Using e-cigarettes for smoking cessation: evaluation of a pilot project in the North West of England

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Abstract

Aims: E-cigarettes have been advocated as an effective smoking cessation intervention, with evidence indicating that they are substantially less harmful than conventional cigarettes. As a result, a pilot to encourage people to swap from conventional cigarettes to e-cigarettes was conducted in 2018 in a socially deprived area in the North West of England. This evaluation highlights the key findings from the pilot.

Methods: An analysis of secondary data at 4 weeks ($n = 1022$) was undertaken to predict those who used solely used e-cigarettes (i.e. had quit tobacco, as confirmed by a carbon monoxide test, CO < 10 ppm) from baseline characteristics, using chi-square tests and logistic regression. Baseline data were demographics, smoking levels and service provider type.

Results: Of the 1022 participants who engaged with the pilot 614 were still engaged at 4 weeks, of whom 62% had quit; quitting was more likely in younger participants (aged 18–24) and less likely in those who were sick and disabled. Of those who still smoked tobacco at week 4 ($n = 226$), smoking had reduced from a baseline of 19.1 cigarettes/day to 8.7. Overall, 37% (381) of those initially enrolled were confirmed to be using an e-cigarette on its own at follow-up. Successful quit was associated with occupation (unemployed, 33% vs intermediate, 47%, $p = .023$) and residing in the less deprived quintiles of deprivation (50% vs 34% in the most deprived quintile, $p = .016$).

Conclusions: Making the conservative assumption that all those not in contact at 4 weeks were still smoking tobacco, for every five people entering the scheme, three people stayed on the programme and reduced their cigarette smoking and one person cut out tobacco altogether. E-cigarettes appear to be an effective nicotine replacement therapy; however, further research is required to determine whether e-cigarette users are more likely to reduce their overall nicotine consumption in the longer term.

INTRODUCTION

Globally, through direct and indirect (secondhand) smoking tobacco is estimated to kill more than 8 million people each year.[1] In England, smoking is the leading cause of preventable death, with approximately 78,000 deaths in 2016 being attributed to smoking.[2] In 2017, 15.1% of people aged over 18 years and above smoked cigarettes, approximately 7.4 million people in the population.[2] The highest proportion of smokers were aged between 25 and 34 (19%), and about 1 in 4 (25.9%) people in routine and manual occupations smoked, compared to 1 in 10 (10.2%) in managerial and professional occupations.[2] Government targets are to cut smoking prevalence in England to 12% by 2020, with estimates suggesting that nationally approximately 61% of smokers aged over 16 want to quit.[2]

Electronic cigarettes ('e-cigarettes' or 'e-cigs') are promoted as an aid for quiting smoking in some countries.[3] However, a cautionary approach

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to their use as a smoking cessation tool has been advocated,[4–6] due to the incomplete evidence base in respect of the risks, particularly long-term, of e-cigarettes. The most recent Public Health England (PHE) evidence review[7] reports that using e-cigarettes, or 'vaping', pose only a small fraction of the risk of smoking, and the comparative risks of cardiovascular and lung disease, although not quantified, are substantially below the risks of smoking, with evidence from one source suggesting that the cancer potencies of e-cigarettes were largely under 0.5% of the risk of smoking. The PHE review[7] asserts that switching completely from smoking to e-cigarettes conveys substantial health benefits, and policy recommendations are to improve access to e-cigarettes for smokers in disadvantaged groups.

Under the revised European Union Tobacco Products Directive, e-cigarettes containing nicotine are regulated in Europe and the United Kingdom, including prohibiting their sale to those under 18 years of age, imposing restrictions on the maximum capacities and nicotine strengths allowed, alongside other safety and quality standards (e.g. tamper evident packaging and being child resistant).[8] In addition, tobacco regulations are overseen by the Medicines and Healthcare products Regulatory Agency who operate a 'yellow card' central cascading system to enable any alerts about potential side effects of e-cigarettes to be flagged quickly by healthcare staff or the public.[8]

E-cigarettes have been the most common quitting aid for smokers in England since 2013, with quit rates reported to be at their highest so far observed in England.[7] However, the evidence for their effectiveness has been limited. In 2016, a Cochrane Review[9] found that evidence, particularly on longer-term effectiveness, was low, recommending that more randomised controlled trial (RCT) trials were needed. Since then an RCT (n = 886)[10] has found that e-cigarettes were more effective than nicotine-replacement therapy for smoking cessation, when both also included behavioural support. While key findings from the PHE evidence review reported that e-cigarettes '*... have contributed tens of thousands of additional quitters in England*' (p. 16),[7] more recently[11] a declining trend in successful quits at 4 weeks in England has been reported, dropping from 2245 per 100,000 smokers in 2016/2017 to 1894 in 2018/2019, while in the North West (NW) of England (the focus of this study), the figures were 2148 per 100,000 smokers in 2016/2017 compared to 2040 in 2018/2019.[11] Despite this, smoking rates have declined in the NW 1.4 percentage points faster than the national average.[12] It has been suggested that the more rapid decline in the NW is due to local action to tackle tobacco harm.[13]

'*Determining how to assess the effects of e-cigarettes on smoking cessation has been one of the most contentious aspects of the debate over e-cigarette use*' (p. 219).[3] Moreover, a recent systematic review of 38 primary studies concluded that e-cigarettes were associated with significantly less quitting among smokers (odds ratio of quitting 0.72, 95% CI: 0.57–0.91).[14] The assessment is made more difficult by the fact that not all e-cigarette users use them as part of a smoking cessation attempt; in the same systematic review, when including only those trying to quit, the odds of quitting were not significantly different between those trying to quit and controls (OR = 0·86, 95% CI: 0.60–1.23).[14]

The aim of this paper is to highlight the key findings from a pilot scheme to distribute free e-cigarettes and fluid to those expressing a desire to quit, delivered in 2018 in a deprived area in the NW of England.

THE INTERVENTION

A pilot scheme to support smokers to quit tobacco by substituting with e-cigarettes was implemented in January 2018, delivered over 3 months in a socially deprived area of the NW. The pilot was designed to enable current smokers to obtain a free e-cigarette, charger, nicotine liquid, and support (see Table 1).

An additional three bottles of liquid were provided to incentivise the participants' final consultation to capture changes from baseline to 4 weeks after the quit date (the final visit), which was validated with a CO test. A £10 high street shopping voucher was also offered as an alternative incentive to reduce bias in the population that returned for follow-up.

E-cigarette vouchers were provided through websites and also advertised and distributed by social housing providers and other community organisations, including pharmacies and stop smoking services.

The pilot ran for just less than 3 months, by which time the e-cigarettes had all been distributed. E-cigarettes were purchased from the only Independent British Vape Trading Association (IBVTA) registered e-cigarette provider in the area (see https://www.ibvta.org.uk/about-us). IBVTA registration provides assurance that there is no connection with the tobacco industry, and they also have a code of conduct, which stipulates they will not supply non-smokers or under 18s with e-cigarettes. The products were distributed to the stop smoking services (community and pharmacy) who provided clients with an e-cigarette and liquid during the consultation. Pharmacy-delivered interventions have been found, through a systematic review,[15] to be effective for smoking cessation. Moreover, a National Institute for Health and Care Excellence (NICE)[16] review concluded that there is strong evidence that behavioural interventions, as adjuncts to Nicotine Replacement Therapy, such as those provided in the Community by Smoking Cessation Advisors, are effective for smoking cessation. Alongside the products, support and training was provided to stop smoking advisors and pharmacies by the e-cigarette provider on the use of e-cigarettes and how to advise their clients.

SETTING

A person's likelihood of smoking has been found to increase with the deprivation level of their neighbourhood.[2] The NW of England has higher than average levels of deprivation: when ranking all local authorities of England by the proportion of their neighbourhoods in

Table 1

Elements provided to service users during the e-cigarette pilot

E-cigarette pilot offer elements	
Free e-cigarette	Three different e-cigarettes were provided in different colours. A slightly more expensive device was included as one of the options, as this had a longer battery life, which would be sufficient for people such as manual workers, who are unable to charge their device for longer periods of time.
Charger	A plug was provided with each device to ensure people could safely charge the device
Nicotine liquid	Two different strengths (1.0% and 1.6%) and four different flavours (tobacco, rolling tobacco, menthol and mixed fruits) were provided. This ensured that individuals had a choice of flavours and an appropriate liquid strength for their smoking habit. Enough liquid was provided to allow the individual to vape for free for at least 4 weeks and was distributed in two batches, five bottles at baseline and five bottles at week 2.
Support	Individuals obtained their e-cigarette from a community stop-smoking-service or a pharmacy, which ensured that they obtained advice and guidance around stopping smoking and using the e-cigarette, in addition to the device itself. People were required to return at 2 weeks in order to get their additional liquid, which helped to ensure that contact with the service could be maintained.

the most deprived 10% of all neighbourhoods, 11 of the top 20 deprived local authorities are in the NW.[17] Regional data for 2017/2018 show smoking prevalence for the NW region at 13.4%, compared to the England average of.[11] For routine and manual workers, the figures were higher at 26%, similar to the England average of 25.7%. Smoking attributable hospital admission rates for 2016/2017 in the NW region were correspondingly high, at 1926 per 100,000 compared to 1685 per 100,000 for England. Mortality attributed to smoking (2015–2017) at 320.5 per 100,000 (compared to 262.6 per 100,000 for England) reflected this trend, as did emergency hospital admissions for chronic obstructive pulmonary disease (COPD) (532 compared to 417 per 100,000 in England), lung cancer registrations (98.3 compared to 78.6 per 100,000 in England) and oral cancer registrations (17.2 per 100,000 compared to 14.7 per 100,000 for England).

METHODS

An independently commissioned evaluation of the e-cigarette intervention was carried out using mixed methods, which included secondary data analysis of assessments carried out at baseline and 4 weeks (n = 1022), along with interviews with service users, and service providers. The focus of this paper is on the secondary data collected by stop smoking providers at baseline and 4 weeks; the qualitative findings will be reported separately.

Anonymised data were provided on Excel spreadsheets to the University of Salford and transferred to SPSS v.24 for analysis. Data collected included demographic profile, cigarette use, e-cigarette use, liquid used, 4-week incentives provided, CO (carbon monoxide) readings and provider type (community/pharmacy). CO monitoring, as well as a way of validating self-reported quits, is a way of providing visible proof to smokers of the harm caused by smoking and a valuable motivational tool with which to chart their progress when quitting smoking.[18] Measuring CO levels, as part of a supported and structured quit plan, has been found to be cheap, non-invasive, easy to use, give immediate results, and improve the likelihood of successful quit attempts.[19]

The primary outcome of the pilot was successful CO-validated quit, 4 weeks after the quit date (this is the standard measure of a successful quit in England);[20] secondary outcomes were number of cigarettes smoked and CO readings. Analysis was stratified by baseline smoking (light smoker 1-10 cigarettes per day (cpd), moderate smoker 11-19 cpd, and heavy smoker 20 + cpd), type of provider, age group, quintile of area deprivation score (the Index of Multiple Deprivation, IMD) and occupational status. Backwards stepwise logistic regression was used to predict quit status from baseline characteristics for those 1021 individuals with complete data at baseline, making the conservative assumption that those not attending at follow-up were still smoking tobacco. Ethics approval (HSR1718-053) was gained from the University of Salford (6 April 2018).

RESULTS

During the period, 1022 smokers registered with the service and obtained a free e-cigarette and fluids. At follow-up (week 4) 614 individuals were still engaged with the programme (60%). No data were available for the 408 people who did not present for the 4-week follow-up. At baseline, the majority of participants were seen by community providers (65%) (Table 2). At follow-up, 73% of the sample were from community providers, who were able to follow up 68% of their participants, compared to pharmacies, which followed up 46%.

Table 2

Client demographics (at registration and 4-week follow-up)

	Registration		Week 4		
	***N* = 1022**	**%**	***N* = 614**	**%**	**Retention in service (%)**
Type of Provider					
Pharmacy	362	35.4	167	27.2	46.2
Community	660	64.6	447	72.8	67.8
Age (average)					
Min – 18, Max 84 – average 44.66	44.66		46.08		
Age group (years)					
18–24	67	6.6	26	4.2	38.9
25–34	232	22.7	131	21.3	56.5
35–44	194	19.0	124	20.2	64
45–54	260	25.4	156	25.4	60
55–64	180	17.6	111	18.1	61.7
65+	89	8.7	66	10.7	74.2
IMD quintile					
Quintile 1	700	68.5	397	64.7	56.8
Quintile 2	171	16.7	110	17.9	64.4
Quintile 3	104	10.2	73	11.9	70.2
Quintile 4	31	3.0	23	3.7	74.2
Quintile 5	15	1.5	10	1.6	66.7
Missing	1	.1	1	.1	-
Ethnic origin					
Non-white	19	1.9	9	1.5	47.4
White	931	91.1	585	95.3	62.9
Missing/non-stated	72	7.0	20	3.2	27.8
Occupational status					
Unemployed	335	32.8	164	26.7	49.0
Home carer	68	6.7	37	6.0	54.5
Managerial and professional	79	7.7	53	8.6	67.1
Intermediate	106	10.4	70	11.4	66.1
Routine and manual	251	24.6	169	27.5	67.4
Retired	98	9.6	67	10.9	68.4
Sick or disabled	85	8.3	54	8.8	63.6

IMD: index of multiple deprivation.

The mean age of participants at baseline was 44.7 years. The majority of participants resided in the most deprived quintile, that is, quintile 1 (69% at baseline to 65% at follow-up), representing the communities targeted by the intervention. The majority of participants were white (91% at baseline to 95% at follow-up), reflecting the ethnic make-up of the area, which comprises about 10% of people from an ethnic minority background. The most common occupational status was unemployed (33%) or routine or manual occupations (25%). Retention in the service varied from 49% for the unemployed group to 68% for those who were retired.

Smoking characteristics at baseline and follow-up

Data were collected at baseline, and weeks 2 and 4. Only baseline and week 4 data are reported here, however, of the 1022 who signed up to the pilot at baseline, at weeks 2 and 4 over half of the participants (n = 670 and 614, respectively) were still engaged with the programme, indicating that the majority of participants who discontinued with the programme did so in the first 2 weeks. At baseline, most participants were either heavy (more than 20 cpd, 58%) or moderate smokers (11–19 cpd, 24%) (Table 3). The average number of cigarettes smoked at baseline was 19.14 cpd, which reduced to 8.67 cpd at follow-up for those who said they were still smoking. At follow-up, the vast majority stated that they were still using their e-cigarette (95%), either on its own (62%) or in combination with tobacco (33%). At initial consultation, the average CO level was 13.9 ppm, with heavy smokers having the highest average reading of 15.8 ppm, as would be expected, followed by moderate smokers at 12.5 ppm, and light smokers at 9.9 ppm. Of the 614 who attended the follow-up, 383 quits were confirmed by a low CO reading (<10 ppm CO), that is, 62% of follow-up attendees or 37% of those who initially registered on the programme. A further five stated they had quit, but had CO readings of 10 ppm or more, which suggested they were still smoking. On average, CO readings were lower at follow-up, at 5.6, 4.5, and 4.2 ppm for heavy, moderate and light smokers respectively (567 individuals provided a reading). Of those who provided a reading on both occasions (n = 567), mean CO dropped significantly from 13.9 to 5.05 ppm (paired t = 28.3, $p < .001$). The most popular flavour liquid selected was mixed fruit (a median of 6 bottles per person distributed over the 4-week period) compared to tobacco flavour (median 0 bottles) and menthol (median 1 bottle).

At 4-week follow-up, 408 (39.9%) had dropped out of the scheme. For the purposes of analysis, these were conservatively assumed to still be smoking tobacco. However, anecdotally, some participants were known to be still using e-cigarettes in preference to tobacco but did not wish to avail themselves of the free liquid top up or incentive vouchers. Of those who collected the 4-week incentive (n = 509) most chose the liquid over the high street shopping voucher (73%).

Comparison of quitters and tobacco users at follow-up

For those attending the 4-week follow-up (n = 614), quitters (those using e-cigarettes only) were compared to those who were still using tobacco at follow-up (with or without e-cigarettes). There were significant differences in quit rates by provider type, with significantly more of those quitting having had the service provided by a pharmacy provider (76.0% quit compared to 57.3% quit for the community provider; Table 4). A significant difference was also found in respect of age group, with 18- to 24-year-olds more likely to have quit at follow-up (73.1% quit compared with 55.9% for 55–64 years). Those whose occupational status was 'sick and disabled' were significantly less likely to have quit at follow-up. The success rate of pharmacy providers compared to community providers was likely to have been influenced by the type of participant engaging with each service: compared to those going to pharmacies, community participants were significantly older (p = .035), more likely to be sick or disabled, less likely to be home carers and less likely to be unemployed ($p < .001$; data not shown). Community participants were also more likely to have tried e-cigarettes before (p = .001), thus on a repeated attempt at quitting. There was also a differential follow-up between the two groups, whereby community providers were more likely to retain participants at 4-week follow-up (Table 2). Of the original 362 individuals seen by pharmacies, 127 (35%) were known to have stopped smoking tobacco by follow-up. Of the original 660 individuals seen by the community services, 256 (39%) were known to have stopped smoking tobacco by follow-up. This suggests overall similar quit rates between the two settings, if making the assumption that those lost to follow-up did not quit.

Prediction of quit status from baseline characteristics

Making the conservative assumption that those lost to follow-up had not quit tobacco, baseline characteristics were compared between those known to quit (n = 383) and 639 individuals who were either still using tobacco or had been lost to follow-up. The two most affluent quintiles had the smallest sample size and were therefore combined for analysis. One individual had missing data (for deprivation of area of residence) and was excluded from the analysis, leaving 1021 available (Table 5). The average quit rate was 37%. Quit rates varied from 28% in the youngest group (18–24 years) to 42% of 35- to 44-year-olds, although this was not statistically significant. Quits were more likely among those of 'intermediate' occupation (47%) and least likely among the unemployed (33%: p = .023). While half of those residing in the most affluent two quintiles quit, only a third of those in the most deprived quintile did so (p = .016). There was no significant difference between quit rates of those attending the community services (35%) compared to the pharmacy (39% quit). Quit rate was not affected by the quantity of cigarettes smoked at baseline. All baseline variables were entered in a backwards stepwise logistic regression. Following multivariate adjustment, only IMD quintile reached the threshold of significance (p = .048), with

Table 3.

Smoking characteristics at baseline and four-week follow-up

	Baseline Number (%) Mean (SD)	Follow-up Number (%) Mean (SD)
Total number of participants	1022 (100)	614 (100)
Total number of smokers	1022 (100)	226 (36.8)
Category of smoker (cigarettes per day)		
Light smoker (1–10 per day)	185 (18.1)	178 (78.8)
Moderate smoker (11–19 per day)	249 (24.4)	17 (7.5)
Heavy smoker (20+ per day)	588 (57.5)	31 (13.7)
Number of cigarettes smoked	19.1 (8.151)	8.7 (7.22)
Mean CO levels (ppm)	13.9 (7.93)	5.1 (5.86)
Mean CO levels (ppm) stratified by baseline category		
Light smoker	9.9 (4.87)	4.22 (5.36)
Moderate smoker	12.5 (5.7)	4.47 (4.83)
Heavy smoker	15.8 (8.87)	5.59 (6.37)
Self reported use of e-cigarette		
Missing data at follow-up		408 (39.9)
Yes		583 (57.0)
No		31 (3.0)
Self-reported use of e-cigarette		
Missing data at follow-up		439 (43.0)
On its own		381 (37.3)
With tobacco		200 (19.6)
Other		2 (0.2)
Quit status		
Still smoking cigarettes		226 (36.8)
Unconfirmed quitters[a]		5 (0.8)
Quitter		383 (62.4)
Four-week incentive accepted		
Missing data at 4-week follow-up		408 (39.9)
Yes: Liquid		370 (36.2)
Yes: High street shopping voucher		139 (13.6)
No		105 (10.3)

[a]People who said they quit, but had CO readings of 10 ppm or more.

those in the most deprived quintile having about half the odds of quitting (OR = 0.551, $p = .054$) compared to those in the most affluent two quintiles. Those in routine and manual occupations had 1.4 times the odds ($p = .041$) and those in intermediate occupations 1.7 times the odds of quitting ($p = .016$) compared to the unemployed (although occupation was not significant overall, at $p = .057$).

DISCUSSION

This paper reported the findings of a pilot scheme to encourage people to swap from conventional to e-cigarettes, through being provided with free e-cigarettes, liquid and support from either pharmacy or community providers. The pilot was instigated in a deprived area in NW England where smoking rates are almost three times higher among lower earners, compared to the highest earners, and remain 'stubbornly higher amongst those in our society who already suffer from poorer health and other disadvantages' (p. 4).[21] The evaluation found that for every five people entering the scheme, three stayed on the programme and reduced their cigarette smoking and one cut out cigarettes altogether. This is based on the conservative assumption that all those who were lost to follow-up were still smoking cigarettes; however, anecdotally, some participants were known to be happy with their e-cigarettes and were continuing unsupported.

The pilot was successful on a number of levels. First, the vast majority of participants were from the most deprived IMD quintile (1), followed by quintiles 2 to 5 in descending order. Moreover, a quarter (24.6%) of the participants (see Table 2) were from routine or manual occupations at registration, the group with the highest prevalence of smoking (26% in the NW Region). This is this group that the UK government are seeking to focus on to reduce the 'burning injustice that sees some of the poorest in our society die on average nine years earlier that the richest' (p. 4).[21]

Of the 1022 who signed up to the pilot at baseline, at weeks 2 and 4 over half the participants ($n = 670$ and 614, respectively) were still engaged with the programme. This indicates that the majority of

Table 4.

Comparison of those still smoking tobacco with CO confirmed quitters at follow-up

	Still smoking tobacco			E-Cigs only (quitters)			Chi square	*p* value
	n	%	SR	n	%	SR		
Type of provider								
Pharmacy	40	24.0	**–2.9**	127	76.0	**2.2**	18.3	**<.001**
Community	191	42.7	1.8	256	57.3	–1.4		
Age group								
18–24	7	26.9	–0.9	19	73.1	0.7	7.8	**.006[a]**
25–34	41	31.3	–1.2	90	68.7	0.9		
35–44	43	34.7	–0.5	81	65.3	0.4		
45–54	61	39.1	0.3	95	60.9	–0.2		
55–64	49	44.1	1.1	62	55.9	–0.9		
65+	30	45.5	1.0	36	54.5	–0.8		
IMD by quintile								
1	157	39.5		240	60.5		3.9	.425
2	34	30.9		76	69.1			
3	30	41.1		43	58.9			
4	7	30.4		16	69.6			
5	3	30.0		7	70.0			
Occupational status								
Unemployed	55	33.5	–0.9	109	66.5	0.7	16.1	**.013**
Home carer	11	29.7	–0.8	26	70.3	0.6		
Managerial/professional	18	34.0	–0.4	35	66.0	0.3		
Intermediate	20	28.6	–1.2	50	71.4	1.0		
Routine and manual	65	38.5	0.2	104	61.5	–0.1		
Retired	31	46.3	1.2	36	53.7	–0.9		
Sick or disabled	31	57.4	**2.4**	23	42.6	–1.8		
Type of smoker								
Light (1-10 cigs per day (PD))	39	35.1		72	64.9		0.7	.717
Moderate (11–19 PD)	56	36.4		98	63.6			
Heavy (20 + cigs PD)	136	39.0		213	61.0			
Total	231	37.6		383	62.4			

IMD: Index of Multiple Deprivation.
[a]Linear Test; Significant results highlighted in bold; SR represents Standard Residual (used to interpret significant chi-square tests, where >2 indicates deviation from expected).

Table 5.

Predicting CO confirmed quit status from baseline characteristics

	N	E-Cigs only (quitters), *n* (%)	Chi square	*p*	Adj odds ratio, (95% CI)[a]	*p*
Age group (years)						
18–24	67	19 (28.4)	5.20	.392		
25–34	232	90 (38.8)				
35–44	194	81 (41.8)				
45–54	259	94 (36.3)				
55–64	180	62 (34.4)				
65+	89	36 (40.4)				
Occupation						
Unemployed	335	109 (32.5)	14.97	.021	1 (reference)	.057
Home carer	68	26 (38.2)			1.306 (0.76–2.245)	.334
Managerial and professional	78	34 (43.6)			1.454 (0.873–2.421)	.150
Intermediate	106	50 (47.2)			1.74 (1.111–2.726)	.016
Routine and manual	251	104 (41.4)			1.428 (1.015–2.011)	.041
Retired	98	36 (36.7)			1.118 (0.695–1.799)	.644
Sick or disabled	85	23 (27.1)			0.756 (0.444–1.287)	.302
IMD quintile						
1	700	240 (34.3)	10.33	.016	0.551 (0.3–1.011)	.054
2	171	76 (44.4)			0.812 (0.421–1.568)	.535
3	104	43 (41.3)			0.698 (0.345–1.413)	.318
IMD quintiles 4 and 5	46	23 (50)			1 (reference)	.048
Type of provider						
Pharmacy	362	127 (35.1)	1.37	.242		
Community	659	255 (38.7)				
Type of smoker						
Light (1–10 cigs/day)	184	71 (38.6)	0.93	.627		
Moderate (11–19 cigs/day)	249	98 (39.4)				
Heavy (20+ cigs/day)	588	213 (36.2)				
Total	1021	382 (37.4)				

CI: confidence interval; IMD: Index of Multiple Deprivation.
[a]Adjusted odds ratio and 95% confidence intervals from backwards stepwise logistic regression; first step: age group, occupation., IMD, provider type, baseline smoking.

participants that discontinued did so in the first 2 weeks. The importance of the first 2 weeks of a quit attempt have been highlighted by several studies,[22–24] although nicotine replacement using e-cigarettes were not the quit methods in any of these studies. High lapse rates of 63% from smoking abstinence within the first weeks of those trying to quit have previously been found.[22] Kirchner et al.[23] also found that those who relapsed from smoking abstinence within the initial days of smoking cessation were more likely to resume daily smoking faster compared to those who refrained from smoking during the initial days, who were more likely to maintain abstinence from daily smoking for longer. This highlights the importance of abstinence and support in the early stages of quit attempts, with Wilkinson et al.[25] highlighting that follow-up appointments should be within 1 or 2 weeks after the quit date. Commissioners of similar schemes may wish to consider having the first follow-up consultation earlier than 2 weeks to try to increase the number of people who keep engaged with the programme.

Looking at changes in smoking behaviour at initial consultation and at follow-up, in respect of those who still reported smoking some cigarettes at week 4 ($n = 226$), the reported number of cigarettes smoked per day had reduced to 8.7, compared to the baseline average of 19.1 cpd. For those who provided CO readings at baseline and follow-up, the behaviour change was confirmed by significant reductions in CO from 13.9 to 5.1 ppm.

NICE[26] guidelines recommend that commissioners and managers of stop smoking services set performance targets of 'at least 35% at 4 weeks, based on everyone who starts treatment and defining success as not having smoked (confirmed by carbon monoxide monitoring of exhaled breath) in the fourth week after the quit date' (p 7). At week 4, in this study, 383 were confirmed quitters (confirmed by a CO reading less than 10 ppm where this was available) – representing 38% of the original 1022 participants, therefore this programme met, and slightly exceeded, NICE targets. For these quitters, the drop in CO levels was significant, from an average of 13.94 ppm at initial consultation to 5.05 ppm at 4-week follow-up, with heavy smokers having the biggest average drop, from 15.82 ppm at baseline to 5.59 ppm at week 4.

Looking at these confirmed quitters ($n = 383$), those aged 18–24 years were significantly more likely to be using e-cigarettes only at 4 weeks (73% quit compared with 56% for 55–64 years). This is in contrast to the findings from Statistics on NHS Stop Smoking Services in England,[27] which found that quitting success increased with age, being highest in those aged 60 years and over. This evaluation found that those whose occupational status was 'sick and disabled' were significantly less likely to be using e-cigarettes only at 4 weeks. This concurs with Hiscock et al.'s[28] earlier analysis of smoking cessation and socioeconomic status in England, which also found lower quit rates for those who are permanently sick. Looking at smoking cessation using e-cigarettes, quit success in England has been found to show parity across socioeconomic groups; similarly in this study there was no significant difference in quit rates by IMD quintile.[29]

Of those remaining engaged with the programme for 4 weeks, differences in quit rates were found by provider type, with significantly more of those using e-cigs only having had these e-cigs provided by a pharmacy provider (76.0% quit compared to 57.3% quit for the community provider, Table 4). However, when baseline characteristics were compared between those known to quit ($n = 383$) and 639 individuals who were either still using tobacco or had been lost to follow-up, using stepwise logistic regression (Table 5), no differences were found between quit rates of those attending the community services (35%) compared to the pharmacy (39% quit). Previous research has shown that pharmacies based in the community are effective for smoking cessation.[14] It has also indicted that many stop smoking services delivered in the community now 'target those most in need',[30] which resonates with the findings from this study. Most notably, the key reasons for differences in quit rates between community and pharmacy appeared to be the type of participant engaging with each service: compared to those going to pharmacies, community participants were significantly older, were more likely to be sick or disabled, less likely to be home carers and less likely to be unemployed. Community participants were also more likely to have tried e-cigarettes before, and thus be on a repeated attempt at quitting. There was also a differential follow-up between the two groups, whereby community providers were more likely to retain participants at the 4-week follow-up (Table 2). Of the original 362 individuals seen by pharmacies, 127 (35%) were known to have stopped smoking by week 4. Of the original 660 individuals seen by the community services, 256 (39%) were known to have stopped smoking by week 4. This suggests overall similar quit rates between the two settings, if we make the assumption that those lost to follow-up did not quit. The Government Tobacco Control Plan for England,[21] highlights the importance of primary care and community providers in delivering an integrated tobacco dependence treatment pathway, which is supported by findings of this study that suggest by having both types of providers there was more scope in the pilot to deal with a wider range of participants, including the most vulnerable.

In this study, the mixed fruit liquid stood out as being the most popular flavour. This finding is similar to the literature, which in the USA indicates that cigarette smokers who have switched to e-cigarettes are more likely to choose non-tobacco e-cigarette flavours and to have transitioned to non-tobacco flavours over time, with tobacco and menthol flavours ranking fifth and sixth most popular flavours in the USA.[31] Of those 509 participants who collected the 4-week incentive, most chose the liquid over the high street shopping voucher ($n = 370$, compared to $n = 139$), which can be considered a further indication of participants' engagement with the e-cigarette.

LIMITATIONS

The study had a number of limitations. As an analysis of secondary data, variables were restricted to those collected

routinely. The sex of participants was not collected. Only 60% of the cohort returned for the 4-week consultation, and it is not known whether the remaining individuals continued to smoke tobacco or used their e-cigarettes. The follow-up period was short, only 4 weeks. At this stage, it would not be expected that participants could be free of nicotine, and therefore, the use of e-cigarettes in the absence of smoking tobacco was the indicator of success. Future studies should look at longer term outcomes, including relapse to tobacco, sustained use of e-cigarettes or quit nicotine completely. They should also explore peoples' views on the safety of long-term use of e-cigarettes, with the view to encouraging them to move to a zero-nicotine strength liquid and quitting e-cigarettes as soon as possible thereafter, to reflect the lack of evidence about long-term health effects of using e-cigarettes.

CONCLUSION

In summary, three out of every five people entering the scheme stayed on the programme and reduced their cigarette smoking and one person cut out cigarettes altogether. The conservative estimate of smoking cessation demonstrated that community and pharmacy providers were able to at least match (if not slightly exceed) NICE[26] smoking cessation targets. Moreover, this was achieved in an area of significant deprivation in the NW of England. E-cigarettes appear to be an effective nicotine replacement therapy; however, further research is required to determine whether e-cigarette users are more likely to reduce their overall nicotine consumption in the longer term.

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CONFLICT OF INTEREST

This work was commissioned by Salford City Council and carried out independently by the University of Salford. While Salford City Council and Great Manchester Health and Social Care Partnership were given the opportunity to input into the final report and drafting this paper, their input was limited to the context and background of the pilot, rather than the analysis or interpretation of the findings.

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