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Equity impact of European individual-level smoking cessation interventions to reduce smoking in adults: a systematic review

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Background: Smoking is the leading cause of health inequalities in Europe. Adults from lower socioeconomic status (SES) groups are more likely to smoke and less likely to quit than adults from higher SES groups. Smoking cessation support is an important element of tobacco control; however, the equity impact of individual-level cessation support is uncertain. **Methods:** Systematic review of individual-level smoking cessation interventions delivered in European countries, reporting a smoking cessation outcome (quit) in adults of lower compared with higher SES. Equity impact was assessed as positive (reduced inequality), neutral (no difference by SES), negative (increased inequality) or unclear. **Results:** Twenty-nine studies were included using different types of support: behavioural and pharmacological (17); behavioural only (11), including specialist (5), brief advice (1), mass media (2), text-based (1) and Internet-based (2); and pharmacological only (1). The distribution of equity effects on quitting was 10 neutral, 18 negative and 1 unclear. Two national studies of UK National Health Service (NHS) stop-smoking services showed overall positive equity impact on smoking prevalence. The evidence suggests that UK NHS services that target low-SES smokers achieve a relatively higher service uptake among low-SES smokers, which can compensate for their lower quit rates. **Conclusions:** Untargeted smoking cessation interventions in Europe may have contributed to reducing adult smoking but are, on balance, likely to have increased inequalities in smoking. However, UK NHS stop-smoking services appear to reduce inequalities in smoking through increased relative reach through targeting services to low-SES smokers. More research is needed to strengthen the evidence-base for reducing smoking inequalities.

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Introduction

Smoking is the leading preventable cause of premature mortality and socioeconomic inequalities in health in Europe.^{1,2} Smoking prevalence in the European Union (EU) is declining, but the social gradient in smoking is not. This is of increasing concern, as countries recognize that tackling inequalities in smoking is central to reducing health inequalities. Both the English and Scottish national tobacco control strategies, for example, identify reducing inequalities and smoking as their key priority.^{3,4} Health equity is defined as the absence of avoidable and unfair inequalities in health.⁵

Smoking prevalence rates differ within European countries by socioeconomic status (SES).⁶ The patterning of smoking by SES reflects the stage of the tobacco epidemic in that country. Most EU countries are in the fourth (last) stage,^{7,8} where lower-SES groups have higher smoking prevalence and consumption, and lower quitting rates compared with higher-SES groups.^{9,10} As smoking prevalence declines in Stage 4 countries, the tobacco control field has started focusing on how to achieve the ‘end game’, i.e. to reduce smoking prevalence to negligible levels.¹¹ A major challenge in achieving this goal is to reduce smoking more rapidly among low-SES groups.⁴ There is an urgent need to develop the evidence-base for effective equity-orientated tobacco control

strategies including smoking cessation support. However, no systematic review has assessed the equity impact of individual-level smoking cessation support in Europe.

Providing evidence-based cessation support is a cost-effective element of comprehensive tobacco control strategies.¹² The most effective cessation support combines behavioural support and pharmacotherapy.^{13,14} Other forms of support (e.g. behavioural only, pharmacotherapy only) are less effective but have higher quit rates than quitting without any support.^{13,14} Few systematic reviews have examined the effectiveness of individual-level smoking cessation support by SES. A recent review of the equity impact of tobacco control interventions published between 2006 and 2010¹⁵ found two reviews and 44 primary studies that had evaluated the SES impact of smoking cessation services. This review found consistent evidence of lower quit rates in low-SES smokers using cessation services. However, most of the evidence included in this and previous reviews¹⁶ was from US-based interventions, which raises questions about their applicability in the European context. Also many studies targeted only low-SES smokers and therefore provided no evidence about their equity impact.

This paper describes the findings of a systematic review that assessed the impact of individual-level smoking cessation interventions undertaken in Europe since 1995, on socioeconomic inequalities in adult smoking. Individual-level interventions were defined as cessation interventions and support delivered at the individual level, in distinction to population-level interventions that are applied to populations, groups, areas, jurisdictions or institutions.¹⁷ This review forms part of the European project 'Tackling socioeconomic inequalities in smoking' (SILNE).¹⁸

Methods

The review was written following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses-equity reporting guidelines: PRISMA-E 2012 (Supplementary File S1a).¹⁹ The search strategy identified studies for both this review and two other reviews for the SILNE project on interventions targeting youth²⁰ and adult population-level interventions/policies.²¹

Search strategy and study selection

On 1 October 2013, a comprehensive search strategy was implemented in 10 electronic databases: BIOSIS, CINAHL, Cochrane Library, Conference Proceedings Citation Index, Embase, Eric, MEDLINE, PsycINFO, Science Citation Index Expanded and Social Sciences Citation Index. Terms for smoking, smoking interventions and outcomes and SES were combined using database specific terms and keywords (Supplementary File S1b). Papers in press in four key journals (*Addiction*, *Nicotine and Tobacco Research*, *Social Science and Medicine* and *Tobacco Control*) were identified through hand-searching. A key review was searched for relevant primary studies.¹⁶ Reference lists of included studies were also searched. Members of SILNE and the European Network for Smoking and Tobacco Prevention (ENSP) were contacted to identify any additional studies.

A database of references generated from the search was produced using Reference Manager 12. A sample of the initial 200 references was screened by title and abstract independently by two reviewers (A.A. and T.B.) to establish screening consistency. One reviewer (T.B.) screened the remaining references that were independently checked by another (A.A.). Any disagreements were resolved by discussion and, if necessary, a third reviewer (S.P.) was consulted.

Eligibility criteria

Studies based in a WHO European Region country (Supplementary File S1c) were eligible for inclusion. All primary study designs were

eligible, including randomized controlled trials (RCTs), non-randomized trials, cohort studies (controlled and uncontrolled), cross-sectional studies and qualitative studies. The minimum age for study participants was 18 years. Any type of smoking cessation intervention delivered at the individual level with any follow-up length was included. Studies had to report cessation (quit) outcomes for at least two socioeconomic groups. Socioeconomic variables included income, education, occupation and area-level deprivation. Studies published since 1995 in full-text, in English and with an SES measure reported in the abstract of the electronic references were included. Evidence identified through hand-searching, searching grey literature and reviews or contacting experts was included if SES was reported in the abstract or main text.

Data extraction and quality assessment

The following data from each study were extracted by one reviewer (T.B.) and checked by another (A.A.) using a piloted data extraction form: study design, population characteristics, intervention details, how SES was measured and quit outcomes by SES, including relative and absolute differences between SES groups.

All studies were quality assessed by one reviewer (T.B.) and checked by another (S.P.). The exceptions were reports that were not formally assessed. Quality was assessed by adapting a method used in a previous review.¹⁷ Each study was assessed using the six-item checklist of quality of execution²²: representativeness of study samples, randomization, comparability of baseline groups, credibility of data collection tools, attrition rate and attributability to the intervention. An additional criterion of 'generalizability' assessed whether findings were likely to be transferable at a regional or national level. While some sources of potential bias were not applicable to all study designs, attrition and confounding issues were always considered. Particular attention was paid to internal and external validity; important quality and validity issues are discussed alongside study results.

Data analysis and synthesis

Given the variation in study designs and intervention types, it was not possible to conduct a meta-analysis. Results are presented as a narrative synthesis according to intervention type (table 1). The equity effect of each intervention was summarized by adapting a model used in a previous review²¹ (table 2) as being positive, neutral, negative or unclear.

Results

The electronic search produced 30,381 references. Six references were identified through other sources. After removing duplicate references and pre-1995 publications, 14,785 titles and abstracts were screened. Three hundred ninety-eight full-text articles were assessed: 29 references were included and 369 were excluded (figure 1, Supplementary Files S1d and e).

Methodological characteristics and quality of included studies

Twenty-nine interventions were included. The intervention types were combined behavioural and pharmacological (17); behavioural only (11), including specialist (5), brief advice (1), mass media (2), text-based (1) and Internet-based (2); and pharmacological only (1). Cessation outcomes included number of quits, quit attempts, cessation rates, relapse rates, prevalence rates and smoking status. Outcomes were self-reported or biochemically validated. The equity impact by intervention type is summarized in table 3 (for summary equity of each study, see Supplementary File S1g).

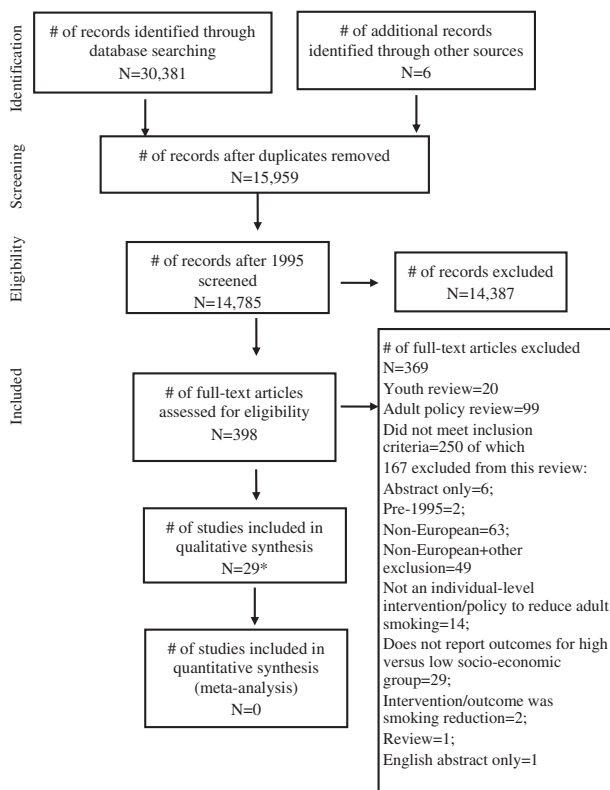
The interventions included 22 observational studies and seven experimental studies, of which six were RCTs. All studies were

Table 1 Types of smoking cessation interventions

- Combined behavioural and pharmacological support – where nicotine replacement therapy (NRT), bupropion (trade name Zyban) or varenicline (trade name Champix) is used in combination with some form of behavioural support (one-to-one or group) over a period of several weeks.
- Behavioural only – where only behavioural support is provided. This includes brief interventions (usually 5–10 min) and more intensive specialist support provided over longer periods. The support can be delivered in various ways including:
 - face-to-face to individuals or groups;
 - the media (Quit & Win competitions);
 - telephone (quitlines);
 - mobile phones (texts); and
 - Internet.
- Pharmacological only – where only NRT, bupropion or varenicline is used or prescribed with no behavioural support.

Table 2 Definitions of equity impact of each intervention/policy

- *Positive equity impact* – evidence that lower-SES groups were relatively more responsive to the intervention/policy.
- *Neutral equity impact* – no social gradient in the effectiveness of the intervention by level of SES, i.e. same impact on high- and low-SES groups.
- *Negative equity impact* – evidence that higher-SES groups were relatively more responsive to the intervention/policy.
- *Unclear equity impact* – not possible to assess the equity impact, e.g. no statistical analysis by SES group.

**Figure 1** PRISMA flow diagram

assessed for quality, with the exception of the National Health Service (NHS) smoking cessation services in Scotland report²³ (Supplementary File S1f). Observational studies have a number of methodological limitations, including selection and measurement bias, and confounding. Only 10 studies had representative study samples, of which nine were generalizable on a national and one on a regional scale. Seven of eight applicable studies met the criteria for baseline comparability between groups. Nine of 20 applicable studies had unacceptably high attrition rates (30-plus %). In eight studies, it was unclear whether the observed effects were attributable to the intervention.

Eighteen studies were conducted in the UK; most evaluated the NHS stop-smoking service. One study was set in both Belgium and The Netherlands; two studies each in Denmark, France and Poland;

Table 3 Summary equity impact of cessation support interventions by quit rates

	Positive	Neutral	Negative	Unclear	Total
Behavioural and pharmacological	0	4	12	1	17
Behavioural only – specialist	0	1	4	0	5
Behavioural only – brief intervention	0	1	0	0	1
Behavioural only – quitlines and Quit & Win competitions	0	1	1	0	2
Behavioural only – text-based	0	1	0	0	1
Behavioural only – Internet-based	0	2	0	0	2
Pharmacological only	0	0	1	0	1
Total	0	10	18	1	29

and one study each in Israel, The Netherlands, Spain and Turkey. Most study samples were derived from the general population. Others included pregnant women, mothers, adults with Crohn's disease, men at high risk of coronary heart disease and men screened for lung cancer. Settings included pharmacies, general practices, hospitals and the community. Participants ranged from 89 to 1.5 million. The data collection period ranged from a single time-point to 8 years.

Combined behavioural and pharmacological interventions

Seventeen studies^{23–39} of combined behavioural and pharmacological interventions were included. Fourteen studies evaluated nationally disseminated programmes: 13 UK NHS stop-smoking services^{23–30,32–35} and one Danish cessation programme.³⁶ Three studies examined other cessation interventions.^{31,37,39} The equity impact of these studies on quit rates was 12 negative, four neutral and one unclear.

Overall, the evidence showed that lower-SES smokers were more likely to access UK NHS stop-smoking services but less likely to quit compared with higher-SES smokers. Motivation to quit and awareness of stop-smoking services did not vary by SES.²⁸ However, lower-SES smokers who contacted stop-smoking services were less likely to set quit dates,³⁴ and loss to follow-up was higher in lower-SES smokers.²⁴ The most recent study³⁸ showed that for most intervention delivery types (one-to-one, drop-in and open groups), clients with professional/managerial occupations were more likely to quit than clients with routine/manual occupations. This was not

Table 4 Equity impact of UK NHS stop-smoking services

NHS stop-smoking service	Relative reach	Quit rate	Overall impact on smoking prevalence
Bauld 2003 ²⁴	Positive	Negative	Unclear
Bauld 2007 ²⁵	Positive	Negative	Positive
Edwards 2007 ²⁸	Unclear	Neutral	Unclear
Galbraith 2012 ²³	Positive	Negative	Positive
Low 2007 ³³	Positive	Negative	Negative
Lowey 2003 ³⁴	Unclear	Unclear	Unclear

because low-SES clients attended less-effective services. Area deprivation did not predict quitting.

Of the 17 studies, six^{23–25,28,33,34} also reported intervention reach by SES, permitting the assessment of equity impact on smoking prevalence (table 4). Reach is defined as the number of service users setting a quit date as a proportion of the adult smoking population. These studies suggest that service reach was relatively higher among low-SES smokers (equity positive), which could compensate for their lower quit rates and potentially reduce smoking inequalities. The two studies^{23,25} that used national data demonstrated an overall positive equity impact on smoking prevalence. For example, the national monitoring of Scottish stop-smoking services²³ demonstrated that services reached proportionately more lower-SES than high-SES smokers, more than compensating for the lower quit rates among low-SES smokers. Thus, the equity effect in terms of quit rates was negative but the overall equity effect in terms of smoking prevalence was positive due to the positive equity impact of the service reach.

Evidence suggests that other factors also influence cessation outcomes, particularly service characteristics.^{24,30} For example, in the most recent study³⁸ of NHS stop-smoking services, all but the most affluent clients were less likely to be successful if treated by a nurse compared with other types of advisers, including smoking cessation specialists. Personal circumstances, such as number of smokers in the household³⁰ and social networks, were also important.²⁸ For example, lower-SES smokers reported slightly less advice to quit from family and friends but more from health professionals.²⁸ In addition, the policy context, e.g. smoke-free legislation, may influence stop-smoking services' outcomes.³⁰

Behavioural-only interventions

Specialist support

Five behavioural support interventions^{40–44} were included in this review. Four were smoking cessation interventions and one study⁴² incorporated smoking cessation advice into lifestyle counselling. Only the lifestyle counselling intervention⁴² included a national sample from the general population. There were two studies of pregnant women,^{41,43} one of adults with Crohn's disease⁴⁰ and one of men screened for lung cancer.⁴⁴

Three interventions^{41–43} were effective in terms of quitting. In the study of men screened for lung cancer,⁴⁴ a standard brochure was equally as effective as tailored advice for quitting smoking. In the study of adults with Crohn's disease,⁴⁰ it was unclear whether subsequent surgery had more of an impact on stopping smoking than the cessation programme. The equity impact of these behavioural interventions was four negative and one neutral.

Brief interventions

An RCT⁴⁵ set in a baby clinic in a large urban children's hospital in Turkey evaluated a brief counselling intervention provided by nurses to mothers, that focussed on the risk of smoking either to the child

or the mother, compared with a control group receiving no cessation advice. Both intervention groups had significantly higher cessation rates than the control group. The child intervention group had a significantly higher quit rate than the maternal intervention group. Income level was not associated with cessation (neutral equity).

Quitlines and Quit & Win campaigns

Two observational cohort studies^{46,47} were included that had a mass media element. An English study⁴⁶ evaluated the impact of a telephone helpline (Quitline) with additional support (written information) on callers who used the service during a 3-month mass media campaign involving TV, radio and magazine advertisements. The Quitline received around half a million calls in 1 year, 4.2% of adult smokers in England. The SES profile of Quitline callers reflected the SES profile of all adult smokers, and at 1 year, there was no significant difference in quit rates between low- and high-SES groups (neutral equity impact). A Polish study⁴⁷ described the results of a 2003 survey of participants who self-reported in 1998 and 2001 that they had been non-smokers since they participated in a Quit & Win contest in 1996. Maintaining abstinence was associated with having a higher than elementary education level (negative equity).

Text-based interventions

A UK study⁴⁸ examined predictors of using a text message system in the intervention arm of 'txt2stop', an RCT of an automated mobile phone text-message smoking cessation intervention to prevent smoking relapse. The intervention included motivational messages and behaviour change support. The messages also promoted the use of a 'QUIT' telephone helpline and nicotine replacement therapy (NRT). This paper⁴⁸ only included intervention participants (of which, 61.5% did not send any text messages). Measures of education and occupation did not predict smoking relapse following a quit attempt (neutral equity).

Internet-based interventions

Two UK Internet-based interventions^{49,50} were included. Both had neutral equity impacts. 'StopAdvisor' was a pilot intervention consisting of a structured quit plan and various cessation behaviour change techniques. At 8 weeks, the intervention was associated with significant biochemically verified abstinence and there was no evidence of an effect of SES on cessation by occupation or education. An Internet-based RCT⁵⁰ compared written tailored cessation advice (based on social cognitive theory and the perspectives on change model) with non-tailored standardized advice. The intervention group did not differ from the control group on self-reported 3-month abstinence or on any secondary outcomes at 6 months. There were no significant SES effects measured by deprivation, although follow-up at 6 months was low.

Pharmacological-only interventions

A cohort study⁵¹ followed smokers treated with NRT at a smoking cessation clinic in Barcelona between 1995 and 2001. Both men and women in affluent social classes or with higher educational levels had significantly higher abstinence at 1 and 8 years (negative equity).

Discussion

Twenty-nine studies evaluating the impact of individual-level smoking cessation interventions on quit rates in adults by SES, measured by a range of indicators including income, occupation, education and area deprivation, were included in this review. The overall equity effects of the interventions were 10 neutral, 18

negative and 1 unclear. Most of the interventions associated with a neutral equity effect equally benefitted all SES groups.

The majority of the evidence was on combined behavioural and pharmacological interventions, particularly the UK NHS stop-smoking service. Lower-SES smokers were more likely to access NHS stop-smoking services but less likely to quit compared with higher-SES smokers. The UK is the only country to have a comprehensive state-reimbursed stop-smoking service. These services were initially established in 1999 in the most disadvantaged areas and then rolled out across the UK.⁵² While all services deliver evidence-based support, there is considerable diversity in terms of the method of delivery (e.g. individual, groups), health professionals providing support (e.g. nurse, stop-smoking advisor or pharmacist) and settings (e.g. primary/acute care, community venue or pharmacy).⁵³ As most of the evidence (13 of 17 studies) on this type of support is derived from NHS stop-smoking services, these findings might be particular to this service that targets low-SES smokers.

There were no studies of behavioural-only cessation interventions in a general population of smokers. There were too few studies of other intervention types to draw conclusions regarding equity impact.

No study showed a positive equity impact on quit rates. However, six of the NHS stop-smoking service studies reported reach and the two studies that used national data covering all services demonstrated higher reach among low-SES smokers, which compensated for their lower quit rates and produced a positive overall equity impact on smoking prevalence.

Strengths and limitations

To our knowledge, this is the first systematic review to evaluate all types of individual-level smoking cessation interventions in Europe that reported cessation outcomes by SES and thus provided information on equity impact.

Wide inclusion criteria were used to encompass the broadest range of evidence to inform equity-orientated interventions. However, it is possible that papers that analysed by SES were not included because this was not mentioned in their abstract. Also, only papers written in English were included. Considerable attempts were made to include published and 'in press' studies as well as grey literature. However, relevant studies might have been missed, which were not published in the peer-reviewed literature and/or in English.

A relatively small number of studies, from only 9 of the 53 countries in the WHO European Region, were included. Only seven studies were experimental trials. Most of the studies used research designs that fail to deal with typical threats to internal validity, especially causal attribution.

Conclusion

Untargeted smoking cessation interventions may have contributed to reducing smoking but are, on balance, likely to have increased inequalities in smoking in Europe. Relatively lower quit rates in low-SES smokers may be due to a combination of factors relating to smoking (e.g. higher levels of consumption and addiction), poorer life circumstances (e.g. higher stress, life chances), pro-smoking social norms (e.g. family and community) and targeted tobacco industry marketing.^{9,30} Low-SES smokers are less likely to adhere to cessation support and drop out of services earlier.^{30,54} A recent study⁵⁵ on seven quintiles across Europe found that low-SES callers did not receive the more intense counselling support. To have a positive equity effect, cessation services in Europe need to target low-SES smokers and provide support and pharmacotherapies tailored to their needs. This should include state-subsidized provision of effective pharmacotherapies. The limited number and quality of studies in this review highlights the urgent need for more research to strengthen the evidence-base for developing equity-positive smoking cessation support.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflicts of interest: None declared.

Key points

- Smoking is the leading cause of premature mortality and inequalities in health in Europe. The socioeconomic gradient in smoking is not declining. No review has assessed the equity impact of individual-level smoking cessation interventions in Europe.
- This systematic review found few studies have assessed the equity impact of individual-level smoking cessation interventions in Europe. However, irrespective of the type of support provided, none of the interventions had a positive equity impact on quit rates.
- Evidence from the UK NHS stop-smoking service indicates that targeting low-SES smokers can achieve relatively higher reach, which more than compensates for their lower quit rates, and thus is overall equity positive.
- Untargeted smoking cessation interventions in Europe may have reduced adult smoking but are likely to have increased inequalities in smoking. However, stop-smoking services if effectively targeted at low-SES smokers can reduce inequalities in smoking.
- More research is needed to strengthen the evidence-base for reducing smoking inequalities through cessation support.

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