Can smoking cessation services be better targeted to tackle health inequalities? Evidence from a cross-sectional study

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Abstract
Objective To investigate how smoking cessation services could be more effectively targeted to tackle socioeconomic inequalities in health.
Design Secondary analysis of data from a household interview survey undertaken for Middlesbrough Council in north east England using the technique of Qualitative Comparative Analysis.
Setting Home-based interviews in Middlesbrough.
Method Qualitative Comparative Analysis of data for 2882 respondents aged 16 years or over. Smoking prevalence was calculated for different combinations of respondents' characteristics: worklessness, income, education, neighbourhood liveability and neighbourliness.
Results Smoking prevalence ranged from 74.5 per cent to 10.3 per cent across 19 combinations of the selected characteristics. Almost all combinations with smoking rates higher than 50 per cent included worklessness. One other combination exceeded 50 per cent and included respondents reporting all of the following: unhelpful neighbours, no further education, low liveability and low income. The combinations with the lowest smoking prevalences had only one or two of these characteristics present and the very lowest prevalence of 10.3 per cent was associated with all being absent. If unhelpful neighbours were present in any combination smoking rates were moderately high (32.4 per cent or higher).
Conclusions  The analysis points to important features of the context of smokers’ lives. By improving these conditions, appreciable reductions in smoking prevalence are likely. These reductions might be even greater if interventions to improve neighbourhoods and job opportunities are combined with the timely provision of smoking cessation services. Targeting these transitions could be a more effective strategy than simply targeting all deprived neighbourhoods.

Key words: deprivation, interventions, smoking, worklessness

Introduction
Smoking cessation services in the United Kingdom are widely regarded as having an important role in tackling health inequalities¹. Smoking is the single most important cause of preventable mortality and these deaths are concentrated among people on low incomes². However, while smoking cessation services are very cost effective they are making little headway with reducing actual smoking prevalence³. There is also a higher rate of smoking cessation among less deprived groups so that the socioeconomic gap in smoking and related morbidity and mortality is set to continue widening. Attempts to quit smoking show no socioeconomic gradient but successful quitting is more likely among those with the most socioeconomic resources⁴. Smoking bans in workplaces and public areas offer relatively little for people excluded from these spaces by worklessness, low income or poor mobility. As smoking becomes more widely discouraged it may increasingly concentrate among people facing these types of exclusion.

If smoking cessation services are to realize their potential to reduce health inequalities, more needs to be done than just targeting deprived neighbourhoods. For any health improvement intervention, a theory of change should propose how the intervention will work to provide both the resources and the reasons for the targeted beneficiaries to change their behaviour⁵. This requires considering why people who are living in disadvantaged circumstances are likely to respond to services being available and, once they quit, to stay as non-smokers. The objective of this article is to present an analysis of survey data suggesting how smoking cessation services could be more effectively targeted to tackle socioeconomic inequalities in health.

Motivation is an important factor at the level of individual smokers⁶. There may also be motivational factors that come into play when the circumstances of groups of people change. This could create opportunities for smoking cessation services to target points of transition for communities rather than having an exclusively individual focus or attempting to target all deprived neighbourhoods. Although the strategy of targeting smoking cessation services on deprived neighbourhoods is well-supported by evidence of a significant association between neighbourhood-level deprivation and smoking, this does not mean that the services are likely to break this link⁷–⁹. Indeed, deprived neighbourhoods are likely to be an unreceptive context for smoking
Better targeted smoking cessation services because these areas are often rich in factors that foster smoking and poor in factors that help people to give up\textsuperscript{10}. People whose smoking is a response to anxiety, depression or boredom are likely to find this behaviour reinforced in deprived neighbourhoods where smoking may be acceptable among peers and part of day-to-day social interaction\textsuperscript{11}. In these conditions of circular causality, cessation is unlikely unless a positive life change means that future health is not so heavily discounted in favour of finding relief from present-day stresses.

There are only a few studies that have investigated the particular features of local social, economic and physical environments that could be behind an increased likelihood of smoking. The neighbourhood rate of non-employment has been found to have a significant association with daily smoking in Sweden after adjusting for individual employment status and housing tenure\textsuperscript{12}. Low social participation and low trust have also been shown to be associated with higher rates of smoking\textsuperscript{13}. A UK study found that smoking declined sharply following physical improvements to a rundown neighbourhood, an effect that appeared to be linked with the improved mental health of residents that followed the neighbourhood improvements\textsuperscript{14}.

**Methods**

In 2003, a household interview survey commissioned by the local authority was carried out in Middlesbrough, one of England's most deprived local authority areas, to gather data about perceptions of quality of life and service delivery. The data provided an opportunity to explore what factors are associated with different levels of smoking among residents living in contrasting circumstances. They were analysed using Qualitative Comparative Analysis (QCA), an exploratory technique that identifies patterns of necessary and sufficient conditions for an outcome to occur\textsuperscript{15}.

The survey was carried out by a market research company commissioned by the local council. It was based on a quota sample of 8100 adults with in-home interviews carried out face to face. Interviewers worked to set quotas for each of the town's 27 electoral wards based on gender, age, working status and ethnic group. They were provided with a starting address and instructed to interview one person aged 16 years or over from the household at that address. Only one interview per address was permitted. Interviewers were given instructions that spread their interviews across the ward until their quota was achieved, with up to three call-backs at an address.

The achieved sample was 7351, a response rate of 90.7 per cent. For the purpose of this analysis, respondents living in wealthier areas were removed from the sample to reduce possible confounding, and these areas were defined as electoral wards with a high proportion of owner-occupied housing (> 70 per cent). The effect was to reduce the sample size to 4697. A question on income achieved a lower response rate of 56 per cent and, because the income variable was important for the analysis reported here, removing these missing cases reduced the sample size further to 2882. None of the frequency distributions for this smaller sample showed a significant difference to those...
of the larger achieved sample with the wealthier wards removed. Table 1 compares the profile of the smaller sample with data from the 2001 Census for Middlesbrough. This suggests that the sample is a reasonable representation of the town’s population in terms of gender, age and ethnicity but that there is some over-representation of employed respondents and under-representation of respondents self-reporting a long-term illness or disability. This might reflect an improvement in economic conditions since 2001, as well as growth in the student population, but some sampling bias seems likely. It is difficult to account for this in the analysis that follows as no data are available on the respondents who may have been missed by the quota sampling. However, the analysis is based on comparison, with the employment and long-term illness/disability categories re-coded into a dichotomized variable with the categories ‘workless’ or ‘not workless’. An assumption is made that these groups in the sample are reasonably typical of their equivalent groups in the town’s population. Whether they are typical of other parts of the UK is a question for further research.

Selecting indicators of respondents’ circumstances

The data were explored using cross-tabulation to identify characteristics of respondents showing a significant relationship with smoking. Smoking rates were similar up to 65 years of age and then declined significantly. Black and ethnic minority respondents were less likely to smoke and there was no relationship with gender. Including these individual characteristics in the QCA model along with indicators of circumstances that are amenable to change with a policy intervention, such as worklessness and income, made little difference to the results. For the sake of clarity they are excluded from the analysis presented here.

The indicators that were included are as follows. The first indicator is worklessness, as among respondents who were retired, in full-time education or employed smoking rates were in the range 24.6 per cent to 30 per cent, while rates among those

| Variable                  | Sample (n = 2882) | 2001 Census (n = 104,839) |
|---------------------------|-------------------|---------------------------|
| Male                      | 48.0              | 47.2                      |
| Female                    | 52.0              | 52.8                      |
| White                     | 93.3              | 94.7                      |
| Non-white                 | 6.7               | 5.3                       |
| Employed                  | 63.0              | 51.6                      |
| In education or training  | 3.3               | 5.6                       |
| Unemployed                | 4.3               | 5.6                       |
| Long-term sick or disabled| 2.9               | 8.4                       |
| Full-time carer           | 8.3               | 7.5                       |
| Retired                   | 18.0              | 21.3                      |

Source: National Statistics (www.statistics.gov.uk/census/)
who were looking after home and family, caring for a sick or disabled person, unable to work due to long-term sickness or unemployed were much higher and in the range 57.7 per cent to 67.7 per cent.

Being out of work for reasons of unemployment, long-term illness, disability or caring are effectively indistinguishable when looking at either the likelihood of subsequent employment or health status. Worklessness may damage a person’s locus of control and can represent a loss of social role, with health effects that are about more than just the income deprivation associated with being out of work. It is most prevalent in areas of the country where demand for labour is weaker than elsewhere and where wages are relatively low.

Liveability was the second indicator, conceptualized in terms of respondents’ reports of visible neighbourhood disorder or neglect. These are related to concerns about crime and incivility, and may be reflected in residents’ sense of personal efficacy and self-esteem. A liveability index was computed based on whether derelict land and buildings, empty houses, fly tipping or litter were ‘serious concerns’, and whether any of the following needed improving ‘a lot’: green spaces, children’s play areas, street lighting, repairs to the roads and pavements, and the condition of housing. Responses were summed for each respondent by scoring each report of a serious concern or needing a lot of improvement as ‘1’ to give a cumulative score. Reliability was assessed using Cronbach’s alpha, with an acceptable value of 0.72 indicating that the score is an adequate measure of liveability understood as a single latent variable. The frequency distribution of the scores was graphed and this showed them grouping into three categories of 0 (high liveability, n = 723), 1–2 (moderate liveability, n = 1047) and 3 or more reported problems (low liveability, n = 1112). The average smoking prevalence in the lowest category was 25.6 per cent, in the middle category 32.1 per cent, and in the highest category 40.4 per cent.

A measure of the neighbourliness of the respondent’s perceived neighbourhood was the third indicator. Neighbourly relations may promote health, buffer stress and promote walking. Promoting neighbourliness by providing opportunities for social participation and encouraging trust by reducing crime and anti-social behaviour is a feature of neighbourhood renewal programmes in the UK. The measure was based on answers to the question whether neighbours were willing to help each other out, dichotomized between strongly agree/agree (n = 3687) and disagree/strongly disagree/don’t know (n = 852). Smoking prevalence among the first group was 31.6 per cent, rising to 40.8 per cent among the second group.

Net weekly income was the fourth indicator, categorized into three groups based on breaks in the frequency distribution: £250 plus (n = 735), £200–249 (n = 470) and less than £200 (n = 1677). The survey question asked respondents to indicate their personal take home income after tax from earnings, benefits or pensions. This lacks the precision of an equivalized household income measure but it appeared to be a reasonably valid measure of individuals’ material circumstances when cross-tabulated
with answers to other questions in the survey on possession of ICT equipment. For example, 71.2 per cent of respondents in the highest income band reported having a computer in their home, compared with 51.7 per cent in the middle income band and 38.2 per cent in the lowest income band. Smoking prevalence across these three income bands was 23.9 per cent, 31.3 per cent and 38.6 per cent respectively.

Finally, respondents’ level of education was included, classified as higher education, further education, or no education beyond the minimum school-leaving age. Levels of smoking were 18.7 per cent for those with higher education ($n = 316$), 27.5 per cent for those with further education ($n = 520$) and 37.5 per cent for those with no further or higher education ($n = 2046$). Education is unlikely to be a direct contributor to smoking behaviour because the risks of smoking are widely known. In England a large majority of smokers report that they want to quit, with little variation by socioeconomic group$^{22}$. It has been suggested that the effect of education on smoking behaviour is more likely to be a reflection of status$^{23}$.

**Results**

The QCA technique is based on making explicit choices about the indicators relevant to an outcome of interest and then exploring every possible combination of these indicators to examine what cases fall into each combination and with what outcome. Software for undertaking this analysis is freely available on the world wide web$^{24}$.

The analysis reported here used categorical variables taken to represent conditions amenable to policy intervention, dichotomized between the ‘worst’ category (e.g. low liveability) and the ‘not worst’ categories (e.g. moderate or high liveability). The analysis generated 19 combinations with more than 30 cases, accounting for 94 per cent of the sample (Table 2). The first combination in the table has the highest smoking prevalence at 74.5 per cent. Along with the three other combinations that exceed a smoking rate of 50 per cent, it includes worklessness. In any of the combinations worklessness is a sufficient condition for smoking rates to be very high. These combinations always include at least two other adverse circumstances such as low income and a lack of further education, which are not surprising concomitants of worklessness. There are several other combinations with these conditions present but, with worklessness absent, smoking rates are a lot lower.

Worklessness seems to be a sufficient condition for very high levels of smoking and, although it is not a necessary condition for this outcome, it takes unhelpful neighbours, no further education, low liveability and low income in combination 5 to reach the levels of smoking seen in the workless combinations 1–4 and 6. After the first six high-smoking combinations, what occurs in the table is a pattern of smoking rates declining as the attributes associated with smoking also decline in number. The lowest rates in combinations 14–18 are where only one or two attributes are present, and for the very lowest rate of 10.3 per cent in combination 19 all attributes are absent. There seems to be one exception to this general pattern: if unhelpful neighbours are present in any
TABLE 2 Qualitative comparative analysis of smoking combinations in Middlesbrough

| Combination number | Workless | Unhelpful neighbours | No further education | Low liveability | Low income | Smoking % | n |
|--------------------|----------|----------------------|----------------------|-----------------|------------|-----------|---|
| 1                  | X        | X                    | X                    |                 |            | ++++74.5  | 47 |
| 2                  | X        |                      | X                    | X               |            | ++++66.7  | 116|
| 3                  | X        |                      |                      | X               | X          | ++++64.6  | 113|
| 4                  | X        |                      |                      |                 | X          | ++++56.8  | 37 |
| 5                  |          | X                    | X                    | X               | X          | ++++46.5  | 89 |
| 6                  | X        |                      |                      | X               | X          | ++++42.9  | 35 |
| 7                  | X        |                      |                      |                 | X          | ++++42.7  | 192|
| 8                  | X        |                      |                      |                 | X          | ++++41.6  | 233|
| 9                  |          | X                    | X                    |                 | X          | ++++41.5  | 118|
| 10                 | X        |                      | X                    |                 |            | ++++35.0  | 60 |
| 11                 | X        |                      |                      |                 | X          | ++++34.7  | 49 |
| 12                 | X        |                      |                      |                 | X          | ++++32.7  | 101|
| 13                 | X        |                      |                      |                 | X          | ++++32.4  | 37 |
| 14                 |          |                      |                      |                 |            | ++++27.6  | 105|
| 15                 |          |                      |                      |                 |            | ++++25.8  | 527|
| 16                 |          |                      |                      |                 |            | ++++23.9  | 331|
| 17                 |          |                      |                      |                 | X          | ++++19.6  | 107|
| 18                 |          |                      |                      |                 | X          | ++++19.0  | 126|
| 19                 |          |                      |                      |                 |            | +10.3     | 194|
combination, even with just one other attribute, then smoking rates are moderately high (configurations 9–13).

Using chi square with a probability criterion of greater than 95 per cent to find significant breaks in the range of smoking rates, three thresholds are apparent as indicated by the plus signs in Table 2. These occur with the appearance of the first adverse condition at the change from a smoking rate of 10.3 per cent to 19.0 per cent; at the change from 27.6 per cent to 32.4 per cent when ‘unhelpful neighbours’ starts to appear in the combinations; and at the change from 46.5 per cent to 56.8 per cent when worklessness appears consistently in all combinations at and above this level of smoking.

Low income by itself is not concentrated among the high smoking rates in Table 2, although it is more common among the combinations with the highest rates, probably because it is a consequence of worklessness. Low liveability does tend to be associated with higher rates of smoking, but only when in combinations including unhelpful neighbours, no further education or worklessness. No further education appears to have little effect on increasing smoking rates because it spans a wide range of rates. It is only in combinations with higher rates when combined with low liveability or unhelpful neighbours. Overall, the higher smoking rates appear to start with unhelpful neighbours, rise further with combinations of low liveability and no further education, and then reach their highest level among the workless configurations.

Conclusions
This analysis points to worklessness as a key factor associated with the very high levels of smoking prevailing among lower socioeconomic groups and which smoking cessation programmes have found so hard to tackle. Low status, low control and little social participation are likely causes of emotional distress sufficient to activate biological stress pathways and encourage finding relief by smoking. Giving up can be left to when times get better, and if health is affected by continuing stress as well as the effects of smoking, motivation for giving up may be even less.

If worklessness is one of the most extreme conditions of low status, control and social engagement, then some other conditions may be similarly distressing. Table 2 suggests that it takes a combination of conditions to come close to the effects of worklessness on smoking, all of which have clear implications for perceptions of status and control and opportunities for social participation: no further education, low liveability and unhelpful neighbours. Unhelpful neighbours may be sufficient in any combination to raise smoking to quite high levels, echoing other findings linking low social participation and low trust to an increased likelihood of smoking.25,26

The Middlesbrough results support this explanation, with smoking rates increasing as stressors are added to the configurations. Selection is a possible cause but this has not been found to be a significant explanation for health inequalities in other studies. Mental health problems increase the likelihood of smoking and although residents’
mental health may influence how they perceive the liveability and neighbourliness of where they live, creating spurious associations with smoking, in general neighbourhood perceptions have been shown to correspond with objectively observed features.

The current evidence base for smoking cessation interventions is poor, especially with regard to the influence of context. This study has explored what might be regarded as contextual factors but has treated them as possible causal conditions: as resources and reasons that influence health-related behaviours and which are amenable to change. A limitation is that the study is based on cross-sectional data, but the intention is to propose a theory of change rather than test it. This theory is that smoking cessation services are best targeted at times of positive transitions in the lives of people on low incomes, particularly when they are helped into employment or experience improvements to their housing and neighbourhoods arising from renewal programmes. Besides the mainstream provision of employment services, several targeted programmes are aimed at tackling worklessness, such as the Working Neighbourhoods Pilot and basing employment advisors in GP surgeries. Similarly, several government-funded programmes are aiming to improve liveability, especially in deprived areas, such as the Department for Communities and Local Government’s ‘Safer and Stronger Communities Fund’.

Because these programmes include objectives to narrow gaps in social and economic outcomes, they could provide a vehicle for smoking cessation services to make an appreciable impact on health inequality; something that has so far eluded them. Testing the theory will require longitudinal studies of programmes to move people into employment or renew neighbourhoods, following up their smoking behaviour with and without integrated smoking cessation services. The aim would be to establish whether these services do work better to narrow the gap in smoking prevalence when combined with other programmes in this way, or indeed whether they add at all to the cessation rates that may follow from people’s circumstances improving.

Current evidence, including the present study, suggests that this theory of change is likely to be correct. If it is, smoking cessation services aimed at helping the UK National Health Service meet its health inequality targets should re-orientate their focus away from simply targeting areas of deprivation, which may well add to the stigma already experienced by residents. The new focus should be to target the social and economic programmes aimed at improving residents’ lives in these areas.

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