rather than to cope (OR 1.38; CI 1.02–1.87), and those who were extremely determined (OR 1.58; CI 1.21–2.05) were more likely to be quitters at 52-week follow-up, whereas those with lower socio-economic status (OR 0.86; CI 0.78–0.96), who smoked their first cigarette of the day within 5 minutes of waking (OR 0.73; CI 0.55–0.96) or had another smoker in their household (OR 0.65; CI 0.49–0.86) were less likely. In contrast, users lost to follow-up tended to be younger and experienced different referral pathways than CO-validated quitters. Gender was not statistically significantly associated with cessation at 52 weeks and nor were any of the key characteristics of intervention, such as group or one-to-one counselling.

Conclusions These results obtained from routine services are consistent with those obtained from clinical trials in relation to abstinence at one year. Given that a high proportion of smokers relapsed between 4 weeks and 1 year it is important that future assessments of longer-term outcomes are conducted. However, following-up service users many months after an intervention is

expensive, and reasonable estimates of quit rates can be estimated from short-term outcomes, provided that they have been CO-validated. Future studies should monitor outcomes from a selection of services treating different groups of smokers, particularly if more is to be learned about the role of smoking treatment services in reducing inequalities in health.

KEYWORDS CO validation, inequalities, prolonged abstinence, smoking cessation.

INTRODUCTION

Smoking treatment services in England have proved themselves to be successful in reaching large numbers of smokers and achieving impressive 4-week quit rates, both self-reported and CO-validated [1,2]. Research has shown, however, that rates of resumed smoking are high at longer-term follow-up. Studies have examined relapse rates at different points in time, following different treatment combinations and with different populations of smokers [3]. Abstinence rates at 1 year, for instance, can vary. Studies involving the provision of brief advice from a health professional plus nicotine replacement therapy (NRT), have reported 1-year abstinence rates of around 10% [4,5]. More intensive interventions can result in a higher proportion of longer-term quitters. Treatment that involves behavioural support plus the use of pharmacological treatments has typically achieved 20–30% cessation rates at 1 year depending on the precise form of intervention [3,6–8]. What has been observed, however, is that although initial outcomes vary significantly—depending on the nature of the intervention—the relapse rate between studies is remarkably similar. A meta-analysis by Stapleton [9] suggests that about two-thirds of quitters at 6-week follow-up will have relapsed by 52 weeks, irrespective of the nature of the initial intervention. However, a recent study of the shape of relapse curves among untreated smokers cautions that much remains to be learned about this topic [10].

Measuring longer-term cessation rates is difficult; the number of service users lost to follow-up becomes higher the more that time elapses. Relatively few studies attempt follow-up beyond 1 year and even fewer have contacted study participants successfully more than 3 years following treatment [7,11]. The Department of Health initially expected all treatment services located in English Health Action Zones to conduct 52-week follow-up as part of routine practice [12]. However, it quickly became apparent that, although some clinics do have a good record in this respect, generic services as a whole did not have the capacity to follow-up all smokers and the requirement was dropped in 2000, when services were rolled out to all

parts of the country [13]. The only remaining mandatory monitoring required was self-reported 4-week quit rates, although services were encouraged to collect 52-week data where possible. However, anecdotal evidence suggests that very few services have been able to implement effective long-term follow-up; those that have tried report low response rates. Lack of time, resources and administrative capacity means that local services have limited opportunity to invest in conducting any form of research to assess longer-term outcomes.

Given the absence of any reliable 52-week monitoring data, the Department of Health decided to commission a study examining longer-term outcomes as part of the national evaluation of smoking cessation services. The study involved providing services in two case-study areas with additional finance for administrative support to conduct 52-week follow-up of all smokers using the service within a 6-month period, and to provide modest reimbursement to respondents to travel to a service venue for CO validation.

DATA, MEASURES AND METHODS

Data

The broad aims of the study were, first, to identify what proportion of service recipients in the study areas had self-reported prolonged abstinence [14] and were verified by CO monitor as abstinent at 52-week follow-up. Secondly, the study aimed to relate outcomes to user characteristics at the time that a quit date was set. The research took place in Nottingham and North Cumbria. Details of services provided in both areas are outlined in a related paper [1], which compared the characteristics of CO-validated and self-reported quitters at 4 weeks. In this study, as there are very few non-validated/self-report quitters, the characteristics of users lost to follow-up are compared with CO-validated quitters at 52 weeks.

Clients were referred to a local smoking treatment service where they were seen by a trained adviser and set a quit date. Most then received treatment on a weekly basis for typically 8 weeks, either with one-to-one or

group-based behavioural support, combined with NRT or bupropion. Services collected detailed information about all smokers setting a quit date between May and November 2002 [1]. These data included information about: smoking history and level of addiction; family and personal circumstances; deprivation category and place of residence; type, quality and location of services received; and smoking status at 4 weeks.

Smokers who had set a quit date during the 6-month study period, had self-reported quitting at 4 weeks and who had agreed previously to participate in the research, were invited to take part in a 52-week review. Both services were provided with extra funding to pay a part-time administrator who contacted clients. Clients were initially invited by letter and responded either with a free-post response slip or by telephone. The number of attempts to follow-up by telephone was recorded. Clients agreeing to follow-up were asked by a trained member of staff to complete a short telephone questionnaire about smoking status, what else might have helped them quit, sustain the quit or prevent relapse. Clients were then invited to have their self-reported prolonged abstinence confirmed by CO validation. These clients received a money voucher to cover expenses and all clients who had successfully remained non-smokers received a

congratulatory certificate. Clients were considered lost to follow-up if they did not respond to the initial letter and/or after several telephone calls.

The 52-week questionnaire material was combined with the descriptive information on each user collected as part of the 4-week study [1], together with the details of treatment and status at 4 weeks on an MS Access database. Data supplied to the research team were anonymous.

Sample

Details on how the initial sample of data for the 52-week analysis was derived are shown in Table 1. The sample of 2564 cases in row 1 represents all smokers setting a quit date in the 6-month study period in the two case-study areas. Rows 2–4 show the effect of excluding part of the total sample from the study sample available for analysis. For example, smokers who were employed in the occupational health section of one of the nine primary care trusts (PCTs) were accidentally excluded from the follow-up on data protection grounds. Those with 'no paperwork' had not been followed-up due to a clerical error. Row 5 shows the effect of excluding cases for which the number of valid values of personal/service characteristics

Table 1 Creation of sample for 52-week analysis.

	<i>Sample size</i>								
	<i>North Cumbria</i>			<i>Nottingham</i>			<i>Total</i>		
	<i>Cases excluded at this stage</i>		<i>Cases remaining</i>	<i>Cases excluded at this stage</i>		<i>Cases remaining</i>	<i>Cases excluded at this stage</i>		<i>Cases remaining</i>
	<i>n</i>	<i>%</i>		<i>n</i>	<i>%</i>		<i>n</i>	<i>%</i>	
1. Original database with quit date in 6-month period			1360			1204			2564
2. Exclude from stage 1 cases with no overall consent to research involvement or incomplete postcode	113	8.3	1247	204	16.9	1000	317	12.4	2247
3. Exclude from stage 2 under 16-year-olds	6	0.5	1241	2	0.2	998	8	0.4	2239
4. Exclude from stage 3 cases not consenting to 52-week follow-up, those with occupational health involvement or no paperwork	40	3.2	1201	52	5.2	946	92	4.1	2147
5. Exclude from stage 4 cases with valid value count less than 21 ¹	24	2.0	1177	54	5.7	892	78	3.6	2069

¹A count of valid values for the variables in each record (excluding those variables routinely provided to the DH) was required to be at least 21 of 28, otherwise the record was not selected (Judge *et al.* 2004).

at 4 weeks was less than 21. The total study sample of 2069 cases represents 80.7% of all those recorded by local services as setting a quit date during the study period. Of these 2069 cases setting a quit date, 1268 self-reported as abstinent at 4 weeks (excluding quit refuted by validation test).

Measures

Personal and service characteristics

Details of the descriptive indicators used in the analysis are shown in Table 2. These cover personal details, socio-economic circumstances (combined to form one socio-economic score), living group, smoking history, area, PCT and service provided.

Outcomes

When the user reported sustained abstinence between their original quit date and 52 weeks they were encouraged to attend the smoking treatment venue for CO validation. If users could not be contacted they were classed as lost to follow-up. No attempt was made to follow-up users at 52 weeks who were non-quitters or lost to follow-up at 4 weeks. For the 2069 cases setting a quit date in the 6-month sample, smoking status at 52 weeks could then be classified into the same four possible outcomes which applied at 4 weeks; namely 'CO-validated quitters' (classified by self-reported prolonged abstinence followed by CO validation of abstinence at 52 weeks); 'self-reported quit without validation'; 'non-quitters'; and 'lost to follow-up'. The percentage of validated quitters is

referred to as the 'CO-validated cessation rate'. The same pool of dummy predictor variables, based on the information shown in Table 2, was used as in the 4-week study [1].

Methods

First, bivariate relationships, between key characteristics of the sample of 2069 cases and CO-validated cessation and loss to follow-up rates, are presented. Tests showing the significance of differences in rates are determined in one of three ways. When the characteristic was continuous or almost continuous, a Mann-Whitney *U*-test was applied. When the characteristic was a dummy variable, a χ^2 test with continuity correction was used. If the characteristic had three or more discrete values but was not approximately continuous, each value except the reference value was considered as a dummy variable in its own right to which a χ^2 test with continuity correction could be applied.

Secondly, the relationship between CO-validated cessation and lost to follow-up rates and personal/service characteristics was investigated with two separate forward stepwise logistic regression analyses ($P(\text{in}) < 0.05$). In order to simplify the models, the summary measure for socio-economic group was used in place of the items from which it is derived. Variables were entered in three blocks: personal characteristics and type of referral; type of intervention and PCTs; and area (North Cumbria or Nottingham). The analysis was repeated entering all variables and then using backward stepwise logistic regression analysis, to see whether the model could be improved.

Table 2 Personal and service characteristics used in the analysis.

<i>Type of characteristic</i>	<i>Listed characteristics</i>
Personal details	Age, gender, pregnant at quit date, not white British or white Irish
Socio-economic circumstances	Socio-economic group (score of 1–6 based on whether education finished by 16, single parent, living in rented housing, unemployed or permanently sick/disabled, whether eligible for free prescriptions and aged under 60, resident in lowest deprivation decile)
Living group	Currently living with spouse/partner, number of adults (including self) in household, number of children in household
Smoking history	Time between waking and smoking first cigarette, cigarettes smoked per day, age started regular smoking, seriously tried to quit smoking in last year, ease/difficulty going without smoking for a whole day, smokes mainly for pleasure or to cope, other regular smoker in household, anyone to support client to stop smoking, self-reported health over last 12 months
Area	North Cumbria/Nottingham
PCT	
Nottingham	Broxtowe and Hucknall, City Central, City North, City South, Gedling, Rushcliffe
North Cumbria	Carlisle, Eden, West
Service provided	Referral source, intervention setting, type of behavioural support, pharmacotherapies

RESULTS

Smoking status

The overall smoking status of respondents from the two study areas is shown in Table 3. One user in seven (14.6%) was CO-validated as a successful quitter at 52 weeks (the primary outcome measure), rising to 17.7% when self-reported cases not receiving a CO-validation test were included. There were 44.7% non-quitters [including 0.2% whose self-reported quit was refuted by a CO \geq 10 parts per million (p.p.m.) test], with a further 37.5% lost to follow-up.

Table 3 also shows how 52-week outcomes are crucially dependent upon whether 4-week quitters were CO-validated or simply self-reported. For example, 25.2% of 4-week CO-validated quitters were confirmed as abstinent at 52 weeks compared with 13.7% of 4-week self-report quitters. Also the proportion lost to follow-up at 52 weeks was much bigger for 4-week unvalidated quitters.

Despite many important differences between the two study areas [1] the relapse rate between 4 and 52 weeks was almost identical; approximately 75% of CO-validated quitters at 4 weeks had relapsed 1 year after setting a quit date in North Cumbria (74.6%) and Nottingham (75.3%). Smokers who had relapsed were asked to identify when they had started smoking again. Of the 83% who responded, 39% had relapsed between 1 and 3 months following the 4-week quit date, 29% had relapsed between 4 and 6 months, 17% between 7 and 9 months and 15% between 10 and 12 months. Thus, more than two-thirds of those who started smoking again had relapsed within 6 months of treatment ending.

Socio-demographic circumstances

Distributions of a selection of the descriptive characteristics related to socio-demographic circumstances are

shown in Table 4, which also includes a breakdown of 52-week CO-validated cessation and lost to follow-up rate by each characteristic with significance tests.

Overall, more disadvantaged socio-economic groups tended to have lower cessation rates, ranging from 17.4% for group 1 to just 8.7% for group 6. Female smokers had lower cessation rates (12.7%) than males (17.2%, $P < 0.01$).

The cessation rate increased sharply with age ($P < 0.001$), with those aged 61 and over having almost three times as high a CO-validated cessation rate (21.5%) as those aged 16–30 (just 7.8%).

Users living with a spouse or partner had a higher cessation rate (15.9%) than the remainder (12.8%, $P < 0.10$). More than one smoker in three (36.1%) had children at home, and while those with none had a relatively high CO-validated cessation rate of 16.4%, partly an age effect, for those with one or two children the cessation rate was 12.5%, and with three or more children it was only 8.6%. While cessation rates reduced with number of children ($P < 0.01$), loss rates increased ($P < 0.001$).

Smoking-related behaviour

Distributions of indicators of smoking-related behaviour are shown in Table 5. Users who smoked their first cigarette within 5 minutes of waking had lower cessation rates (11.7%) than those starting smoking at least 30 minutes after waking (18.1%). Cessation rates for users smoking mainly for pleasure (19.7%) were greater than for those smoking mainly in order to cope (11.4%). The presence of another regular smoker at home was associated with a reduced cessation rate of 12.2%, compared to 16.5% for others ($P < 0.01$).

Considering other types of smoking-related behaviour, those respondents who started smoking aged 13 or under had a cessation rate of just 12.7%, while those

Table 3 Creation of long-term outcome categories from 4- and 52-week outcomes.

52-week status	4-week status									
	CO-validated quitters		Self-report quit without validation ¹		Non-quitters ²		Lost to follow-up		Total	
	n	% ³	n	% ³	n	% ³	n	% ³	n	% ³
CO-validated quitters	284	25.2	19	13.7					303	14.6
Self-report quit without validation ¹	52	4.6	13	9.4					65	3.1
Non-quitters ²	483	42.8	50	36.0	392	100.0			925	44.7
Lost to follow-up	310	27.5	57	41.0			409	100.0	776	37.5
Total	1129	100.0	139	100.0	392	100.0	409	100.0	2069	100.0

¹Cases where self-report quit was refuted by a negative CO validation test were included with non-quitters. ²Non-quitters include self-report quit refuted by CO validation test. ³Percentages are expressed with respect to column totals.

Table 4 Frequencies of characteristics of smokers including 52-week CO-validated cessation rates and loss rates: socio-demographic circumstances.

Characteristic	Valid values		52-week cessation rate (%), with sig. test ²	52-week loss rate (%), with sig. test ²
	n	% of valid values		
Socio-economic group ¹				
1 Relatively advantaged	172	8.6	17.4	38.4
2	681	33.9	19.7	33.3
3	468	23.3	13.9	32.9
4	329	16.4	9.7	45.0
5	234	11.6	9.8	43.6
6 Relatively disadvantaged	127	6.3	8.7	43.3
Total	2011	100.0	14.7*** ³	37.4*** ³
Gender				
Male	902	43.6	17.2**	36.5 NS
Female	1167	56.4	12.7	38.3
Total	2069	100.0	14.6	37.5
Age (years)				
16–30	371	17.9	7.8	51.2
31–40	471	22.8	11.7	41.6
41–50	428	20.7	15.2	37.2
51–60	411	19.9	17.3	30.9
61 and over	386	18.7	21.5	26.4
Total	2067	100.0	14.7*** ³	37.5*** ³
Currently living with spouse/partner				
Yes	1260	62.5	15.9(*)	36.7 NS
No	757	37.5	12.8	38.4
Total	2017	100.0	14.7	37.3
Number of children (aged 0–15) at home				
0	1263	63.9	16.4	34.4
1 or 2	586	29.6	12.5	42.3
3 or more	128	6.5	8.6	45.3
Total	1977	100.0	14.7*** ³	37.5*** ³

¹Socio-economic group is a summary measure based on whether education finished by 16, single parent, rented housing, unemployed or permanently sick/disabled, whether eligible for free prescriptions and aged under 60, lowest deprivation decile. ²Significance tests: NS, not significant; (*) < 0.10; * < 0.05; ** < 0.01; *** < 0.001. A χ^2 test was used unless otherwise stated. ³Mann–Whitney *U*-test.

starting aged 21 or over had a rate of 16.3%. Users who seriously tried to quit smoking in the year before setting a quit date had significantly lower cessation rates. Users who were extremely determined to quit smoking had somewhat higher cessation rates (16.7%) than others (13.6%), although this was only significant at the 10% level.

Smoking intervention

Distributions of items relating to the characteristics of the smoking intervention are presented in Table 6. The vast majority of users received one-to-one support (96.9%). Those users receiving group intervention had apparently higher cessation rates (18.8%) than the remainder (14.4%), although due to the small number

involved the difference was statistically insignificant. Most users received either NRT only or bupropion only. NRT was received by 78.6% of users and bupropion by 15.7%. Just 3.4% of clients received both, and only 2.4% relied upon other methods, such as willpower or other non-pharmacological means. There were no significant differences in cessation rates or loss rates between the different types of pharmacotherapies received.

Multivariate analyses

The user and service characteristics illustrated in Table 2 and employed in the 4-week follow-up paper [1] were used as a predictor pool in the subsequent 52-week multivariate analyses.

Table 5 Frequencies of characteristics of smokers including 52-week CO-validated cessation rates and loss rates: smoking-related behaviour.

Characteristic	Valid values		52-week cessation rate (%), with sig. test ¹	52-week loss rate (%), with sig. test ¹
	n	% of valid values		
Time after waking that first smokes				
Under 5 minutes	710	34.6	11.7**	36.9 NS
At least 5 and under 15 minutes	650	31.7	14.6 NS	39.0 NS
At least 15 and under 30 minutes	333	16.2	16.8 NS	37.8 NS
30 min and over	359	17.5	18.1*	35.9 NS
Total	2052	100.0	14.6	37.6
Smokes mainly for pleasure or to help cope				
Mainly for pleasure	371	19.6	19.7**	32.4*
About equally	1124	59.5	14.5 NS	38.2 NS
Mainly to cope	394	20.9	11.4*	40.4 NS
Total	1889	100.0	14.9	37.5
Another regular smoker in household				
Yes	823	40.5	12.2**	38.2 NS
No	1207	59.5	16.5	37.2
Total	2030	100.0	14.7	37.6
Age started regular smoking (years)				
13 or under	409	20.1	12.7	43.5
14 or 15	653	32.1	14.6	35.5
16–20	771	37.9	15.3	36.5
21 and over	203	10.0	16.3	36.0
Total	2036	100.0	14.6(*) ²	37.5* ²
Whether seriously tried to quit smoking in last year				
Yes	945	45.7	12.4**	39.2 NS
No	1123	54.3	16.6	36.1
Total	2068	100.0	14.7	37.5
Extremely determined to quit				
Yes	747	37.2	16.7(*)	38.7 NS
No	1261	62.8	13.6	36.9
Total	2008	100.0	14.8	37.6

¹Significance tests: NS, not significant; (*) < 0.10; * < 0.05; ** < 0.01; *** < 0.001. A χ^2 test was used unless otherwise stated. ²Mann-Whitney *U*-test.

Modelling CO-validated cessation and loss rates individually

Two separate logistic regression analyses were used to estimate the probabilities of CO-validated cessation and loss to follow-up. Predictors were entered into three blocks: personal characteristics and referral source; followed by intervention details and PCT; and North Cumbria/Nottingham. Only the full models with all blocks entered are presented here. Only terms for which the significance of the change in -2 log likelihood was less than 5% were allowed to enter. Entering all variables followed by stepwise regression failed to improve upon the initial models. The results are shown in Table 7.

CO-validated cessation

In the model for CO-validated cessation, both age and number of adults in the home were associated with a higher cessation rate, while a higher socio-economic score was associated with lower cessation rates. When the period between waking and a first cigarette was less than 5 minutes, CO-validated cessation rates were smaller ($P=0.023$). Users who had seriously tried to quit smoking in the last year had lower CO-validated cessation rates. Smoking mainly for pleasure, rather than to cope, increased rates. Having another smoker in the household significantly reduced rates ($P=0.003$). Those who were extremely determined to quit smoking had higher rates. Clients in Nottingham had lower rates.

Table 6 Frequencies of characteristics of smokers including 52-week CO-validated cessation rates and loss rates: intervention.

Characteristic	Valid values		52-week cessation rate (%), with sig. test ¹	52-week loss rate (%), with sig. test ¹
	n	% of valid values		
Referral source				
Self-referral	1077	52.7	13.7 NS	37.7 NS
GP	666	32.6	15.6 NS	37.5 NS
Other health professional	63	3.1	22.2 NS	41.3 NS
Practice nurse	61	3.0	19.7 NS	41.0 NS
Consultant	92	4.5	17.4 NS	31.5 NS
Other	84	4.1	8.3 NS	36.9 NS
Total	2043	100.0	14.7	37.5
Type of intervention				
One-to-one	1970	96.9	14.4 NS	37.6 NS
Group	64	3.1	18.8	40.6
Total	2034	100.0	14.5	37.7
Intervention setting (multiple choice)				
Primary care	1163	56.5	15.2 NS	39.4*
Hospital	244	11.9	18.0 NS	32.4(*)
Work-place or educational establishment	28	1.4	10.7 NS	39.3 NS
Other community venue	377	18.3	11.1*	37.4 NS
All valid cases	2059	100.0	14.6	37.5
Has client received NRT and/or bupropion?				
NRT only	1568	78.6	15.2 NS	37.6 NS
Bupropion only	313	15.7	14.4 NS	33.6 NS
NRT and bupropion	68	3.4	7.4 NS	38.2 NS
Other (e.g. willpower/non-pharmacological)	47	2.4	25.5	34.0
Total	1996	100.0	15.0	36.9

¹Significance tests: NS, not significant; (*) < 0.10; * < 0.05; ** < 0.01; *** < 0.001. A χ^2 test with continuity correction was used.

Apart from the terms involving number of adults and smoking mainly for pleasure, all remaining results are consistent with the trends identified in the corresponding analysis of 4-week outcomes, except that no intervention terms entered significantly [1].

Loss

Younger users were more likely to be lost to follow-up, the opposite result to that found for CO-validated quitters. When the period between waking and first cigarette was between 1 and 2 hours, users were less likely to be lost to follow-up. It is therefore likely that when the delay is less than 5 minutes, users would have been more likely to be lost to follow-up, again opposite to the result for CO-validated quitters. Also, those users who were treated in primary care settings were more likely to be lost to follow-up.

DISCUSSION

This study provides evidence of longer-term cessation rates among users of 'real world' smoking treatment

services. This population of smokers is quite different from those treated in clinical trials, that often represent a carefully screened group. The 1-year CO-validated cessation rate of 14.6% (rising to 17.7% when self-reported quitters are included) identified here is consistent with previous studies. The evidence-base, made up largely of results from clinical trials, has found a cessation rate of between 10% (brief intervention plus NRT) and 30% (intensive group support plus pharmacotherapies) at 52 weeks [3,4,15]. The type of support provided to smokers accessing English smoking treatment services involves more than brief advice, but in many instances is less intensive than the interventions reported in some trials.

This study also supports findings from other research regarding relapse rates at 1 year. A meta-analysis by Stapleton [9] reported that, irrespective of the original intervention, two-thirds of 6-week quitters would have relapsed by 52 weeks. This translates to a relapse rate of around 75% among 4-week quitters. This study found that three-quarters of smokers in both study areas had relapsed by 1 year. It should be noted, however, that these relapse rates are higher than those assumed by the recent Wanless report, which suggested that '30–40% of smok-

Table 7 Separate models¹ for CO-validated cessation rate and lost to follow-up at 52 weeks for cases setting a quit date.

	Model 1: CO-validated quit rate ^{4,6}			Model 2: lost to follow-up ^{5,7}		
	B ²	Sig. ³	OR	B ²	Sig. ³	OR
Personal characteristics						
Age (years)	0.023	<0.001	1.023	-0.026	<0.001	0.974
Number of adults, including self, in home	0.224	0.008	1.251			
Socio-economic group score	-0.146	0.004	0.864			
Smoking-related behaviour						
Delay between waking and first cigarette						
Under 5 minutes	-0.321	0.023	0.725			
Between 1 and 2 hours				-0.432	0.023	0.649
Serious attempt to quit smoking in last year	-0.341	0.009	0.711			
Smokes mainly for pleasure	0.322	0.041	1.380			
Other smoker in household	-0.429	0.003	0.651			
Extremely determined to quit smoking	0.455	0.001	1.577			
Area						
Nottingham	-0.306	0.021	0.737			
Intervention						
Referral source						
Other health professional				0.570	0.040	1.769
Intervention setting						
Primary care				0.287	0.003	1.333
Type of intervention						
Bupropion				-0.262	0.031	0.770
Type of intervention missing				0.524	0.036	1.689
Sample size		2069			2069	

¹Each model uses logistic regression. ²B is the unstandardized coefficient. ³Significance relates to the change in $-2 \log$ likelihood. ⁴Female would enter the model for CO-validated quit rate with B = -0.211, Sig = 0.130, OR = 0.810, 95% confidence interval CIOR = 0.628-1.044. ⁵Female would enter the model for lost to follow-up with B = 0.005, Sig = 0.962, OR = 1.005, 95% confidence interval CIOR = 0.834-1.209. ⁶Group intervention would enter the model for CO-validated quit rate with B = 0.437, Sig = 0.201, OR = 1.549, 95% confidence interval CIOR = 0.792-3.030. ⁷Group intervention would enter the model for lost to follow-up with B = 0.208, Sig = 0.431, OR = 1.231, 95% confidence interval CIOR = 0.733-2.068.

ers truly abstinent at 4 weeks are likely to be abstinent at one year' [16].

The form of the models for CO-validated quit rates and lost to follow-up are quite different. In combination, the findings lend support to the conventional assumption that those lost to follow-up should not be regarded as successful quitters.

In an earlier paper discussing short-term outcomes [1], it was suggested that self-report quitters had similar characteristics to those who were CO-validated as successful. This study confirms the cautionary note associated with those findings. It shows that non-validated/self-report short-term quitters are more likely than those who were CO-validated to be either non-quitters or lost to follow-up at 52-week follow-up. This raises questions about relying on self-report data for 4-week outcomes to make assumptions regarding the longer-term impact of services.

Overall, the factors that predict longer-term CO-validated cessation are broadly the same as those that were identified as significant determinants of short-term

cessation [1]. Age, socio-economic status, delay between waking and first cigarette, other smoker in household and motivation to quit are statistically significant predictors. All these factors affect whether an individual quits at 4 and at 52 weeks. It is interesting to speculate whether these factors represent causal effects upon cessation rates, and whether they could be modified to improve success rates. Older people are likely to have higher success rates due to their greater likelihood of adhering to a treatment programme and the smaller risk of a relapse. Also, cases with a high socio-economic score (higher need) are more likely to have lower success rates due to their less favourable social circumstances. However, this is no argument for targeting resources on those with greatest success rates, as it is also desirable to aim resources at younger people and those with poor social circumstances. Similarly, people who smoke within 5 minutes of waking, being highly dependent, need more rather than less intensive treatment. However, perhaps it is reasonable to target more resources on those who are highly motivated; for example, those who are extremely

determined to quit, as these cases have higher cessation rates.

The difference between short- and longer-term cessation rates, and the loss of three-quarters of short-term quitters by 1 year, is likely to be due to a range of factors not identified or measured by this study. In other words, after smokers have received the original intervention, life intervenes and affects whether they can sustain their quit attempt. Changes in personal circumstances, levels of stress and other life events may cause an individual to start smoking again, weeks or months after their treatment has ended.

This raises the issue of relapse prevention and whether services should be providing smokers routinely with help to maintain abstinence. Relapse prevention studies so far have been lacking in efficacy, and more research is needed in this area. This study did not examine the issue of relapse prevention specifically. However, we did obtain some basic information that helps shed some light on the issue. Clients who had started smoking again reported that the most common period for relapse was in the first 6 months following the end of their sessions with the service. This suggests that there may indeed be some merit in investing in relapse prevention programmes to support smokers in the weeks immediately following treatment. English smoking treatment services are not currently funded to provide relapse prevention, but if longer-term cessation is to be maximized, this may be a fruitful area for future development.

This study assumes that loss to follow-up is equivalent to relapse by 52 weeks. This assumption is consistent with other studies. Although there is ample evidence to suggest that those lost to follow-up are a quite distinct group from both quitters and non-quitters it is unlikely that many of them should be considered as abstinent.

CONCLUSION

This study has important implications for future monitoring and evaluation of smoking treatment services. The first clear message is that longer-term follow-up is important. In order to make any reasonable assumptions about the contribution of services to reducing smoking prevalence, we need to know what proportion of clients is likely to achieve abstinence beyond 4 weeks. Assessing longer-term cessation is also necessary if we are to learn more about socio-economic inequalities in smoking and the effect that services may have on assisting disadvantaged smokers to stop. The importance of longer-term outcomes is not necessarily limited to 52 weeks, however. Research suggests that relapse continues beyond 1 year and thus it may not be sufficient to base assumptions about service effectiveness on one year outcomes.

A second implication is that, in order to achieve a reasonable response rate, 52-week follow-up has to involve repeated attempts to contact smokers and for this reason it is expensive. Services require dedicated administrative support to conduct follow-up and should ideally be able to reimburse smokers for any costs associated with attending service venues for purposes of CO validation. Given these costs it is probably not reasonable to expect all local smoking treatment services to collect 52-week follow-up data for all smokers. The fact that the results are so consistent with other studies suggests that it is possible to estimate 1-year outcomes from 4-week quit rates, but these should be CO-validated rather than self-reported quit rates.

The most fruitful and realistic way forward may be to invest in determined efforts to monitor and evaluate longer-term outcomes from a selection of services on a regular basis. These services should be operating in a range of settings, offering varied interventions (i.e. group and one-to-one) and treating different groups of smokers. This type of follow-up would provide reliable evidence about the most effective way of treating nicotine addiction, particularly with low-income smokers, and could inform service design and development in the United Kingdom and beyond.

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