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Low-income Groups and Behaviour Change Interventions

A REVIEW OF INTERVENTION CONTENT AND EFFECTIVENESS

Susan Michie

Karen Jochelson

Wolfgang A Markham

Chris Bridle

Kicking Bad Habits: How can the NHS help us become healthier?

Individual responsibility for health and self-care are key themes in recent health policy documents in England. The Wanless review of health care funding (2002) showed that public engagement with health could help to reduce health care costs. *Choosing Health* (2004) looked at how information, services, retailers and marketers could make healthy lifestyles 'an easier option' for people. *Our Health, Our Care, Our Say* (2006) explored the future of health and social care based on an assumption of individuals managing their health and health care. These policies are based on a number of ideas:

- individuals should take greater responsibility for their health care
- individuals should adopt healthier behaviours to avoid ill-health in later life
- if individuals do change their behaviours, the hope is that better health will reduce future health costs.

For the NHS and health practitioners working within it the challenge is how to support people to adopt healthier behaviours and avoid risky ones. Much of the published material on models of individual behaviour and change is based on theory rather than practice, and there is little consensus on the elements of successful interventions.

This programme explores both the theory and practice of behaviour change interventions and tries to answer the questions:

- what interventions are effective in encouraging healthy behaviour?
- how can the NHS help people become healthier?

During 2007 and 2008 the King's Fund will publish a series of papers on:

- the impact of financial incentives
- the effectiveness of targeting low socio-economic groups
- the role of information-led strategies
- the impact of personal skills, capabilities and confidence to change
- strategies for identifying and targeting interventions.

These papers will be of interest to policy-makers, academics, commissioners and practitioners concerned with supporting behaviour change and securing future health improvements.

We will be inviting comments on these papers on our website, and will be holding a series of seminars to discuss our findings. These will feed in to a final report to be published in late 2008.

To get updates on the Kicking Bad Habits programme of work, email your name, job title and organisation to: kickingbadhabits@kingsfund.org.uk

For more information, contact Ruth Robertson at: r.robertson@kingsfund.org.uk

This paper, *Low-income Groups and Behaviour Change Interventions: A review of intervention content and effectiveness*, is the second in this series. The paper reviews interventions to quit smoking or promote healthy eating or physical activity that are specifically targeted at low-income groups. It analyses interventions according to their component techniques. It finds that interventions can be effective in low-income groups, and that the most frequently used techniques are providing information and encouraging people to set goals. These may be particularly effective in disadvantaged groups as their knowledge and skills base may be lower. The techniques may be complementary: providing information about the benefits of changing behaviour may increase people's motivation to change, while helping people to form specific, realistic goals may help them to translate motivation into action.

Authors

Professor Susan Michie
Professor of Health Psychology
University College London

Dr Karen Jochelson
Director of Research
Equality and Human Rights Commission

Formerly, Research Fellow at the King's Fund

Dr Wolfgang A Markham
School of Health and Social Studies
University of Warwick

Dr Chris Bridle
Institute of Clinical Education
Warwick Medical School
University of Warwick

Introduction

Chronic diseases, such as cardiovascular disease, diabetes, cancer and respiratory disease, are a major cause of death and disability worldwide. There is considerable evidence showing that quitting smoking, eating a healthier diet, not consuming excessive amounts of alcohol and exercising regularly can have a major impact on reducing rates of chronic illness (World Cancer Research Fund and American Institute for Cancer Research 2007; World Health Organization 2002). With this in mind, the government in England has highlighted the significance of individual behaviour change for improving health (Department of Health 2004, 2006), while a UK Treasury report also highlighted how public engagement with health could help reduce health costs (HM Treasury 2002). The Department of Health, which runs health policy in England, also has a target to reduce inequalities in life expectancy by 10 per cent by 2010, much of which is related to preventable diseases. It is underpinned by specific targets to reduce the gap in cardiovascular disease and cancer between the fifth of areas with the worst health and deprivation indicators and the population as a whole, and to reduce the prevalence of smoking in routine and manual groups (Department of Health 2007).

Lower socio-economic status (SES) is associated with poorer health outcomes and less healthy behaviours. For example, in Great Britain, although smoking prevalence has declined across all socio-economic groups, 15 per cent of managerial and professional groups smoked compared to 29 per cent of routine and manual groups in 2006 (National Statistics 2005). While 30 per cent of adults in managerial and professional groups eat the recommended five portions of fruit and vegetable a day, just 18 per cent of adults in the routine and manual groups do so (NHS Health and Social Care Information Centre 2004). Only 25 per cent of people in lower socio-economic groups participate in sports and exercise compared to about 50 per cent of higher socio-economic groups, though when occupational activity is controlled for activity levels are similar (NHS Health and Social Care Information Centre 2004; Office of National Statistics 2001). The adult routine and manual group is estimated at about 15 million people: about 4.3 million smoke; 12.3 million eat less than five fruit and vegetable portions a day; and 7.5 million are not physically active (Office of National Statistics 2003). Even a small percentage change in behaviour in this group could have a large impact on the health profile of the general population and on health costs.

The health promotion literature offers many theories and techniques on behaviour change, but thus far there has been little research analysing the effectiveness of particular component techniques, or of effectiveness of techniques across different groups. Literature reviews of particular health behaviours point to the paucity of data on the impact of health promotion programmes on behaviour change in poor and socially excluded groups (Hillsdon *et al* 2005; Michie *et al* 2005; Naidoo *et al* 2004). Recent reviews for the National Institute for Health and Clinical Excellence (NICE) also noted the lack of information at review or meta-review level on the variable effects of interventions on different socio-economic groups and on the impact of interventions on reducing health inequalities (Blaxter 2007; NICE 2007). Albarracín and colleagues show that the impact of interventions is contingent on gender, age, ethnicity and other population-specific factors, suggesting that generic interventions cannot be applied across populations with confidence that they will be effective (Albarracín *et al* 2005).

There is clear evidence that people from disadvantaged backgrounds are less successful in achieving behaviour change following participation in formal programmes such as smokers' clinics (Kidd and Altman 2000; Ferguson *et al* 2005). However, this does not necessarily mean that those programmes were less effective; it may be that those from disadvantaged backgrounds began with a lower chance of success because of their starting levels of behaviour, and their physical and/or social environments undermine attempts at change. There is consistent evidence that smokers in low socio-economic groups are significantly more likely to fail to quit smoking compared to smokers in higher socio-economic groups (Bell *et al* 2006). Community-based programmes promoting healthy eating and physical activity

have more difficulty recruiting participants from low socio-economic groups (Bernal and Sharron-del-Rio 2001) and find higher attrition rates among low-income participants (Yancey *et al* 2006).

Reducing health inequalities depends on developing interventions to increase healthy behaviours that are differentially effective in favour of those from disadvantaged backgrounds or target socially disadvantaged groups. The recent NICE review on behaviour change drew attention to the lack of reviews and primary studies investigating differential effectiveness among social groups and the lack of research on the cost-effectiveness of behaviour change interventions (NICE 2007). The few studies that have investigated the effectiveness of interventions across socio-economic groups have tended to do this as post-hoc comparisons and are under-powered to do this, leading to equivocal results. In the light of the paucity of evidence of differential effectiveness, NICE calls for the consideration of evidence of the effectiveness of generic interventions targeted at disadvantaged groups.

This review focuses on interventions *specifically targeted* at low-income populations – one index of disadvantage. It included three targeted behaviours related to health: smoking, healthy eating and physical activity. These were selected as they are highly associated with illness and death, for example, they constituted 70 per cent of the modifiable behaviours found to be associated with death in the United States in 2000 (Mokdad *et al* 2004). The recent NICE guidance on behaviour change recommends that interventions should be designed with the link between theoretical models, expected outcomes and the process of change made explicit, and then evaluated (NICE 2007). This review builds on the NICE guidance by analysing intervention content into its component techniques; such a detailed description is necessary for evaluating effectiveness and for understanding mechanisms of change (Michie *et al* (in press)). Interventions are described using a reliable taxonomy of behaviour change techniques (Michie and Abraham 2004).

The increasing recognition that interventions to change behaviour should draw on theories of behaviour and behaviour change in their development (Campbell *et al* 2000) is for three main reasons (Michie *et al* (in press)).

- First, interventions are likely to be more effective if they target causal determinants of behaviour and behaviour change.
- Second, theory-based interventions facilitate an understanding of why particular interventions work and thus provide a basis for developing better interventions across different contexts, populations and behaviours.
- Third, theory can be advanced only if interventions and evaluations are theoretically informed (Michie and Abraham 2004; Michie *et al* (in press)).

The aim of this review is to describe the evidence base for the effectiveness of health behaviour interventions that target low-income groups, with the aim of reducing smoking, unhealthy eating, or increasing physical activity. It focuses on the component techniques of the interventions, the theories used to develop the interventions, and considers associations between theory and intervention content, and between intervention content and effect. It should be stressed that this approach is unable to comment on differential effectiveness across social groups, only on whether there was any evidence of effect in interventions targeting low-income groups.

Method

SEARCH STRATEGY

We searched 21 electronic databases (January 1995 to September 2006) using search terms related to a low-income population (for example, socio-economic status, deprivation, disadvantaged, income)

and three behaviours related to health: smoking cessation, healthy eating, and physical activity.[1]
The eligibility criteria for inclusion in this study were as follows.

- **Population** – non-clinical, general population adults (18 years and older) from a low-income group.
- **Interventions** – any interventions promoting smoking cessation, healthy eating and/or physical activity targeted at low-income groups.
- **Outcomes** – behavioural outcomes relevant to the intervention target, that is, smoking cessation, and increased healthy eating and physical activity.
- **Date** – published after January 1995.
- **Language** – published in English language.
- **Methodological criteria** – concurrent control, with or without random allocation, which therefore excludes reviews.

We approached 24 experts in the health inequalities field and enquired about potential studies missed by our electronic search strategy. As Figure 1 illustrates, we identified 9,725 references of potentially relevant studies, of which 1,468 were duplicates, leaving 8,257 distinct references.

SCREENING

We screened the titles and abstracts against the inclusion criteria, excluding 7,821 papers primarily because the study populations were not of low income. A second reviewer independently assessed a random 10 per cent of the sample. We ordered full text copies of the remaining 279 references, and assessed 258 (21 were not obtained by the end of the review). We excluded 238, primarily for failing to satisfy the population criterion. Again, a second reviewer independently assessed a random 10 per cent of the sample. Of the remaining 20 papers, eight were subsequently excluded following data extraction when it became apparent that they did not meet the inclusion criteria or reflected duplicate reporting. The bibliography of each of these 12 papers was scanned for additional references, identifying three potentially relevant papers that were subsequently excluded for failing to satisfy the inclusion criteria.

The experts identified an additional 38 potentially relevant studies, of which 34 were excluded in the first screening stage, primarily because the interventions were not aimed explicitly at low-income groups, and an additional one was excluded after screening as it did not report behavioural outcomes. The remaining three papers were: Andrews *et al* 2007, published after our search was completed, which duplicated the findings of an earlier paper, Andrews *et al* 2005; Auslander *et al* 2000, which was missed by our search because it was not indexed using a behavioural identifier in either the key words or title (however, a later paper reporting longer-term outcomes was included (Auslander *et al* 2002)); Lowther *et al* 2002, which was identified by the search strategy and was eligible for inclusion, but had been missed. Lowther *et al* was included in the review, and thus the total data set was 13 papers. Where a study investigated more than one behaviour (Emmons *et al* 2005; Rosamond *et al* 2000; O'Loughlin *et al* 1999) it was included separately in the review. This resulted in a total of 17 comparisons.
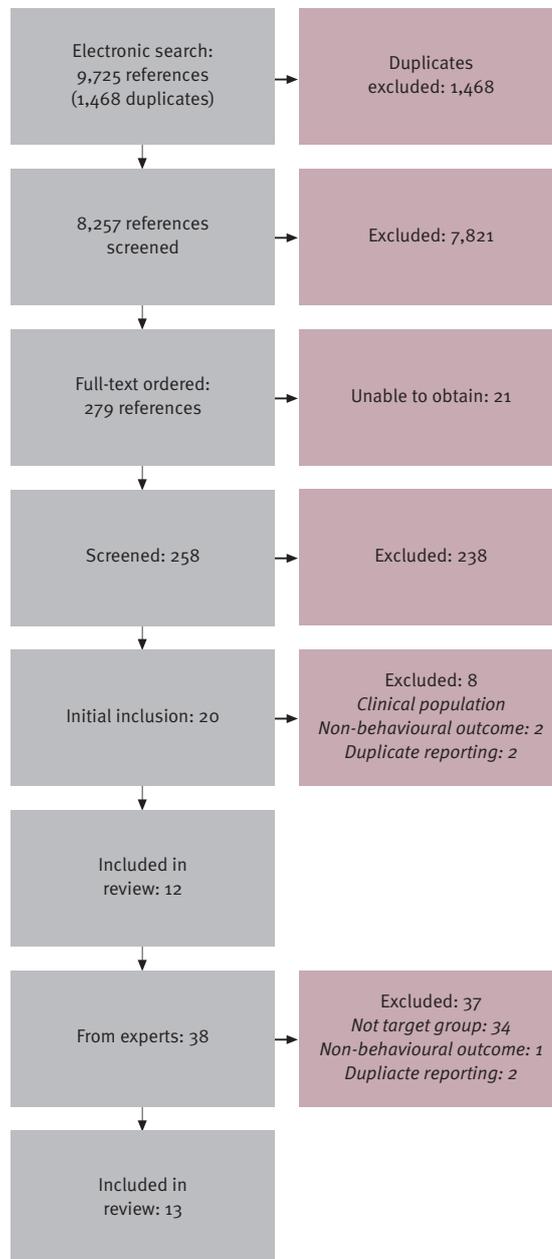
DATA EXTRACTION

A reviewer extracted data from the primary studies and a second reviewer checked a 10 per cent random sample for accuracy – discrepancies were resolved through discussion. The interventions were coded by study design, country, target behaviour, type of participant, type of theory cited by the authors as informing the intervention, type of intervention and intervention effect. Intervention content was analysed into component techniques, using a reliable published taxonomy of 26 techniques (Abraham and Michie (in press)), but two additional techniques were also identified. When interventions targeted more than one behaviour, the techniques and results were recorded for each behaviour.

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1 Further details available from fourth author, Chris Bridle

FLOW OF STUDY PAPERS THROUGH THE REVIEW

Electronic search: 9,725 references (1,468 duplicates)	→ Duplicates excluded: 1,468
8,257 references screened	→ Excluded: 7,821
Full-text ordered: 279 references	→ Unable to obtain: 21
Screened: 258	→ Excluded: 238
Initial inclusion: 20	→ Excluded: 8 *Clinical population Non-behavioural outcome: 2 Duplicate reporting: 2*
Included in review: 12	
From experts: 38	→ Excluded: 37 *Not target group: 34 Non-behavioural outcome: 1 Dupliacte reporting: 2*
Included in review: 13	

Results

CHARACTERISTICS OF INCLUDED STUDIES

Summary information for included studies is presented in Table 1 overleaf.

TABLE 1: SUMMARY OF STUDIES

Study	Study design	Country	Target	Participants	Theoretical base of intervention
1. Andrews *et al* (2007) (intervention description supplemented by Andrews *et al* 2005)	Randomised control trial	USA	Smoking	N: 103 Inclusion: African-American women Indicator: public housing development	None stated
2. Auslander *et al* (2002) (intervention description supplemented by Auslander *et al* 2000)	Randomised control trial	USA	Diet	N: 294 Inclusion: overweight African-American women Indicator: low-income area	Stages of change
3. Bemelmans *et al* (2000)	Controlled comparison study	The Netherlands	Diet	N: 266 Inclusion: hypercholesterolaemic adults with at least 2 additional CVD risk factors Indicator: socio-economically deprived area	Stages of change
4. Emmons *et al* (2005)	Randomised control trial	USA	Diet, exercise	N: 1954 Inclusion: non-related medical consultation Indicator: low-income area	Social cognitive theory, stages of change, precaution adoption and organisational theories
5. Fisher *et al* (1998)	Quasi-experimental	USA	Smoking	N: 2219 – 7 neighbourhoods (2 cities) matched for ethnicity, income and education Inclusion: residents (80% African-American) contactable by telephone. Indicator: low-income area	None stated

OR=Odds Ratio, CI=Confidence Interval, t=t-statistic of mean differences, SD=standard deviation, p=probability level

Intervention	Results and effects
Techniques: increasing self-efficacy and supporting relationships; free NRT, self-help educational materials, culturally specific Delivery: nurse-led behavioural/empowerment counselling in group; weekly individual counselling in person or by phone by trained Community Health Workers, who were local African-American women, ex-smokers Context: community Intensity: weekly 1-hour group education and behavioural counselling for 6 weeks and a booster counselling session at week 12 and 24. Contact with CHW, 1 per week for 24 weeks Follow-up: 12 and 24 weeks	Outcome: smoking status Assessment: self-report and carbon monoxide breath readings Effect: positive – 6 month abstinence was 27.5% and 5.7% in intervention and comparison group. Intervention group more likely to quit smoking than comparison participants (OR=6.18, 95% CI=1.65-23.01)
Techniques: in class and community demonstrations, teach participants how to assess fat in diet, label reading, shopping for low fat foods, recipe modification, eating out, coping with high-risk situations; culturally specific Delivery: individual and group peer counselling by peer educators from African-American community. Assessment, review of current stage, goal setting Context: community Intensity: 12 sessions (6 group, 6 individual), 1 per week for 3 months – session length not reported Follow-up: 6 months	Outcome: fat intake (daily calories from fat and saturated fat) Assessment: self-report Effect: positive – percent of calories from fat for treatment group was reduced from 35.9% pre-test to 32.3% 6-month follow-up compared to 36% and 34.5% respectively for control. No SD. Difference between control and treatment: at baseline, t=0.03 n.s.; 3 month post, t=4.01, p<0.001; 6-month follow-up, t=2.50, p<0.05. Calories from saturated fat treatment group significantly reduced from pre 12.4% to post 10.8% and follow-up 10.9%. Control scored 12.4%, 12.3%, 12.0% respectively. Difference between control and treatment: at baseline, t=0.00 n.s.; 3 month post, t=4.39, p<0.001; 6-month follow-up t=3.00, p<0.01
Techniques: information about healthy products and Mediterranean diet, explanation of reading food labels, video about shopping for food and product choice, local recipe book, personal letter tailored to stage of change providing tailored information Delivery: small group sessions (n=10) with partners attending and booklets with programme-relevant information Context: community Intensity: three 2-hour sessions and 4 dietary education booklets Follow-up: 52 weeks	Outcome: consumption of fruit, vegetables, red meat, and intake of total and saturated fat Assessment: self-report Effect: fruit = positive outcome for men intervention mean 297g day (SD170), women intervention 342g (SD180) men control 221g (SD163), women control 283g (SD175) Total fat = positive – reduce intake with mean net difference of 1.8% Saturated fat = positive net difference 1.1%
Techniques: provision of a tailored prescription for cancer prevention indicating specific risk factors, individual counselling using motivational interviewing Delivery: telephone counselling and written material Context: primary care Intensity: one 20-minute individual counselling session, four 10-minute follow-up telephone counselling sessions, 6 sets of tailored written material and ongoing activities Follow-up: 8 months	Outcome: diet (fruit and vegetables per day, red meat consumption) and exercise (weekly minutes of physical activity) Assessment: self-report Effect: diet = positive: adjusted %s of participants with each health behaviour at baseline and follow-up. Servings fruit/veg ?5/d Control -3.8% Intervention =3.3%, p=0.005 Exercise = non-significant
Techniques: unclear Delivery: multiple. Included smoking cessation classes, billboards, door-to-door campaign, gospelfest with anti-smoking songs, health fairs, self help brochures Context: community Intensity: unclear, but programme ran for 24 months Follow-up: 2 years from start of programme	Outcome: smoking prevalence Assessment: self-report Effect: positive. Smoking prevalence declined 7% p=.028 in St Louis programme receiving sample and only 1% p=.641 in Kansas City comparison group between 1990–92. Reliability suggested by reduced prevalence in 3 St Louis neighbourhoods

Study	Study design	Country	Target	Participants	Theoretical base of intervention
6. Hahn *et al* (2004) (intervention description supplemented by Loughlan and Mutrie 1995)	Quasi-experimental	USA	Smoking	N: 538 (intervention n= 248; control n =290) Inclusion: no one excluded volunteers Indicator: had to be 18 years or older and earn less than $25,000 per year	None stated
7. Lowther *et al* (2002) (intervention description supplemented by Loughlin and Mutrie 1995)	Randomised control trial	UK	Physical activity	N: 370 Inclusion: residents of 2 Scottish housing estates Indicator: low-income area; people not regularly active	Not clear
8. O'Loughlin *et al* (1999) (intervention description supplemented by O'Loughlin *et al* 1997; Paradis *et a*l 1995)	Quasi-experimental	Canada	Smoking, physical activity, diet	N: 1195 neighbourhoods (2 matched areas) Inclusion: residents contactable by telephone Indicator: low-income area with high CVD mortality rate	Social learning theory, the reasoned action model and the precede–proceed model
9. Rosamond *et al* (2000)	Non-randomised intervention trial	USA	Diet, physical activity	N: 712 (579 enhanced intervention group, 133 minimum intervention group) Inclusion: all women 50 years of age or older, income ‹ 200% of poverty level, uninsured or underinsured resident in one of 31 counties (17 minimum intervention, 14 enhanced intervention) found to be at elevated risk for CVD. Indicator: low income	Social cognitive theory, the transtheoretical model and behaviour modification principles
10. Solomon *et al* (2000)	Randomised control trial	USA	Smoking	N: 214 Inclusion: women aged 18–50 years, who smoked more than 4 cigarettes per day and had a home telephone Indicator: low income	None stated

OR=Odds Ratio, CI=Confidence Interval, t=t-statistic of mean differences, SD=standard deviation, p=probability level

Intervention	Results and effects
Techniques: unclear Delivery: multiple. Quit and win supported by provider advice, mailed postcards, online and one-to-one telephone quit assistance, media campaign (radio, television advertisements, billboard and newspaper features, promotional fliers), group smoking cessation classes, community quit date and cash prize lottery Context: community Intensity: unclear Follow-up: 12 months	Outcome: tobacco use Assessment: self-reported not having used any form of tobacco within past 7 days; urine sample Effect: positive. Confirmed quit rates showed that at 3 months 11% had quit compared to 0.7% and at 12 months 8% had quit compared to 0.7%
Techniques: free vouchers to local exercise facilities. Exercise consultation experimental group received a one-to one exercise consultation interview which discussed how to become more physically active, advantages and disadvantages of change, barriers, social support, goal setting, relapse prevention Delivery: fitness assessment experimental group received standard computerised physical fitness assessment and then offered an exercise programme geared to personal capabilities. Exercise consultation got one-to-one interview. Control group got height and body mass measurement, and information on physical activity Context: community Intensity: 30 minute consultation Follow-up: 4, 12, 24, 52 weeks	Outcome: regular physical activity Assessment: self-report Effect: no difference in physical activity between 2 groups. Physical activity increased from baseline to 4 weeks and maintained at 3 and 6 months for both groups, but declined by 12 months follow-up. Only exercise consultation experimental group reported significantly more activity after 1 year. Dropout rate for fitness assessment group was higher than for exercise consultation group
Delivery: multiple. Smoking cessation workshops, heart-health recipe contests, heart health education workshops, menu labelling, direct mail and video educational materials Context: community Intensity: unclear, but programme ran for 48 months Follow-up: 3 years and 5 years from the start of the programme	Outcome: smoking, diet (fat intake), physical activity Assessment: self-report Effect: a) Smoking: non-significant b) Diet (fat intake): non-significant c) Physical activity: negative
Techniques: patient assessment to set goals, counselling to improve patient self-efficacy, educational material to identify and reinforce positive behaviours, tailored tip sheets, patient self-assessment, individual counselling, breaking goals into small, achievable steps Delivery: Minimum Intervention (MI): usual health department counselling system and education materials; Enhanced Intervention (EI): health department staff provided a structured assessment of diet and physical activity followed by structured counselling focused on behaviours in greatest need of change Context: primary care Intensity: MI – usual health department follow-up – variable and not specified EI – 3 intervention visits Follow-up: 7 months	Outcome: diet (fat intake), physical activity (frequency, duration, intensity) Assessment: self-report Effect: a) Diet: positive. Reduced cholesterol, blood pressure, smoking in both groups though not statistically significant b) Physical activity: positive – 5.9% report regular physical activity in EI group and 9.3% in MI group, but difference between groups was not statistically significant
Techniques: unclear Delivery: free nicotine replacement therapy and telephone counselling Context: home Intensity: 8–10 weeks of nicotine patches and 1 phone call before quit day, on quit day, 1 phone call 4 days after quit day and a weekly or biweekly phone call for up to 3 months Follow-up: 6 months	Outcome: smoking prevalence Assessment: self-report and carbon monoxide readings Effect: non-significant. At 3-month follow-up 42% of women in patch plus proactive counselling were abstinent compared to 28% of patch only. No differences at 6-month follow-up. Experimental subject report greater confidence to quit

Study	Study design	Country	Target	Participants	Theoretical base of intervention
11. Solomon *et al* (2005)	Randomised control trial	USA	Smoking	N: 330 Inclusion: women aged 18–50, smoking more than 4 cigarettes a day, with home telephone, intending to quit in the next 2 weeks Indicator: currently receiving Medicaid or Vermont Health Assistance Plan (VHAP) health care coverage for low-income Vermonters	None stated
12. Steptoe *et al* (2003)	Randomised control trial	UK	Diet	N: 271 Inclusion: primary health centre patients, aged 18–70, resident in low-income area, with an income less than £400 per week Indicator: low-income area	Social learning theory and stages of change
13. Sykes and Marks (2001)	Randomised control trial	UK	Smoking	N: 260 Inclusion: smokers volunteering to attend a smoking cessation trial Indicator: low-income area	Unclear

OR=Odds Ratio, CI=Confidence Interval, t=t-statistic of mean differences, SD=standard deviation, p=probability level
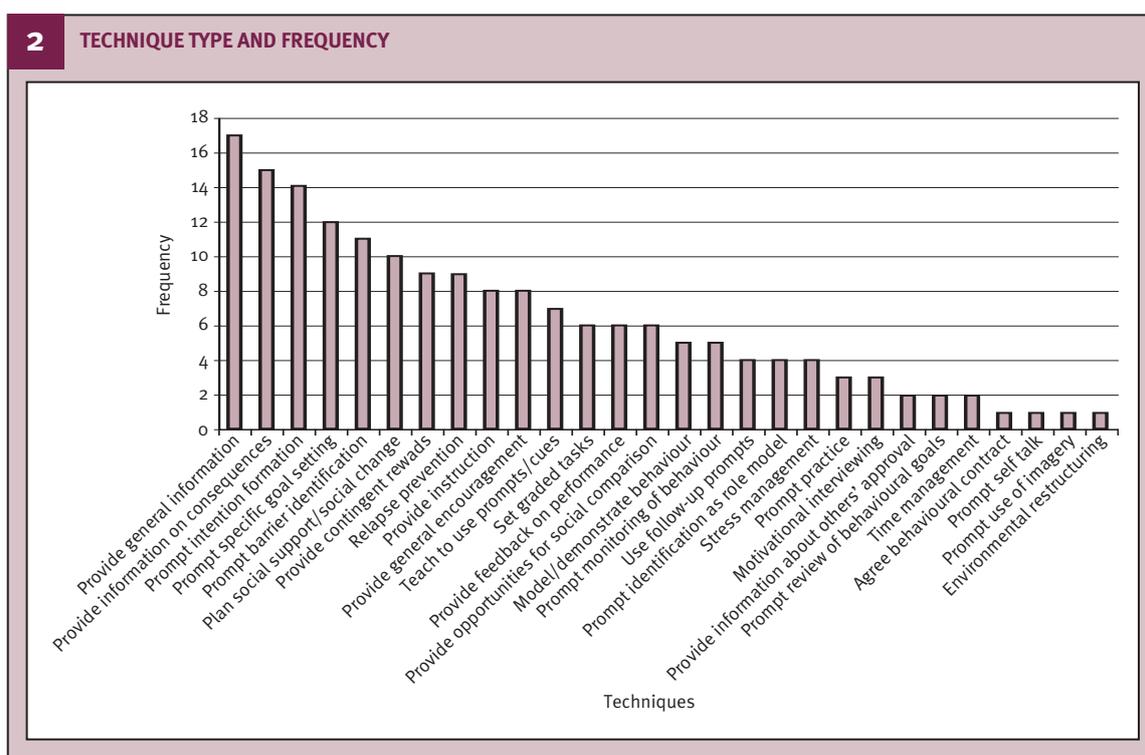
Intervention	Results and effects
Techniques: free NRT plus proactive telephone peer support. The support person followed a semi-structured protocol to provide encouragement, guidance and reinforcement for quitting smoking and to assist in problem-solving high risk-for-smoking situations Delivery: telephone interview and free nicotine patches through the post Context: home Intensity: up to 4 months of proactive support by telephone. 3 phone calls then subsequent calls occurring weekly and tapering to bi-weekly for up to 4 months. Up to 10 weeks' supply of nicotine patches Follow-up: 6 months	Outcome: smoking cessation Assessment: self-reported abstinence Effect: non-significant. At 3 months telephone support had a significant effect with 43% of experimental versus 26% of control reporting 30 day abstinence. Difference was no longer significant at 6 months
Techniques: behavioural counselling Delivery: a research nurse provided a baseline assessment, two individual counselling sessions Context: primary care Intensity: 1 baseline assessment, one 15-minute counselling session, a second 15-minute counselling session 2 weeks later Follow-up: 12 months	Outcome: diet (fruit and vegetable consumption) Assessment: self-report and biomarkers of fruit and vegetable intake (urine test) Effect: positive consumption of fruit and vegetables increased by 1.5 and 0.9 portions per day in the behavioural and nutrition groups. Proportion of participants eating 5 or more portions per day increased by 42% and 27% in the two groups
Techniques: multiple Delivery: choice of psychological methods and optional nicotine replacement therapy (30 CBT and other methods in self help package consisting of handbook, reduction cards, progress chart) Context: community Intensity: reduction. Initial 7–10 day period. Relapse prevention: unclear, but totals 3 months Follow-up: 6 months	Outcome: smoking prevalence Assessment: self-report and carbon monoxide readings Effect: positive at 6-month follow-up 17.2% of receiving therapy were abstinent and 11.5% had reduced consumption by a quarter of pre-treatment level compared to 5.6% of control group who were abstinent and of whom none had reduced their consumption

Of the 13 studies included in the review, three were conducted in the United Kingdom (Lowther *et al* 2002; Steptoe *et al* 2003; Sykes and Marks 2001), one in Canada (O'Loughlin *et al* 1999), eight in the USA (Andrews *et al* 2007; Auslander *et al* 2002; Emmons *et al* 2005; Fisher *et al* 1998; Hahn *et al* 2004; Rosamond *et al* 2000; Solomon *et al* 2000; Solomon *et al* 2005), and one in the Netherlands (Bemelmans *et al* 2000). In total, seven, six and four studies developed interventions to promote smoking cessation, healthy eating and physical activity, respectively, with three studies targeting more than one behaviour (Emmons *et al* 2005; O'Loughlin *et al* 1999; Rosamond *et al* 2000).

Eight studies were randomised control trials (Andrews *et al* 2007; Auslander *et al* 2002; Emmons *et al* 2005; Lowther *et al* 2002; Solomon *et al* 2000; Solomon *et al* 2005; Steptoe *et al* 2003; Sykes and Marks 2001) and five studies evaluated interventions among a non-randomised cohort with concurrent control (Bemelmans *et al* 2000; Fisher *et al* 1998; Hahn *et al* 2004; O'Loughlin *et al* 1999; Rosamond *et al* 2000). Sample sizes ranged from 15 to more than 2,000, though most were between 200 and 1,000, with an average approaching 500. Effect data were extracted for the final follow-up, which ranged from less than 6 months (Andrews *et al* 2007) to between 6 and 12 months (Auslander *et al* 2002; Emmons *et al* 2005; Rosamond *et al* 2000; Solomon *et al* 2000; Solomon *et al* 2005; Sykes and Marks 2001), to 12 months or more (Bemelmans *et al* 2000; Fisher *et al* 1998; Hahn *et al* 2004; Lowther *et al* 2002; O'Loughlin *et al* 1999; Steptoe *et al* 2003). None of the studies investigatedcost-effectiveness.

INTERVENTION TECHNIQUES

Interventions were very heterogeneous, incorporating anything from 4 to 19 techniques. Figure 2 shows the number of interventions incorporating each technique (multiple behaviours targeted by one study intervention are counted as separate interventions). Those used most frequently (in at least 10 of the 17 interventions) were: providing general information; providing information about the consequences of a particular behaviour; helping to form an intention to change a behaviour; setting specific goals; identifying barriers to changing behaviour; and planning social support or social change and providing rewards contingent on performing the behaviour.


2 TECHNIQUE TYPE AND FREQUENCY

INTERVENTION CONTENT AND EFFECTS

Overall, nine interventions had positive effects, seven resulted in no detectable change and one had an adverse effect. For smoking, four studies reported a positive effect (Andrews *et al* 2007; Fisher *et al* 1998; Hahn *et al* 2004; Sykes and Marks 2001), and three reported no effects (O'Loughlin *et al* 1999; Solomon *et al* 2000; Solomon *et al* 2005). For healthy eating, four studies reported positive effects (Auslander *et al* 2002; Bemelmans *et al* 2000; Emmons *et al* 2005; Steptoe *et al* 2003) and two reported no effects (O'Loughlin *et al* 1999; Rosamond *et al* 2000). For physical activity, one study reported a positive effect (Lowther *et al* 2002), two no effects (Emmons *et al* 2005; Rosamond *et al* 2000) and one an adverse effect (O'Loughlin *et al* 1999). Overall, five of the nine positive intervention effects were obtained from RCTs aimed at promoting healthy eating (Auslander *et al* 2002; Emmons *et al* 2005; Steptoe *et al* 2003), physical activity (Lowther *et al* 2002) and smoking cessation (Sykes and Marks 2001), three of which were conducted in the United Kingdom (Lowther *et al* 2002; Steptoe *et al* 2003; Sykes and Marks 2001). Differing sample sizes do not appear to explain differences in effectiveness, since there was no difference between sample sizes for effective interventions (M = 665, SD = 812) and those having no effect (M = 613, SD = 443; $t[11] = 0.12$, $p = .91$).

Effective interventions had a tendency to have fewer techniques on average than ineffective interventions (8.22 vs 12.75; $t[15] = -1.95$, p=.07; 95% CI for mean difference = -9.48, 0.43) (*see* Figure 3). Figure 4 shows the percentage of interventions that included each technique, comparing effective with ineffective interventions. Due to the heterogeneity in intervention content and design, meta-analysis was not appropriate. Visual inspection suggests that providing information about consequences of the behaviour and about others' views towards the behaviour, and prompting people to form intentions to change behaviour and to set goals for change may be associated with effective interventions.

3   **NUMBER OF TECHNIQUES USED IN EFFECTIVE AND INEFFECTIVE STUDIES**
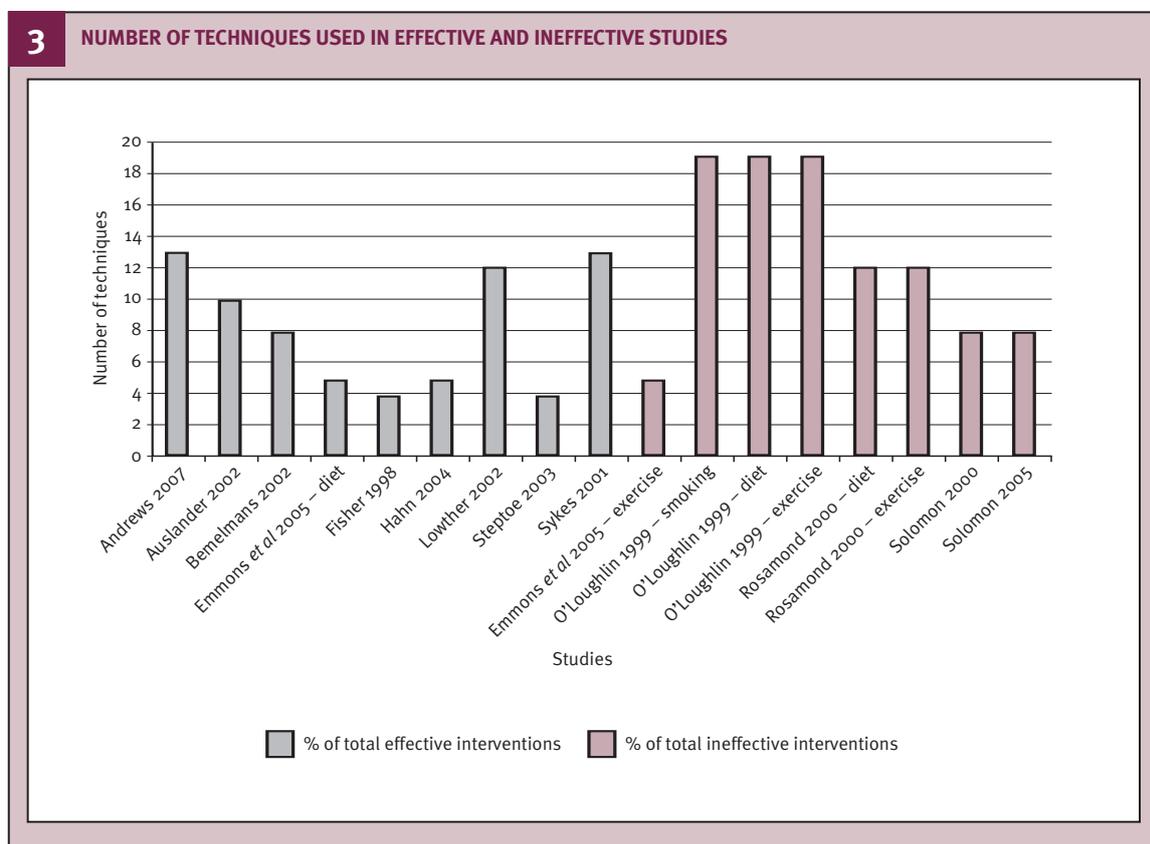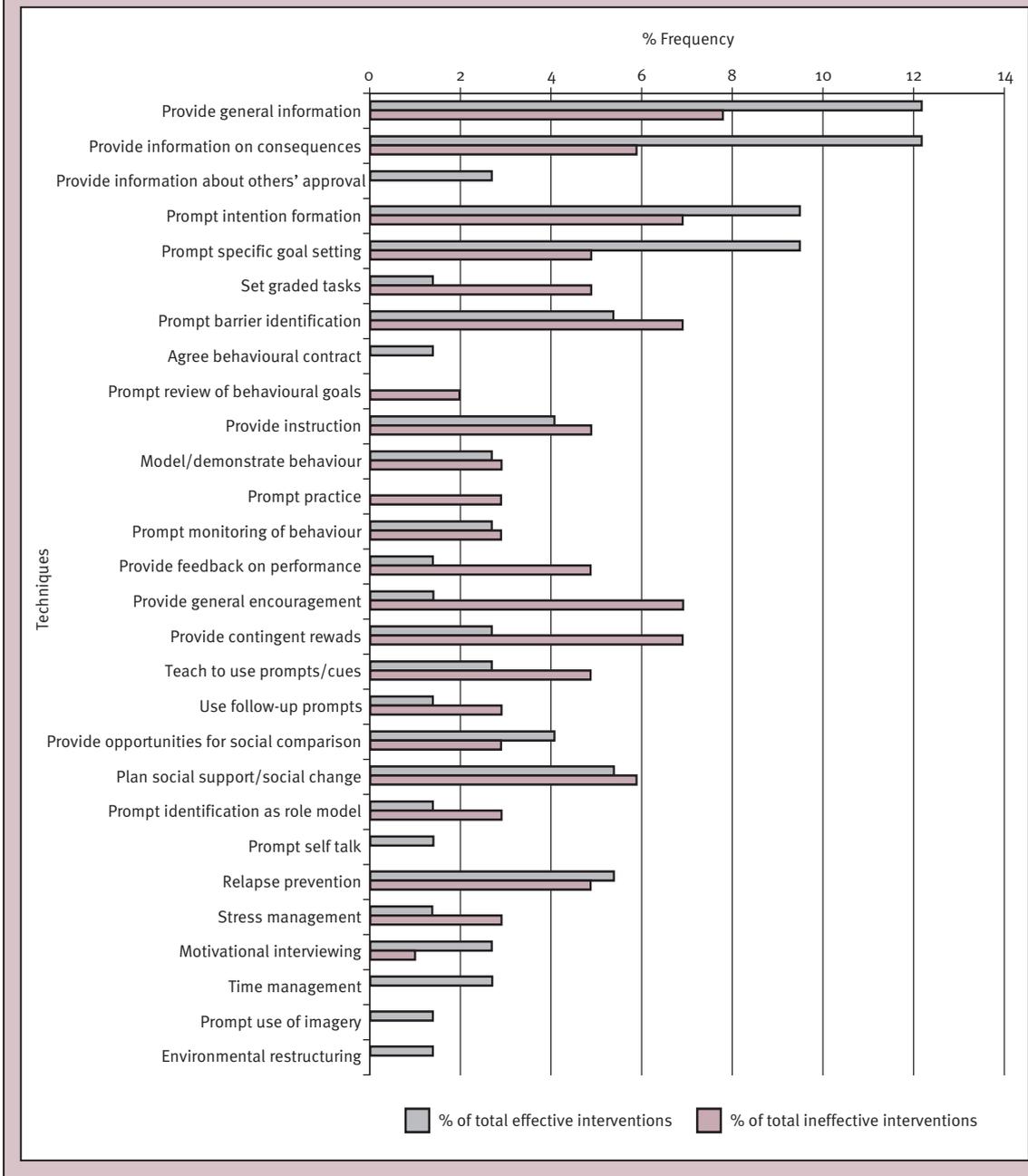
THEORETICAL BASE OF INTERVENTIONS

Theories were cited in 6 of the 13 included studies, incorporating 10 of the 17 comparisons, four studies drawing on more than one theory. Five studies cited the stages of change/transtheoretical model, four studies cited social cognitive theory, and five theories were cited only once: the theory of reasoned action, the precaution adoption model, the precede–proceed model, behaviour modification principles and organisational theory. There was thus a plethora of theories used in these few studies. None of the papers reported how the stated theories were used as a basis for selecting the techniques comprising the intervention, and none drew conclusions about theory from the evaluation data. There

were no obvious differences between those studies that explicitly used theory and those that did not in intervention content (that is, the techniques used within the intervention). There was also no obvious association between reported use of theory and whether or not the intervention was effective.

DISCUSSION

There is evidence that behaviour change interventions can be effective in low-income groups. Of the 17 intervention evaluations that targeted low-income groups, we found that nine were effective, seven were not statistically different and one suggested adverse effects. That nine statistically significant positive results were obtained purely by chance seems unlikely. However, the small number of studies means that the results should be treated with caution. We identified only three UK randomised control trials; however, each reported positive long-term intervention effects across the target behaviours; smoking cessation at six months (Sykes and Marks 2001), healthy eating (Steptoe *et al* 2003) and physical activity (Lowther *et al* 2002) at 12 months.

The most frequently used intervention techniques were providing information (for example, about the consequences of the behaviour) and prompting people to form intentions and set goals. No clear patterns between the purported theoretical basis, intervention content and the effect were evident, although the data set was too small for formal analysis. In addition, the lack of reported detail as to how theory was used in designing interventions precludes the possibility of explaining a lack of association. It may be that particular theories were not useful for intervention development, or that useful theories were poorly applied.

There are two suggestive findings from this review. The first is that more focused interventions involving a small set of techniques may be more effective than interventions combining a large number of different techniques. There may be more variation in the quality of intervention delivery as the number of component techniques increase, both within and between providers, increasing the likelihood of inconsistent effects. This highlights the need to monitor the fidelity of intervention delivery (Bellg *et al* 2004; Hardeman *et al* 2008), an important practice that is rarely observed.

The second suggestive finding is that the most common techniques (providing information and facilitating goal-setting) may be helpful for low-income groups. These two sets of techniques may be working additively, in that providing information about the benefits of changing behaviour may increase people's motivation to change, while helping people to form specific, realistic goals help people to translate motivation into action. This has some parallels with a finding from Coulter and Ellins' systematic review of patient-focused interventions (Coulter and Ellins 2007). They found that providing information, on its own, had little effect on people's knowledge about their own health. However, combined with professional consultation or advice, it could improve knowledge and recall, especially where the information was personalised. Disadvantaged populations benefited more than other groups, possibly because their knowledge base, was less, and so they had more to gain from health information. It is also consistent with a meta-analysis of interventions to increase HIV preventive behaviours (Albarracin *et al* 2005). Providing information changed behaviour only when accompanied by active, behavioural strategies such as teaching self-management techniques.

Goal-setting is a key behaviour change technique in evidence-based theories of behaviour change, most notably social cognitive theory (Bandura 1986) and self-regulation (control) theory (Carver and Scheier 1999). Setting goals that are realistic and achievable help people to feel more confident about being able to change their behaviour. Setting goals may also help people to be more aware of their current behaviour and to take steps when they notice their behaviour is falling short of their targets. Breaking down large, long-term goals into smaller, short-term goals allows people to build on small

successes, leading to greater feelings of control or 'mastery'. This may be especially important for those in disadvantaged situations, who often experience a lack of control and therefore feel powerless to bring about change. Emerging research findings suggest that adults with a low income or a high school education or less score poorly on the 'patient activation measure' (PAM). This measures an individual's confidence, knowledge and skills to take action to improve their health and stay the course even under stress (Hibbard *et al* 2004). Goal-setting is a relatively simple technique that can be successfully taught to a wide range of people varying in educational and social background, but disadvantaged groups may have more to gain, if their confidence and skill base is lower (Heneman *et al* 2005; Mayer *et al* 1994; Kelley and Abraham 2004; Glasgow *et al* 2002).

Our scoping review is, by definition, not exhaustive. Given that only 3 of the 13 interventions were conducted in the United Kingdom (nine were from North America), caution needs to be exercised about the generalisability of the findings. In addition, the scope of the review did not extend to consider studies that directly compared the effectiveness of an intervention in low-income groups versus more affluent groups. Therefore, it is not clear whether interventions to change these behaviours are differentially effective across socio-economic groups. We are unable to answer the question as to whether different techniques, or different modes of delivery, tailored so as to be more relevant or attractive, are needed to promote health among lower, than higher, income groups.

However, this review shows that there is a widespread paucity of evidence about the effectiveness and cost-effectiveness of changing health behaviours in disadvantaged groups. If England is to achieve the 'fully engaged' scenario outlined by the second Wanless review (HM Treasury 2004), we need to understand what kinds of interventions are most effective for different groups. To build evidence about 'what works for whom', it is essential that the same intervention be compared across different groups, and that different interventions be compared in the same groups. As this review demonstrates, such work is in its infancy. Increased investment into research evaluating the differential impact of interventions associated with factors such as social class, ethnicity and deprivation has been called for by NICE (NICE 2007).

For those with responsibility for commissioning or conducting systematic reviews in this or related areas, there is a need to consider carefully methods for maximising the inclusion of relevant evidence.

- First, reviews may need to include other study designs that balance adequately methodological reliability and contextual relevance.

- Second, future reviews may need to consider evidence obtained from a wider range of individuals. For example, our review focused on evidence that reported outcomes in adults, excluding evidence that targeted low SES adults but which reported outcomes only in their children.

- Third, future reviews should consider the implications of using different indicators of social disadvantage. For example, in our review the population of interest was defined as low income, but that meant the review excluded 'culturally sensitive/targeted' interventions that were not explicitly indexed under terms related to SES.

A dedicated stream of research funding for research into interventions targeting health behaviour change among low SES groups would thus seem timely and warranted. In 2006/7, the Department of Health spent 3.6 per cent of its £735 million NHS research and development budget on prevention (Cooksey 2006). Of the £950 million spent on health-related research by government and charity funders in 2004/5, 2.5 per cent was spent on research into prevention of disease and promotion of well-being and 0.5 per cent was invested in developing behavioural interventions (Cooksey 2006). Reducing health inequalities needs increased investment in research into behavioural interventions

for disadvantaged groups. For such investment to maximise its potential to improve population health, the study of interventions to change behaviour should be informed by methods for analysing interventions by their component techniques and underlying theories of behaviour change. This will facilitate building evidence about not just 'what works' but how interventions work – evidence that is crucial for the future development of more effective interventions.

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