Bazian

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Individual-Level Behaviour Change

External evidence review 1: review of current NICE guidance and recommendations.

Evidence review for Public Health Guidance

Developed by Bazian for NICE

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List of Abbreviations

BCT(s)	Behaviour change technique(s)
BMI	Body mass index
CBT	Cognitive behaviour therapy
EC	Emergency contraception
ES	Evidence statement
HIV	Human immunodeficiency virus
HR	Hazard ratio
IF	Intervention function
IGT	Impaired glucose tolerance
LARC	Long-acting reversible contraception
MSM	Men who have sex with men
NICE	National Institute for Health and Clinical Excellence
NRT	Nicotine replacement therapy
OR	Odds ratio
PH[number] e.g. PH1	NICE public health guidance 1
RCT	Randomised control trial
RR	Relative risk ratio
SMS	Short message service e.g. text messaging
STI/STD	Sexually transmitted infection/sexually transmitted disease

1 Executive Summary

Aims and objectives

This is the first of three external evidence reviews commissioned by NICE to update the current NICE Public Health Guidance on behaviour change.

This review aims to describe individual-level interventions, recommended by existing NICE Public Health Guidance, for changing behaviour in the target areas of smoking cessation, reducing alcohol consumption, promoting a healthy diet, physical activity and sexual health. It aims to summarise what was known at the time these guidance documents were published and report, using a taxonomy of behaviour change techniques (BCTs), the BCTs that have been used in interventions shown to be effective. The objective was to provide baseline information from current guidance that in part helps to answer three overarching questions posed to all three evidence reviews. The research questions that guided this review were:

1. a. Which interventions are effective at changing behaviour and/or sustaining behaviour change in individual-level interventions?

   b. Which specific behaviour change techniques and combinations of behaviour change techniques are effective at changing behaviour in the long term (over 6 months) and/or sustaining behaviour change in individual-level interventions?

2. Which behaviour change techniques are effective for changing and/or sustaining change in specific behaviours only, such as alcohol or smoking, and which are more generalisable (i.e. effective across a range of behaviours)?

3. How do the effects of individual interventions vary across different population groups?

The evidence statements offered in this review (Review 1) should be considered alongside the statements in Review 2 and Review 3.

Methods

For this review we began by identifying public health guidance on the NICE website. Guidance documents relevant to the research questions were selected and any recommendations relating to individual-level behaviour change interventions extracted. We examined the evidence reviews underlying each guidance document to identify the evidence statements, evidence tables and underlying studies for interventions that were described as effective for initiating or sustaining behaviour change. An extraction table was developed and BCTs, theoretically organised clusters of BCTs, and intervention functions were coded. Summary tables were used to develop new evidence statements relating to BCTs and functions that were described in effective interventions.

Summary of findings

Amongst 38 public health guidance documents identified, 12 contained one or more recommendations relevant to individual-level behaviour change and at least one of the five target behaviours (smoking cessation, physical activity, alcohol consumption, diet, sexual health). Within these, five contained recommendations relevant to smoking cessation, four on increasing physical activity levels, four on diet, three on reducing alcohol consumption and one related to sexual health.

BCTs, BCT clusters and intervention functions reported in effective interventions are briefly listed below. These are described in more detail in Table 4 and in evidence statements.

Smoking

Evidence from current NICE guidance indicated the following individual-level interventions were effective at getting adult smokers to quit:

- Brief interventions (including referral to specialised stop smoking services)
- Individual behavioural counselling
- Nicotine replacement therapy
- Self-help materials

- Telephone counselling and quitlines
- Rapid smoking form of aversion therapy

The following interventions were deemed effective in pregnant women:

- Cognitive behaviour therapy
- Motivational interviewing
- Self-help and support from NHS Stop Smoking services

One or more of the following BCTs, BCT clusters or intervention functions could be coded as being reported in these effective interventions:

- BCT3 Social support (unspecified)
- BCT4 Pharmacological support
- BCT7 Paradoxical instructions
- BCT34 Adding objects to the environment
- BCT36 Instructions on how to perform behaviour
- BCT Cluster 1 “Social Support”
- Intervention Function 2 Persuasion

Diet

Evidence from current NICE guidance indicated the following individual-level interventions were effective at changing diet in the specific populations:

- Nutritional counselling in adults
- Lifestyle interventions targeting diet to prevent new cases of diabetes were effective in those at high risk of diabetes or who had pre-diabetes
- Large, diverse, multi-faceted lifestyle interventions including a dietary element were also effective in pregnant women and new mothers.

One or more of the following BCTs, BCT clusters or intervention functions could be coded as being reported in these effective interventions:

- BCT3 Social support (unspecified)
- BCT29 Graded Tasks

- BCT61 Problem Solving
- BCT89 Vicarious consequences
- BCT Cluster 1 “Social Support”
- BCT Cluster 3 “Feedback and Monitoring”
- BCT Cluster 11 “Goals and Planning”

Physical activity

Evidence from current NICE guidance indicated the following individual-level interventions were effective at increasing physical activity levels in the specific populations:

- Brief interventions in primary care (containing advice and/or motivational interviewing, follow up calls or an activity plan) were effective across all adults groups
- Home based, group based and educational interventions were effective for older people
- Combined lifestyle interventions containing specific physical activity elements were effective at increasing physical activity in those at risk of type 2 diabetes.

One or more of the following BCTs, BCT clusters or intervention functions could be coded as being reported in these effective interventions:

- BCT3 Social support (unspecified)
- BCT10 Self-monitoring of behaviour
- BCT11 Self-monitoring of outcomes
- BCT23 Behavioural practice/rehearsal
- BCT29 Graded Tasks
- BCT36 Instructions on how to perform a behaviour
- BCT61 Problem Solving
- BCT62 Goal setting (behaviour))
- BCT64 Action planning
- BCT89 Vicarious consequences

- BCT Cluster 1 “Social Support”
- BCT Cluster 11 “Goals and Planning”
- Intervention Function 1 Education
- Intervention Function 2 Persuasion

Diet and physical activity combined

Evidence from current NICE guidance indicated the following individual-level interventions were effective in the specific populations below:

- Adults at risk of diabetes
  - Multifaceted complex interventions
  - Information and support from professionals (including motivational interviewing in some cases)
- Weight loss in women of child bearing age; expectant mothers and new mothers with BMI over 30
  - Opportunistic brief intervention
  - Regular exercise, advice about healthy eating and group support.

One or more of the following BCTs, BCT clusters or intervention functions could be coded as being reported in these effective interventions:

- BCT10 Self-monitoring of behaviour
- BCT11 Self-monitoring of outcomes
- BCT23 Behavioural practice/rehearsal
- BCT29 Graded Tasks
- BCT61 Problem solving
- BCT62 Goal setting (behaviour)
- BCT64 Action planning
- BCT Cluster 1 “Social Support”,
- BCT Cluster 3 “Feedback and Monitoring”,
- BCT Cluster 11 “Goals and Planning”
- BCT Cluster 14 “Natural Consequences”

- Intervention Function 1 Education
- Intervention Function 2 Persuasion

Alcohol

Evidence from current NICE guidance indicated the following individual-level interventions were effective at reducing alcohol intake in the following groups:

- Adult problem drinkers
  - Brief behaviour counselling
- Adult hazardous drinkers
  - Brief interventions in primary care
- Young people with substance misuse (including alcohol)
  - Brief intervention (including elements of motivational interviewing and goal setting)

One or more of the following BCTs, BCT clusters or intervention functions could be coded as being reported in these effective interventions:

- BCT3 Social support (unspecified)
- BCT10 Self-monitoring of behaviour
- BCT61 Problem solving
- BCT78 Information about health consequences
- BCT79 Information about emotional consequences
- BCT Cluster 1 “Social Support”
- BCT Cluster 3 “Feedback and Monitoring”
- BCT Cluster 5 “Repetition and Substitutions”
- BCT Cluster 11 “Goals and Planning”
- Intervention Function 1 Education
- Intervention Function 2 Persuasion

Sexual health

Evidence from current NICE guidance indicated the following individual-level interventions were effective at improving sexual health in the following groups:

- Adolescents to reduce pregnancies and or increase contraception use.
  - One to one sexual health advice
- Adults (including MSM) and adolescents for preventing STIs including HIV and increasing condom use
  - One to one structured discussions
- Patients with an STI and their partners
  - Partner therapy plus support

One or more of the following BCTs, BCT clusters or intervention functions could be coded as being reported in these effective interventions:

- BCT3 Social support (unspecified)
- BCT4 Pharmacological support
- BCT23 Behavioural practice/rehearsal
- BCT34 Adding objects to the environment
- BCT36 Instructions on how to perform a behaviour
- BCT61 Problem solving
- BCT62 Goal setting (behaviour)
- BCT64 Action planning
- BCT78 Information about health consequences
- BCT cluster “Social Support
- Intervention Function 1 Education

Conclusions

For individual-level interventions the following patterns were identified through a descriptive synthesis:

- Social support is codable as a BCT (BCT3 Social support (unspecified)) across all five health topics
- Brief interventions for smoking cessation appear effective and often include social and pharmacological support. This included social and pharmacological support BCTs associated with a referral to specialist stop smoking services.
- BCT Cluster 3 “Feedback and Monitoring” or BCT Cluster 11 “Goals and Planning” that require continued engagement and follow up over time are included in effective intensive interventions combining dietary and physical activity elements. These interventions help to prevent progression of impaired glucose tolerance to type 2 diabetes and reduce weight in adults or postpartum women who are obese or overweight
- The sustainability of any behaviour change achieved with interventions designed to initiate behaviour change is rarely reported beyond 12 months and few interventions appear in these guidelines to have been designed specifically for maintaining behaviour change
- Sexually transmitted infections (including HIV) and pregnancy are the primary clinical outcomes considered in sexual health guidance. However Only a small proportion of the evidence identified in current guidance has been reported in terms of behavioural outcomes (e.g. condom use)
- Individual-level interventions relying on remote communication (SMS, web based support or gaming) have not so far been covered in public health guidance

Discussion

This review reflects the evidence behind effective individual-level behaviour change interventions described in current NICE public health guidance, and where possible, describes BCTs underlying these interventions.

Limitations to the approach stem from the fact that BCT coding ultimately depends on clear and unambiguous reporting, but intervention descriptions are often poorly reported, making BCT coding difficult. This summary of findings should therefore be seen as descriptive only. It should not, for

example, be inferred that only the BCTs described in this report are effective or that the pattern described above is similar to what will be found from more recent research (with better descriptions of the techniques used) or when statistical associations with variation in effectiveness are analysed using meta-regression procedures in Review 2.

There are several other important limitations inherent in this review that should be considered. These are outlined in full in the discussion section of the main document.

2 Introduction

This is the first of three external evidence reviews commissioned by NICE to update the current public health guidance on behaviour change (PH6). This first evidence review is a review of existing NICE guidance on smoking, alcohol, diet, physical activity and sexual health for evidence of effective behaviour change interventions and techniques at an individual-level. Interventions at a community or population level are not considered in this review.

This review aims to summarise the existing state of knowledge and guidance on behaviour change as described in current NICE public health guidance. It reports the recommendations, and underlying body of evidence, regarding interventions and techniques at the date of previous guidance as a basis for future reviews.

For this review an individual-level behaviour change intervention was defined as one where an individual is selected for an intervention on the basis of an existing health status (e.g. overweight) or behaviour (e.g. high alcohol consumption, smoking). This includes health promotion and disease prevention interventions aimed at changing an individual's behaviour.

The three questions that guided this review (Review 1) are:

1. a. Which interventions are effective at changing behaviour and/or sustaining behaviour change in individual-level interventions?

   b. Which specific behaviour change techniques and combinations of behaviour change techniques are effective at changing behaviour in the long term (over 6 months) and/or sustaining behaviour change in individual-level interventions?

2. Which behaviour change techniques are effective for changing and/or sustaining change in specific behaviours only, such as alcohol or

smoking, and which are more generalisable (i.e. effective across a range of behaviours)?

3. How do the effects of individual interventions vary across different population groups?

These questions will be more fully addressed as part of the second external evidence review commissioned by NICE (Review 2). Review 2 will address these questions, and one other, in more detail as it will involve a new literature search, data extraction and quality assessment of primary research. Review 3 is a qualitative review that addresses one further question regarding the competencies required to deliver effective interventions and techniques as well as patient views. Review 1 should be interpreted alongside the findings of the other two reviews.

3 Methods

The steps in this review were:

- Identifying public health guidance on the NICE website
- Selecting relevant guidance and extracting recommendations relating to individual-level behaviour change interventions
- Searching for evidence in the reviews, evidence statements and evidence tables. Identifying the interventions that are recommended as effective for changing behaviours and sustaining behaviour change and those that are not recommended
- Coding behaviour change techniques and looking in more depth at the evidence supporting recommended behaviour change interventions to identify information about the interventions available from the evidence tables
- Summarising findings and drafting new evidence statements relating to BCTs

Identifying public health guidance

A list of published public health guidance was obtained from the NICE website (NICE 2012). A total of 38 public health guidance documents were published at the time of searching on 25th July 2012.

Selecting relevant guidance

The objective of screening the public health guidance was to identify documents that contained recommendations relating to individual-level behaviour change in one of the five health topics of interest. The quick reference guidance documents for each of the 38 guidelines were obtained and individual recommendations within each report screened for relevance by one analyst. Borderline inclusion/exclusion cases were discussed and resolved with reference to a second analyst.

Relevant recommendations or relevant sub-parts of recommendations were extracted into a data extraction table to create a trail from NICE's recommendations to the individual studies underpinning them (Appendix A). NICE public health guidance containing no relevant recommendations was excluded at this stage if its recommendations were: aimed at the wrong age group (aged under 16 years); not individual-level recommendations; or not related to one of the five health topics in scope (smoking, alcohol, physical activity, diet or sexual health). Reasons for exclusion are recorded in Table 2 Excluded NICE public health guidance.

The definition of individual-level behaviour change interventions are described in the project scope of Review 1, available as a separate document.

Common examples of non-individual recommendations that were excluded include those relating to policy and strategy; service design; referral recommendations (where a description of the service to be referred to was absent or was not concerned with behaviour change); those affecting the physical environment; school wide/whole school approaches; and workplace interventions (where no individual elements were described).

Recommending vitamin D and folic acid to all pregnant women was not viewed as an individual-level dietary behaviour change intervention as it represented an effort to encourage adherence to a specific medication.

HIV partner testing was generally viewed as a community level intervention as in most cases the intervention sought to bring about the target behaviour (safe sex or taking an HIV test) through social processes (partner persuasion) rather than directly targeting the person/partner. Where both the partner and the patient were the direct target of the intervention (e.g. information and advice was given to both patient and partner) this was included.

Searching for the evidence in the underlying reviews, evidence statements and evidence tables

For each relevant recommendation or sub-recommendation the relevant evidence statements were identified from the full NICE public health guidance and recorded in the data extraction table (Appendix A). In many cases only a sub-section of the entire recommendation was relevant to individual-level behaviour change. Hence, not all the evidence statements, which were given for the whole recommendation, were relevant to the sub-section. In these cases only the relevant evidence statements were extracted into the data extraction table.

Individual studies underlying the evidence statements were also recorded in the data extraction table giving an audit trail from recommendation to research study. The evidence statements are designed to summarise the findings, strength and quality of evidence behind each recommendation and were extracted for this purpose. However, further information about the specific components of the interventions was sought to aid behaviour change coding by viewing information extracted in the evidence tables associated with each evidence review. Links to the evidence reviews associated with each NICE public health guidance document that contained relevant information are included in the data extraction table for reference.

Coding behaviour change techniques

Specific behaviour change techniques (BCTs) were sought from the information available in the evidence statements and evidence tables describing the intervention. For the purposes of coding, behaviour change interventions and techniques were assumed to have been delivered as intended and as described in the evidence tables. No independent assessment of whether the intervention was delivered as intended was undertaken.

BCT coding was based on an 89-item BCT taxonomy (Michie et al., 2011a). This taxonomy contains explicit definitions of individual BCTs while also organising each technique into one of 16 theoretical clusters (e.g. BCT Cluster 1 “Social Support”).

The 89-item BCT taxonomy (May 2012) was the most up-to-date version available at the time of coding. The taxonomy was under development at the time of our review, and it has since been expanded to incorporate 93 items (“BCT taxonomy v1”); one BCT from the 89-item version (BCT60 Incentive) has been broken down into five discrete BCTs (i.e. material incentive for behaviour, material incentive for outcome, social incentives, non-specific incentives, self-incentives)(Michie et al., 2013). Therefore the technique of “Incentive” would still have been captured in the 89-item BCT taxonomy, but not classified in as much detail as in the 93-item taxonomy. The 93-item taxonomy v1 was not used in this review (Review 1) but it has been used for a separate cost effectiveness review for NICE (Shahab et al., unpublished document; see http://guidance.nice.org.uk/PH49/SupportingEvidence for report)). The changes in the taxonomy reflect the evolving nature of this relatively new approach, and it is anticipated that the taxonomy will continue to undergo development (Michie 2013).

Interventions were also categorised according to which one or more of nine intervention functions they served (education; persuasion; incentivisation; coercion; training; enablement; modelling; environmental restructuring;

restriction). Functions were derived from the 'Behaviour Change Wheel' (Michie et al., 2011b).

Evidence statements associated with relevant recommendations were first reviewed and where sufficient detail was provided one or more BCTs were coded in the data extraction table. Where this detail was lacking, information about the intervention components was reviewed from the evidence tables and coded in the data extraction table where possible. If no specific information was available to code an individual BCT then the BCT cluster was coded. If no BCT or BCT cluster was identifiable the intervention function was inferred from any explicit statement of the intended function of the intervention, or inferred from a broader description of the intervention. See Appendix B for descriptions of the BCT taxonomy codes, BCT clusters and intervention functions used in this report. The number of items in each of the coding frames is given below and indicates the level of specificity in each of the coding structures.

- BCT taxonomy code (89 items)
- BCT clusters (groups individual BCTs into 16 clusters)
- Intervention function (9 items)

In identifying recommendations relating to individual-level behaviour change two broad types of recommendation emerged. The first were those that contained explicit mention of specific BCTs that matched those described in the behaviour change taxonomy coding structure. For example, "physical activity goals were set" would be a clear example of BCT62 Goal setting (behaviour). Similarly, "nicotine replacement therapy was given" is an example of BCT4 Pharmacological support. The second were recommendations that clearly aimed to support behaviour change but were more generic and less detailed in their description (even with reference to the evidence tables). Statements such as "provide information and advice" were common yet too generic to be assigned a specific BCT or BCT cluster as the content of the information and advice was typically absent from the evidence

statements or evidence tables. These invariably attracted a more general code. In the case of “provide information and advice” an intervention function code of IF1 Education was used. Directly examining the relevant primary research, as is planned in Review 2, may provide further insight into the specific nature of this information and advice and allow specific BCTs to be coded. The ability to code BCTs is dependent on how well the intervention is described in the primary research publication.

Similarly, the term “motivational interviewing” was relatively common yet poorly defined in the guidance and evidence tables. This approach can, but not always, include specific BCTs such as eliciting self motivating statements (BCT43 Self-talk) and social support (BCT3 Social support (unspecified)). The term motivational interviewing was generally coded more generically as Intervention Function 2 Persuasion unless further information was available to ascribe a BCT or BCT cluster. The definition of Intervention Function 2 Persuasion used in the BCT taxonomy was a technique that uses “communication to induce positive or negative feelings to stimulate action”, and the example provided was “Using imagery to motivate increases in physical activity”. This definition seemed to fit most pragmatic definitions of motivational interviewing we came across in the guidance documents.

It is important to note that a lay definition of the word ‘persuasion’ might carry connotations of coercion or imposing external views, which are not part of motivational interviewing (Health Foundation 2011). The definition of the Intervention Function ‘Persuasion’ (“Using communication to induce positive or negative feelings to stimulate action”,) does not carry these connotations. (‘Coercion’ is in fact a separate Intervention Function.)

This example highlights the importance of referring to the full definitions of the techniques, clusters, and intervention functions provided in the coding manuals when interpreting their content (see Appendix B). Their titles are used in the text for brevity, and the full coding manual definitions may include nuances not obvious from their brief titles. Equally, the titles may have lay

definitions and connotations that are not present in their formal coding manual definitions.

Summarising and evidence statements

Findings were grouped around the five individual health topics of interest. For each health topic, effective interventions and approaches highlighted in the recommendations and evidence statements were described alongside the body of evidence behind them. This classification included subgroups, such as adolescents, older people or pregnant women, and information on the short, medium and long term where available from the existing evidence statements.

In cases where there was evidence from multiple guidance documents and evidence statements, these have been pooled into new summary evidence statements. Where the only available evidence on a topic came from a single evidence statement it was quoted, and in some cases shortened, from the original guidance document.

In addition, the behavioural components or “active ingredients” of these interventions (where sufficient detail was present) were described with reference to the appropriate BCT, BCT cluster or intervention function coding, described above.

These statements build on existing evidence statements and, in some cases, studies that have been cited directly in the guidance that fall outside of evidence statements. Study type and quality assessments were carried through from previous NICE guidance and were not reappraised for the purposes of this review. Each study had been given a quality rating ([++], [+], [-]) to reflect the study’s internal validity concerning the risk of potential bias arising from its design and execution. These quality ratings, based on methods for the development of NICE public health guidance, are given below in brief for clarity (NICE 2009).

Quality rating

[++] All or most of the NICE checklist criteria have been fulfilled; where they have not been fulfilled the conclusions are very unlikely to alter.

[+] Some of the checklist criteria have been fulfilled, where they have not been fulfilled, or not adequately described, the conclusions are unlikely to alter.

[-] Few or no checklist criteria have been fulfilled and the conclusions are likely or very likely to alter.

Where evidence statements or evidence specifically mentions or relates to specific groups e.g. older people or pregnant women, we have addressed contextual factors or modifiers of effect; for example, how the effects of individual interventions vary across different population groups.

Is the evidence up to date?

The evidence statements, quality assessment and detail in evidence tables referred to in this document are current up to the search date of the underlying NICE public health guidance. Some of the evidence comes from Cochrane systematic reviews which are periodically updated. A proportion of Cochrane reviews included and appraised as part of early NICE public health guidance (the earliest NICE public health guidance (PH1) was published in 2006) may have since been updated and the conclusions may have changed in light of new evidence. Consequently, the evidence statements included in this review reflect the strength and quality of the evidence base as it was when the relevant NICE public health guidance was published. The more recent evidence will be identified, reviewed and incorporated as part of Review 2.

Review 1 and Review 2 overlap

Review 2 will extract information from RCTs published since 2003 (inclusive) that meet the inclusion criteria set out in that review. Some RCTs referenced in Review 1 may not be included in Review 2 as previous NICE evidence

reviews may have used differing inclusion criteria to the current evidence review, specifically in their definitions of individual-level behaviour change interventions and the behaviour change outcomes of interest.

Referencing

This review draws on existing information from NICE public health guidance evidence reviews, evidence statements and the studies informing them. This document cross references studies and evidence statements from existing evidence reviews underlying current NICE guidance. The cross references at the end of paragraphs indicate the NICE public health guidance (PH) and evidence statement (ES) from where the information was drawn. E.g. (PH26, ES1.6) refers to NICE public health guidance 26 and evidence statement 1.6. This cross referencing is to enable the information to be tracked a) to the data extraction table created for this review (Appendix A) containing the whole evidence statement and additional information and b) to the original NICE evidence review references and evidence tables containing full details. Full study details and key extracted data are present in evidence tables in these underlying reviews.

4 Summary of findings

A total of 38 NICE public health guidance documents were identified for review: 12 contained one or more recommendations relevant to individual-level behaviour change (either specific or more generic) while 26 were excluded. See Table 1 for included guidance and recommendations and Table 2 for a list of excluded guidance and main reason for exclusion.

Of the twelve relevant NICE public health guidance documents identified; five contained recommendations relevant to smoking cessation; four on increasing physical activity levels; four on diet, three on reducing alcohol consumption and one related to sexual health (see Table 3).

In some cases one public health guidance document was relevant to more than one health topic, for example, PH38 was relevant to both diet and

physical activity. The current behaviour change guidance (PH6) was relevant to four of the five topic areas with the exception of sexual health.

4.1 Smoking

Overview

Most of the evidence in this section comes from Cochrane systematic reviews appraised pre-2006. A proportion of these reviews will have been updated since, and the conclusions may have changed in light of new evidence. In addition, more contemporary intervention types, such as internet based or mobile phone delivered interventions for smoking cessation, were not considered at this time, but are the subject of more recent Cochrane reviews. Further evidence statements on such topics may be developed for Review 2 where appropriate evidence exists.

The following descriptions and evidence statements reflect the evidence as it was at the time it was appraised by NICE in the formation of previous public health guidance.

Evidence behind interventions highlighted in current NICE guidance

Current NICE public health guidance on behaviour change identified 22 systematic reviews evaluating interventions to aid smoking cessation, prevent relapse, or prevent people taking up smoking at an individual-level (PH6). From this evidence base it concluded that interventions that showed a positive effect include advice from physicians (IF1 Education, BCT36 Instructions on how to perform a behaviour) (5 reviews: Lancaster and Stead, 2004 [+]; Fiore et al., 2000 [++]; West et al., 2000 [+]; Moher et al., 2005 [++], Fisher et al., 1990 [+]), the rapid smoking form of aversion therapy (BCT7 Paradoxical instructions) (1 review: Hajek and Stead, 2001 [+]), self-help materials (BCT34 Adding objects to the environment) (1 review: Lancaster and Stead, 2005a [+]), telephone counselling (BCT3 Social Support unspecified) (compared to less intensive interventions) (1 review: Stead et al., 2003 [+]), nursing interventions (1 review: Rice and Stead, 2004 [+]) and group counselling

(BCT3 Social support (unspecified)) (which is also more effective than self-help) (1 review: Lancaster and Stead, 2005b [+]) (PH6).

Those that showed “less clear, poor quality or inconclusive evidence of effect” included social support interventions (“Social Support” BCT cluster) (e.g. buddy systems or friends and family) (2 reviews: Park et al., 2004 [+]; May and West, 2000 [-]), relapse prevention (BCT61 Problem solving) (1 review: Hajek et al., 2005 [+]), biomarker feedback (BCT14 Biofeedback) or biomedical risk assessment (2 reviews: Bize et al., 2005 [+]; McClure, 2002 [-]), exercise (1 review, Nishi et al., 1998 [+]), and interventions by community pharmacy personnel or dentists (2 reviews: Brothwell, 2001 [-]; Sinclair et al., 2004 [+]) (PH6).

Interventions that had evidence of no effectiveness included hypnotherapy (no behaviour change coding possible) and stage-based approaches to changing smoking behaviour (2 reviews: Abbot et al., 1998 [+]; Riemsma et al., 2003 [-]) (PH6).

In addition to this review of reviews, four individual NICE public health guidance documents contained recommendations relating to individual-level behaviour change interventions for smoking cessation (PH1, PH5, PH10 and PH26).

NICE public health guidance 5 and 10 both highlighted six individual-level smoking cessation interventions as being effective interventions for adults including:

- Brief interventions
- Individual behavioural counselling
- Group behaviour therapy
- Pharmacotherapies
- Self-help materials
- Telephone counselling and quitlines

The evidence behind each of these interventions is described below.

4.1.1 Brief interventions

Brief interventions were described in NICE public health guidance as involving opportunistic advice, discussion, negotiation or encouragement, typically taking between 5 and 10 minutes and may include one or more of the following (PH1):

- simple opportunistic advice to stop
- an assessment of the patient's commitment to quit
- an offer of pharmacotherapy and/or behavioural support
- provision of self-help material and referral to more intensive support such as the NHS Stop Smoking Services.

Evidence informing the effectiveness of brief interventions comes from NICE public health guidance 1 and 6 (see Appendix A). NICE public health guidance 1 is also cross referenced by NICE public health guidance 5 and 10 when describing the evidence supporting brief interventions.

Moderate quality evidence directly applicable to the UK (Lancaster and Stead, 2004 [+]) shows a small effect of physician advice (BCT36 Instructions on how to perform a behaviour) on the odds of quitting for all smokers, with additional supporting evidence from two further reviews of a similar body of research (Fiore et al., 2000 [++] and West et al., 2000 [+]) (PH1, ES1 and PH6).

There is evidence from a single systematic review directly applicable to the UK setting (Rice and Stead 2004 [+]) that nurse structured advice (BCT36 Instructions on how to perform a behaviour) in primary care and community settings shows a moderate effect at increasing smoking cessation in non-hospitalised people (PH1 ES2 and PH6). The primary focus of the contact in these studies was smoking, and hence they represent planned brief interventions and not "opportunistic" brief interventions made during routine care (i.e. when individuals are making contact with a nurse but not specifically for smoking purposes). In addition, poor uptake of invitations to contact

nurses for assistance with smoking cessation was noted in some UK studies. There is insufficient evidence to say whether opportunistic advice increases quit rates (PH1 ES2 and PH6).

There was also evidence from a systematic review (Moher et al., 2005 [++]) and evidence from a meta-analysis (Fisher et al., 1990 [+]) that minimal interventions including brief advice from a health professional are effective in facilitating smoking cessation. Moher et al., 2005 found an odds ratio for quitting with brief advice of 1.69, 95% confidence interval 1.45 to 1.98 compared to self-help (PH5, ES2).

Similarly there was evidence from a single systematic review supporting the efficacy of NRT (BCT4 Pharmacological support) as part of a brief intervention (Silagy et al., 2004 [+]) (PH1 ES7).

No direct evidence was identified to support the efficacy of referral to NHS stop smoking services from within NICE public health guidance 1 or 5.

Evidence statement 1: Brief interventions

There is a body (7 studies) of systematic review evidence (Lancaster and Stead, 2004 [+]; Fiore et al., 2000 [++]; West et al., 2000 [+]; Rice and Stead, 2004 [+]; Moher et al., 2005 [++], Fisher et al., 1990 [+]; Silagy et al., 2004 [+]) that demonstrates the effectiveness of nurse or GP led brief interventions, including elements of brief advice to stop smoking and an offer of pharmacological (NRT) support.

The effectiveness of opportunistic nurse interventions is uncertain as the evidence related to an advice session aimed specifically at smoking, rather than as part of a routine care (Rice and Stead, 2004 [+])

Behaviour change components

Effective brief interventions typically incorporated giving brief advice to quit smoking (BCT36 Instructions on how to perform a behaviour), which also functions to educate the participants (Intervention Function 1 Education) as

well as offering pharmacological support (BCT4 Pharmacological support). Most of the studies included here were reviews, consequently the descriptions of the active ingredients of the interventions lacked sufficient detail to code further behaviour change techniques from the evidence tables.

NICE public health guidance 1 (ES1, 2, 7)

NICE public health guidance 6 ("Health Professional led interventions")

4.1.2 Individual behaviour counselling

Effectiveness of individual behaviour counselling was cited in NICE public health guidance 5 which addressed Smoking Cessation in the Workplace based on a single evidence statement (ES2). This highlighted a systematic review (Moher et al., 2005 [++]) and meta-analysis (Fisher et al., 1990[+]) that found that "the most effective smoking cessation interventions in workplace settings are those interventions that have proven effectiveness more broadly", i.e. in settings other than the workplace (PH5 ES2). These systematic reviews suggested there is strong evidence that group therapy, individual counselling and pharmacological treatments all have an effect in facilitating smoking cessation. However, both reviews failed to identify effects due to the technique(s) used in a particular intervention type (PH5 ES2).

NICE public health guidance 6 highlights evidence from a single review (Dunn et al., 2001 [-]) that showed an inconclusive effect of motivational interviewing in smoking cessation (PH6).

Evidence statement 2: Individual Behavioural counselling

There is evidence from one systematic review (Moher et al., 2005 [++]) and one meta-analysis (Fisher et al., 1990 [+]) that individual counselling has an effect (specific effect sizes not reported in the evidence tables) in facilitating smoking cessation. Further evidence from a single study (Dunn et al., 2001

[-]) showed an inconclusive effect of motivational interviewing in smoking cessation.

Behaviour change components

The elements of the individual counselling interventions were not deducible from the evidence tables associated with the guidance. However, most behavioural counselling elements would map to BCT3 Social support (unspecified). However, as it is likely that the precise definitions and components of “individual behaviour counselling” vary between the studies there may be additional applicable BCTs that were used but were not recorded in the evidence tables and so are not coded here.

NICE public health guidance 5 (ES2)

NICE public health guidance 6

4.1.3 Group behaviour therapy

Systematic review evidence (Moher et al., 2005 [++]) and evidence from a meta-analysis (Fisher et al., 1990 [+]) showed that group therapy is effective for increasing smoking cessation. Moher et al., 2005 found that for group therapy vs. self-help the odds ratio (OR) for quitting was 1.97, 95% CI 1.57 to 2.48 (PH5, ES2). It also found no evidence that more intensive counselling was more effective than brief counselling and no evidence of a difference in effect between individual counselling and group therapy (OR 1.33, 95% CI 0.83 to 2.13). In addition, a further systematic review (Stead and Lancaster 2005 [+]) provided evidence that group behavioural therapy, also referred to as group counselling, was more effective than self-help programmes or no intervention (PH6).

Evidence statement 3: Group behavioural therapy

Systematic review evidence (Moher et al., 2005 [++]) and evidence from a meta-analysis (Fisher et al., 1990 [+]) showed that group therapy is effective

for increasing smoking cessation.

Moher et al., 2005 found that for group therapy vs. self-help the odds ratio (OR) for quitting was 1.97, 95% CI 1.57 to 2.48). It also found no evidence that more intensive counselling was more effective than brief counselling and no evidence of a difference in effect between individual counselling and group therapy (OR 1.33, 95% CI 0.83 to 2.13).

In addition, a further systematic review (Stead and Lancaster 2005 [+]) provided evidence that group behavioural therapy, also referred to as group counselling, was more effective than self-help programmes or no intervention.

Behaviour change components
No information on the components of the effective interventions was deducible from the evidence tables associated with the relevant public health guidance.

NICE public health guidance 5 (ES2 and direct reference to Cochrane systematic review of group behaviour therapy programmes for smoking cessation 2005)

NICE public health guidance 6

4.1.4 Pharmacotherapy

One systematic review (Silagy et al., 2004 [+]) provides evidence directly applicable to the UK that supports the efficacy of nicotine replacement therapy (NRT) as part of a brief intervention for smokers wishing to make a quit attempt (PH1, ES7). This study assessed NRT combined with minimal additional support from physicians or purchased over the counter. It identified 34 randomised trials of NRT prescribed with “low intensity” support. The definition of low-intensity in the review was intended to identify a level of support that could be offered as part of the provision of routine medical care. If the duration of time spent with the smoker (including assessment for the

trial) exceeded 30 minutes at the initial consultation or the number of further assessment and reinforcement visits exceeded two, the level of additional support was categorized as high.

NICE public health guidance 5 also provides evidence from a systematic review (Moher et al., 2005 [++]) and meta-analysis (Fisher et al., 1990 [+]) that pharmacological treatments have an effect in facilitating smoking cessation (PH5, ES2).

Evidence statement 4: NRT

Two systematic reviews (Silagy et al., 2004 [+]; Moher et al., 2005 [++]) and one meta-analysis (Fisher et al., 1990 [+]) provide evidence that NRT can be effective at facilitating smoking cessation as part of a brief intervention or with low intensity support. The definition of low-intensity in one review (Silagy et al., 2004 [+]) was intended to identify a level of support that could be offered as part of the provision of routine medical care. If the duration of time spent with the smoker (including assessment for the trial) exceeded 30 minutes at the initial consultation or the number of further assessment and reinforcement visits exceeded two, the level of additional support was categorized as high.

Behaviour change components

BCT4 Pharmacological support with or without support (BCT3 Social support (unspecified)).

NICE public health guidance 1 (ES7)

NICE public health guidance 5 (ES2)

4.1.5 Self-help materials

A systematic review (Moher et al., 2005 [++]) and meta-analysis (Fisher et al., 1990 [+]) indicates that self-help manuals appear to be less effective than other smoking cessation interventions (PH5, ES2).

Further evidence for the effectiveness of self-help materials comes from a direct reference in NICE public health guidance 5 to a 2005 Cochrane review on self-help interventions for smoking cessation, also covered in NICE public health guidance 6 (Lancaster and Stead, 2005a [+]). This concluded that standard self-help materials may increase quit rates compared to no intervention but the effect is likely to be small (OR 1.24, 95% CI 1.07 to 1.45). This provided additional evidence that self-help materials tailored for the characteristics of individual smokers are more effective than untailored materials, although the absolute size of effect is also small (OR 1.42, 95% CI 1.26 to 1.61). It is not clear from the evidence tables whether this refers only to a comparison of tailored vs. untailored interventions or also tailored vs. no intervention. There was no evidence of benefit from adding self-help materials to face-to-face advice, or to nicotine replacement therapy.

Evidence statement 5: Self-help materials

There is evidence from two systematic reviews (Moher et al., 2005 [++]; Lancaster and Stead, 2005a [+]) and one meta-analysis (Fisher et al., 1990 [+]) that self-help materials are effective at increasing quit rates compared to no intervention, and that materials tailored for the characteristics of individual smokers are more effective than untailored materials.

Lancaster and Stead, 2005a [+] showed that standard self-help materials may increase quit rates compared to no intervention but the effect is likely to be small (OR 1.24, 95% CI 1.07 to 1.45). Furthermore, self-help materials tailored for the characteristics of individual smokers are more effective than untailored materials although the absolute size of effect is also small (OR 1.42, 95% CI 1.26 to 1.61).

Self-help materials are less effective than other smoking cessation interventions (Moher et al., 2005 [++]), and do not add benefit when added to face-to-face advice or NRT (Lancaster and Stead, 2005a [+]).

Behaviour change components

Giving self-help materials to encourage smoking cessation represents BCT34 Adding objects to the environment. However, as the content of the self-help materials were not described in any detail in the evidence tables there may be additional BCTs in the interventions delivered that are not coded here.

NICE public health guidance 5 specifies that self-help materials comprise any manual or structured programme, in written or electronic format, that can be used by individuals in a quit attempt without the help of health professionals, counsellors or group support. Based on this general description they are likely to include elements of education (Intervention Function 1 Education) through information and advice, or persuasion (Intervention Function 2 Persuasion) through increasing motivation to change behaviour.

NICE public health guidance 5 (ES2)

NICE public health guidance 6

4.1.6 Telephone counselling and quitlines

Telephone counselling can be proactive or reactive. In the proactive approach the counsellor initiates one or more calls to provide support in making a quit attempt or avoiding relapse. This can be offered as part of an intervention such as face-to-face counselling or as an add-on to a mailed self-help program. Reactive counselling, by contrast, is available on demand from the person calling the service e.g. calling a quitline or helpline. These services take calls from people who smoke or their friends and family.

Evidence statement 6: Telephone counselling and quitlines

A single Cochrane review provides evidence (Stead et al., 2003 [+]) that proactive telephone counselling has a positive effect on smoking quit rates compared to less intensive interventions (less intensive not defined in the evidence tables; OR 1.56, 95% CI 1.38 to 1.77). Adding telephone support to face-to-face interventions or NRT did not have a long term effect on quit rates.

The Cochrane review concluded that proactive telephone counselling (rather than reactive telephone support) helps smokers interested in quitting. Also that telephone quitlines provide an important route of access to support for smokers and call-back counselling enhances their usefulness (PH5 direct reference to Cochrane reviewed in PH6 above).

Behaviour change components

No coding was possible from information in the evidence table. NICE public health guidance 5 describes telephone counselling and quitlines as providing proactive or reactive advice, encouragement and support over the telephone (BCT3 Social Support (Unspecified)) to anyone who smokes who wants to quit, or who has recently quit.

Note on social support for smoking cessation

It was noted in PH6 that review level evidence (Park et al., 2004 [+] and May and West, 2000 [-]) on social support interventions, including buddy systems or support from friends and family, showed “less clear, poor quality or inconclusive evidence of effect”. Hence, the specific type of social support (professional or family) and method (face-to-face or telephone support) may be important and related to its effectiveness at bringing about behaviour change.

NICE public health guidance 5 (Direct reference to Cochrane review by Stead et al., 2003*)*

NICE public health guidance 6

4.1.7 Subgroup – pregnant women

NICE public health guidance 6 identifies systematic review evidence (Lumley et al., 2004 [+]) that shows significant effects of a wide range of interventions on smoking reduction and smoking cessation in pregnant women (PH6).

Further evidence for the effectiveness of smoking cessation interventions in pregnant women comes from NICE public health guidance 26 'Quitting smoking in pregnancy and following childbirth'. This covered interventions to help pregnant women who smoke to quit but stated that no specific recommendations were made for those planning a pregnancy or who have recently given birth due to a lack of evidence available on stop-smoking interventions for these groups.

Recommendation 4 of NICE public health guidance 26 contains a context section that states "studies have shown that the following interventions are effective in helping women who are pregnant to quit smoking". These were:

- cognitive behaviour therapy
- motivational interviewing
- structured self-help and support from NHS stop smoking services

In addition it states that in other countries the provision of incentives to quit has been shown to be effective with this group (but that research is required to see whether it would work in the UK) (PH26). The evidence behind the effectiveness of these interventions is draw from a single systematic review (Lumley et al., 2009, [++]) on interventions for promoting smoking cessation during pregnancy, an update of the review cited in PH6 (PH27, ES ER1.1).

Recommendations 1 and 2 of NICE public health guidance 26 advocate the provision of information (for example, a leaflet) about the risks to the unborn child of smoking when pregnant and the hazards of exposure to second-hand smoke for both mother and baby. This recommendation is based on five qualitative studies (Anderson et al., 2002 [-]; Everett et al., 2005 [+]; Arborelius and Nyberg, 1997 [+], McCurry et al., 2002 [+]; Nichter et al.,

2007 [+]) and three surveys (Grange et al., 2006; Cooke et al., 1998; Clasper and White, 1995). These studies provided evidence that the information and advice provided by health professionals can be perceived as insufficient or inadequate by some women and by professionals themselves (PH26, ES R2.2).

Referral to NHS stop smoking support is advocated by recommendation 1, 2 and 4 based on evidence from four UK studies that used mixed or qualitative methods (Bryce et al., 2007 [+], McGowan et al., 2008 [+], Macaskill et al., 2008 [+], Lee et al., 2006 [+]) showing that NHS stop smoking services are effective in supporting pregnant women to stop smoking (PH26 ER1.6). The NHS stop smoking service interventions for pregnant women described in these articles consist of a combination of behavioural support (BCT3 Social support (unspecified)) delivered in a range of settings and formats and NRT (BCT4 Pharmacological support) for most but not all women.

There is evidence from one systematic review (Lumley et al., 2009, [++]) and one recent RCT (Oncken et al., 2008 [++] not included in the review) on the effectiveness of NRT for promoting smoking cessation in pregnancy. In the review, meta-analysis of data from five trials found NRT to be effective (RR 0.95, CI 0.92 to 0.98). However, the large double blind placebo controlled trial published after the review searches were completed found no evidence that NRT was effective for smoking cessation in pregnancy (RR 0.96, 95% CI 0.85-1.09) (PH26, ES ER1.3).

Evidence statement 7: Smoking cessation in pregnancy

There is evidence from a systematic review (Lumley et al., 2009 [++]) that cognitive behaviour therapy (CBT), motivational interviewing and structured self-help and support from NHS Stop Smoking Services can be effective at increasing quit rates in pregnant women.

There is additional evidence from four UK studies (Bryce et al., 2007 [+], McGowan et al., 2008 [+], Macaskill et al., 2008 [+], Lee et al., 2006 [+]) that

NHS stop smoking services (including provision of NRT) are effective.

One systematic review (Lumley et al., 2009[++]) and one RCT (Oncken et al., 2008 [++]) provide conflicting evidence (one positive effect Lumley et al., 2009, one no effect Oncken et al., 2008) regarding the effectiveness of NRT for promoting smoking cessation in pregnancy.

Behaviour change components

CBT, a form of directive psychotherapy that emphasises the interrelated influence of thoughts and feelings on behaviour, is a more intensive form of counselling (with social support) provided by NHS stop smoking support services (BCT3 Social Support (unspecified)). These services also encompass practical (BCT1 Social support (practical)) and emotional support (BCT2 Social support (emotional)) to aid smoking cessation and so represent all elements of BCT Cluster 1 "Social Support". NHS stop smoking services can also contain an element of pharmacological support in the form of nicotine replacement therapy and other medicines to help quit smoking (BCT4 Pharmacological support) although there was mixed evidence that NRT was effective in other contexts.

The content of motivational interviewing was often described in only limited detail in the guidance and evidence tables. Based on the detail provided it best matched Intervention Function 2 Persuasion (defined as "Using communication to induce positive or negative feelings, or to stimulate action"). Self-help material interventions were not defined in enough detail to deduce their function (e.g. to persuade or motivate) but are an example of BCT34 Adding objects to the environment, in order to facilitate behaviour change.

NICE public health guidance 27 (ER1.1 and R2.2)

NICE public health guidance 26 (ER1.3 and 1.6)

4.2 Diet

Overview

Four NICE public health guidance documents (PH 6, PH11, PH27 and PH38) contained recommendations describing individual-level dietary interventions. One related to interventions to promote healthy eating, including adult and pregnant women sub-groups (PH6), one related specifically to maternal and child nutrition (PH11), one contained dietary interventions as part of weight management before, during and after pregnancy (PH27) and one as part of preventing type 2 diabetes for individuals at high risk (PH38).

The guidance covered the following interventions:

- Nutritional counselling
- Dietary lifestyle interventions (described generically)
- Health education and counselling (in new mothers)

NICE public health guidance 38 contained evidence that analysed BCTs included in effective interventions to reduce the risk of type 2 diabetes.

The majority of the evidence related to people at risk of type 2 diabetes because of an existing impaired glucose tolerance (PH38). There was very little evidence identified from current NICE guidance on individual-level interventions focussing on other population groups, such as those not achieving nationally recommended levels of fruit and vegetables in their diet.

Dietary interventions were often combined with physical activity interventions. Where the effects of the diet and physical interventions were not discussed separately within evidence statements of existing guidance, they are included in Section 4.4 Diet and physical activity combined.

Evidence statement 8: Dietary interventions (overview)

Adults

There is evidence from a single systematic review of 29 RCTs (Ammerman et

al., 2002 [+]) showing a positive effect of nutritional counselling interventions delivered to a primary care population in changing eating habits relating to fat intake, fruit and vegetable intake and dietary fibre.

Diabetes risk

A meta-analysis of 12 randomised controlled trials (Jarrett et al., 1979 [+]; Pan et al., 1997 [++]; Wein et al., 1999 [-]; Penn et al., 2009 [++]; Kosaka et al., 2005 [++]; Li et al., 2008 [-]; Ramachandran et al., 2006 [++]; Roumen et al., 2008 [++]; Lindstrom et al., 2006 [++]; Lindahl et al., 2009 [++]; Diabetes Prevention Program Research Group, 2009 [++]; Liao et al., 2002 [+]) showed that lifestyle interventions targeting diet can be effective alone in reducing the progress to diabetes for people with impaired glucose tolerance (HR 0.67, 95% CI 0.49 to 0.92) but are more effective when combined with physical activity (HR 0.47, 95% CI 0.37 to 0.59). Diet only interventions hazard ratio estimates were based on three studies (one UK study: Jarrett et al., 1979 [+], one Chinese study: Pan et al., 1997 [++], and one Australian study: Wein et al., 1999 [-]).

There is evidence from four systematic reviews of randomised controlled trials (Baker et al., 2011 [++]; Burnet et al., 2006 [+]; Waugh et al., 2010 [++]; Paulweber et al., 2010 [++]) and two non-systematic reviews (Davies et al., 2004 [+]; Roumen et al., 2009 [-]) supporting dietary components of lifestyle interventions for the prevention of type 2 diabetes.

Behaviour change components.

In most cases there was insufficient information to be able to code BCTs from the evidence tables. However, Baker et al., 2011 [++] analysed the behaviour components of effective interventions included in their systematic review. For dietary behaviour change they described taking small steps (BCT29 Graded Tasks) and providing both observational and vicarious leaning opportunities (BCT89 Vicarious consequences) as reported in effective interventions. They also described how encouraging the identification of barriers and problem solving (BCT61 Problem Solving) were also reported as strategies used in

prevention programmes that had achieved reduction in diabetes incidence (PH38, ES3.8). Nutritional counselling was not described in sufficient detail to infer a behaviour change technique.

NICE public health guidance 6

NICE public health guidance 38 (ES 2.2, 3.5)

Evidence behind interventions highlighted in current NICE guidance

4.2.1 Nutritional counselling

A systematic review (Ammerman et al., 2002 [+]) of 29 RCTs found a positive effect of nutritional counselling interventions delivered to a primary care population in improving eating habits (reducing dietary fat intake, increasing fruit and vegetable and dietary fibre intake) (PH6). The interventions assessed in this systematic review were not described in sufficient detail in the evidence table to infer a behaviour change technique, cluster or function (PH6).

4.2.2 Dietary lifestyle interventions

A meta-analysis of 12 randomised controlled trials (Jarrett et al., 1979 [+]; Pan et al., 1997 [++]; Wein et al., 1999 [-]; Penn et al., 2009 [++]; Kosaka et al., 2005 [++]; Li et al., 2008 [-]; Ramachandran et al., 2006 [++]; Roumen et al., 2008 [++]; Lindstrom et al., 2006 [++]; Lindahl et al., 2009 [++]; Diabetes Prevention Program Research Group, 2009 [++]; Liao et al., 2002 [+]) carried out for an evidence review for NICE public health guidance 38 showed that lifestyle interventions targeting diet can be effective alone in reducing the progress to diabetes for people with impaired glucose tolerance (HR 0.67, 95% CI 0.49 to 0.92) but are more effective when combined with physical activity (HR 0.47, 95% CI 0.37 to 0.59) (PH38, ES2.1). Diet only intervention hazard ratio estimates were based on three studies of varying quality (one UK study: Jarrett et al., 1979 [+], one Chinese study: Pan et al., 1997 [++], and one Australian study: Wein et al., 1999 [-]) The evidence tables were not sufficiently detailed for BCT coding but suggest that information was provided

in each of the three diet only interventions representing Intervention Function 1 Education. In addition, two used pharmacological agents for weight loss (BCT4 Pharmacological Support) (Jarrett et al., 1979 [+]; Wein et al., 1999 [-]).

There was evidence from four systematic reviews of randomised controlled trials (Baker et al., 2011 [++]; Burnet et al., 2006 [+]; Waugh et al., 2010* [++]; Paulweber et al., 2010 [++]) and two non-systematic reviews of a range of study types (Davies et al., 2004 [+]; Roumen et al., 2009 [-]) for dietary components of lifestyle interventions for the prevention of type 2 diabetes (PH38, ES3.5).

Baker et al., 2011 [++] assessed seven RCTs in which all participants were advised individually to modify their diet. All the interventions advised a reduction in fat (with four studies carried out in the US, Finland, China and Sweden) specifying a reduction to <20-30% of total energy intake, and six studies advised adjustment of portion control. Four studies (carried out in the US, India, Italy and Sweden) recommended an increase in fibre intake, and all seven studies advised increased fibre intake in the form of fruit and vegetables. Quality of the trials was assessed but not reported, however, the study quality was reported as "good" in the evidence statement since "only trials that met threshold criteria were included in the review" (PH38, ES3.5).

Baker et al., 2011 [++] also analysed the behaviour components of effective interventions included in their systematic review. For dietary behaviour change, taking small steps (BCT29 Graded Tasks) and providing both observational and vicarious leaning opportunities (BCT89 Vicarious consequences) as well as encouraging the identification of barriers and problem solving (BCT61 Problem Solving) were reported as strategies used in

* Please note that in the original evidence review the citation Waugh et al., 2010 referred to a study "in progress". This study has since been published in 2012 with identical title but under a different first author (Gillet et al., 2012). The 2012 publication is cited in the Review 1 bibliography below as the "in progress" unpublished study was not available.

prevention programmes that had achieved reduction in diabetes incidence (PH38, ES3.8).

4.2.3 Sub group – pregnant women and new mothers

There is systematic review evidence (Van Teijlingen et al., 1998 [+] containing 9 RCT and non-RCT studies) showing that there is no conclusive evidence on the effectiveness of interventions involving health education (Intervention Function 1 Education), counselling, changes in environment and changes in policy to encourage pregnant women to eat healthily (PH6). This systematic review did not describe effective interventions in sufficient detail in the evidence table to infer further behaviour change techniques, clusters or functions.

There is inconclusive evidence from one U.S. RCT (McCrory et al., 1999 [+]) that dietary intervention alone from 12 weeks post-partum may help women across the BMI spectrum start to lose weight after childbirth compared to usual care (PH27, ES2.1). This intervention provided a tailored diet to each woman including the provision of food in pre-weighed amounts. Tailoring the intervention does not fit with a specific BCT in our coding frame nor does the provision of food in pre-weighed amounts. Further information about the intervention would be needed to code BCTs but this was absent from the evidence tables.

Three RCTs from the USA found that interventions focusing on diet and exercise resulted in decreased calorie intake (Leermakers et al., 1998 [+]; Lovelady et al., 2006 [+]; O'Toole et al., 2003 [-]) and decreased consumption of unhealthy foods in women post-partum (Lovelady et al., 2006 [+]) (PH27 ES2.6). These three studies contained large, diverse and multifaceted interventions and so it is not simple to establish which BCT or combination of BCTs were behind the reported effectiveness. At a cluster level Leermakers et al., 1998 tended to focus on BCT Cluster 3 “Feedback and Monitoring”, BCT Cluster 1 “Social Support”, BCT Cluster 11 “Goals and Planning” and also discussed behaviour change and problem solving strategies (BCT61 Problem

solving). Lovelady et al., 2006 also discussed behaviour change strategies and problem solving with participants alongside implementing aspects of BCT Cluster 11 “Goals and Planning” and BCT Cluster 3 “Feedback and Monitoring”. The main intervention components of O'Toole et al., 2003 were also related to BCT Cluster 11 “Goals and Planning” and BCT Cluster 3 “Feedback and Monitoring”.

Evidence statement 9: Diet in new mothers

There is evidence from one systematic review of RCT and non-RCT studies (Van Teijlingen et al., 1998 [+]) showing there is no conclusive evidence for the effectiveness of health education and counselling interventions to encourage pregnant women to eat healthily. There is also inconclusive evidence from one RCT (McCrory et al., 1999 [+]) as to whether dietary intervention alone helps women across the BMI spectrum start to lose weight after childbirth.

Combined intervention dietary outcomes

Three RCTs from the USA found that interventions focusing on diet and exercise resulted in decreased calorie intake (Leermakers et al., 1998 [+]; Lovelady et al., 2006 [+]; O'Toole et al., 2003 [-]) and decreased consumption of unhealthy foods in women post-partum (Lovelady et al., 2006 [+]).

Behaviour change components

NICE public health guidance 11 included evidence from two RCTs (Leermakers et al., 1998 [-]; O’Toole et al., 2003 [-]) showing that the characteristics of programmes which are effective in enabling some women to lose weight in the post-partum period are those which: combine diet and physical activity; include strategies for behaviour change; tailor the intervention to individual or group needs; include some group sessions and written materials; provide on-going support (BCT3 Social support (unspecified)) and contact with programme staff; and are of a sufficient duration to make sustained lifestyle changes (PH11,ES3.5). The behaviour change components identified by the authors above, for instance, tailoring of

the interventions and group sessions, are not detailed enough to code individual BCTs.

Information from the evidence tables suggests that one RCT (Leermakers et al., 1998 [-]) tended to focus on BCT Cluster 3 “Feedback and Monitoring”, BCT Cluster 1 “Social Support” and BCT Cluster 11 “Goals and Planning” as well as including discussion of behaviour change (no code) and problem solving strategies (BCT61 Problem solving). The intervention in the RCT by Lovelady et al., 2006 [+] also discussed behaviour change strategies and problem solving with participants alongside implementing aspects of BCT Cluster 11 “Goals and Planning” and BCT Cluster 3 “Feedback and Monitoring”. The main intervention components in the RCT by O'Toole et al., 2003 [-] were also related to BCT Cluster 11 “Goals and planning” and BCT Cluster 3 “Feedback and Monitoring”.

NICE public health guidance 6

NICE public health guidance 27 (ES2.1, 2.6)

4.3 Physical activity

Overview

Four NICE public health guidance documents contained recommendations describing individual-level physical activity interventions (PH2, PH6, PH27 and PH38). Two related to interventions aiming to increase physical activity in inactive adults and older people (PH2 and PH6), one as part of weight management during and after pregnancy (PH27), and one as part of preventing type 2 diabetes for individuals at high risk (PH38).

These examined the effectiveness of:

- brief interventions in primary care
- exercise referral schemes

- pedometer based interventions
- individualised interventions
- biomarker feedback or brief motivational interventions

A key theme of the evidence surrounding physical activity interventions was the sustainability of behaviour change. Where effectiveness was described it was usually in the short term only. Evidence for longer term effectiveness was either lacking or suggested no or very limited effectiveness over the medium and long term.

Physical activity interventions were often combined with dietary interventions. Where the effects of the diet and physical interventions are not discussed separately they are included in Section 4.4 Diet and physical activity combined.

Evidence behind interventions highlighted in current NICE guidance

4.3.1 Brief interventions

Evidence from eleven primary studies (6 individual RCTs: Petrella et al., 2003 [++]; Harland et al., 1999 [+]; Swinburn et al., 1998 [+]; Halbert et al., 2000 [-]; Halbert et al., 2001 [-]; Hillsdon et al., 2002 [+]; 2 cluster RCTs: Elley et al., 2003 [++]; Goldstein et al., 1999 [-]; and 3 controlled non-randomised trials: Naylor et al., 1999 [-]; Smith et al., 2000 [+]; Bull and Jamrozik, 1998 [-]) reviewed in NICE public health guidance 2 suggested that brief interventions in primary care can be effective in producing moderate increases in physical activity in middle aged and older populations in the short term (6-12 weeks), longer term (over 12 weeks) or very long term (over 1 year). However, for the effect to be sustained at one year, the evidence suggested that several follow-up sessions over a period of 3 to 6 months are required after the initial consultation episode (PH2, ESBI.1).

From the eleven studies, six reported significant increases in physical activity outcomes: five RCTs (Elley et al., 2003 [++]; Petrella et al., 2003 [++]; Harland et al., 1999 [+]; Swinburn et al., 1998 [+]; Halbert et al., 2000 [-]) and one

controlled non-RCT (Bull and Jamrozik, 1998 [-]). The guideline stated that the findings of these studies are potentially applicable to the UK, if there was moderate training of health professionals, moderate additional resources and organisation of follow up (PH2, ESBI.1). Interventions aimed at older groups seemed more effective than those aimed at middle age groups, but it is not clear whether this effect was linked to the age of the population or the design of the intervention (PH2, ESBI.2.c). Physical activity advice in primary care is the subject of NICE public health guidance currently in development (NICE Public Health Guidance in Development).

Similarly, the same body of six studies provided inconclusive evidence that a "written prescription" outlining physical activity goals and or "step testing" during the consultation may be a useful addition to verbal advice to increase physical activity. The studies that included goal setting varied according to what happened at the initial consultation and whether there was follow-up to reinforce advice so it is difficult to separate the relative contributions of each (PH2, ESBI.2.a).

Qualitative evidence was available from two interview studies (Penn et al., 2008 [++], Jallinoja et al., 2007 [++]) and one focus group study (Troughton et al., 2008 [++]) that health information and support could facilitate healthy lifestyle changes (PH38 ES4.17).

Evidence statement 10: Brief interventions

There is a small body of evidence from five RCTs (Elley et al., 2003 [++]; Petrella et al., 2003 [++]; Harland et al., 1999 [+]; Swinburn et al., 1998 [+]; Halbert et al., 2000 [-]) and one controlled non-RCT (Bull and Jamrozik, 1998 [-]) showing brief interventions in primary care can be effective in producing moderate increases in physical activity in middle aged and older populations in the short term (6-12 weeks), longer term (over 12 weeks) or very long term (over 1 year). For the effect to be sustained at one year, the evidence suggested that several follow-up sessions over a period of 3 to 6 months are

required after the initial consultation episode.

The same six studies provide inconclusive evidence for the benefit of including a “written prescription” outlining physical activity goals and or step testing during the intervention consultation.

Qualitative evidence from two interview studies (Penn et al., 2008 [++], Jallinoja et al., 2007 [++]) and one focus group study (Troughton et al., 2008 [++]) suggests health information and support could facilitate healthy lifestyle changes.

Behaviour change components

The six effective studies cited above all contained brief advice, either verbal or written (Intervention Function 1 Education), alone or in combination with one of the following: motivational interviewing (Intervention Function 2 Persuasion), calls from an exercise specialist (BCT Cluster 1 “Social Support”), and in one case (Halbert et al., 2000 [-]) a physical activity plan for the next 3 months (BCT64 Action planning). The qualitative evidence cited above indicated that well received approaches included: motivational interviewing, check-up visits, formal measurements, and repeat tests to monitor and help sustain behaviour change.

NICE public health guidance 2 (ESBI.1, ESBI.2.a, ESBI.2.c)

NICE public health guidance 38 (ES4.17)

4.3.2 Exercise referral

There is evidence from two RCTs (Taylor et al., 1998 [-] and Halbert et al., 2000 [-]) that exercise referral schemes have positive effects on physical activity in the short term (6 to 12 weeks). Evidence from four varying quality RCTs (Lamb et al., 2002 [++], Taylor et al., 1998 [-]; Halbert et al., 2000 [-] and Harrison et al., 2005 [-]) indicates that such referral schemes are ineffective in increasing physical activity levels in the longer term (over 12

weeks) or over a very long timeframe (over 1 year). The study by Lamb et al., 2002 [++] found that the intervention had no effect on physical activity levels in the longer term (PH2, ES ER.1 and ER.2). No behaviour change coding was possible here as the nature of the exercise scheme referred to was not well described in the evidence tables.

4.3.3 Pedometer based interventions

There is evidence from four RCTs (DuVall et al., 2004 [-]; Moreau et al., 2001 [-]; Tudor-Locke et al., 2004 [-]; Talbot et al., 2003 [-]) that the effectiveness of pedometer-based interventions aimed at increasing physical activity levels in the adult population is equivocal[†] in both the short-term (6-12 weeks) and longer term (12 weeks to one year). No studies addressed the very long term (over 12 months) (PH2, ESP.1). Pedometer interventions are typically used to self monitor behaviour (number of steps) and to aid progress toward step goals (BCT10 Self-monitoring of behaviour and BCT62 Goal setting (behaviour) respectively).

4.3.4 Physical activity interventions

NICE public health guidance 6 identified eight systematic reviews evaluating interventions to increase or promote the uptake of physical activity at an individual-level (4 systematic reviews of RCTs: Hillsdon et al., 2005 [++]; McClure, 2002 [-]; Dunn et al., 2001 [-]; van Sluijs et al., 2004 [++] and 2 systematic reviews of RCTs and non-RCTs: Holtzman et al, 2004 [+]; Eden et al, 2002 [+]). One systematic review of RCT evidence (Hillsdon et al., 2005 [++]) showed evidence for the effectiveness of individualised physical activity interventions to increase self reported physical activity in the short term, but a

[†] NB: at the time Review 1 was prepared NICE public health guidance on Walking and Cycling was in progress and expected to be published in November 2012. This guidance will have an up-to-date literature search and will address the latest evidence on pedometers for increasing physical activity. It may reach different conclusions to those stated here. The latest Walking and Cycling guidance had not been published at the time Review 1 was prepared and so could not be included.

second systematic review of RCT and non-RCT evidence (Holtzman et al, 2004 [+]) found most interventions had no effect three months or more after the end of the intervention (PH6). The Hillsdon et al., 2005 review included interventions consisting of: one to one counselling/advice and/or group counselling/advice (BCT3 Social support (unspecified)); self-directed or prescribed physical activity (BCT Cluster 11 “Goals and Planning”); supervised or unsupervised physical activity; home-based or facility-based physical activity (BCT23 Behavioural practice/rehearsal); on-going face-to-face support; telephone support; written support material (BCT Cluster 1 “Social Support”); and self-monitoring (BCT10 Self-monitoring of behaviour) (PH6).

4.3.5 Biomarker feedback, brief motivational interventions and counselling

There is mixed and inconclusive evidence from systematic reviews for the effect of biomarker feedback (BCT14 Biofeedback), brief motivational interventions (Intervention Function 2 Persuasion) (systematic review of RCTs: McClure, 2002 [1-]) and counselling interventions (systematic review of RCTs and non-RCTs: Eden et al., 2002 [+]) on increasing physical activity (PH6).

4.3.6 Subgroup - older people

There is systematic review of RCT level evidence (van-der-Bij et al, 2002 [++]; Conn et al, 2003 [-]) that shows a small effect of home-based, group-based, and educational physical activity interventions on increasing physical activity among older people (PH6). The higher quality review (van-der-Bij et al, 2002 [++]) evaluated interventions consisting of an exercise programme (BCT Cluster 11 “Goals and Planning”) or aiming to promote physical activity, for example, through information (Intervention Function 1 Education) and counselling (BCT3 Social support (unspecified)). Thirty eight studies with 16,378 participants were included. “Nine studies evaluated home-base physical intervention studies. Of the two studies reporting the outcome

change in physical activity, one was a short-term intervention and the others were long-term (not defined further). The short-term intervention study reported a decline in exercise activity 18 months after the intervention ended: 3.6 days/week versus 2.8 days/week. The long-term intervention study reported a decline in physical activity in both the intervention and control groups, with the decline being significantly larger in the control group" (PH6).

Evidence statements underlying NICE public health guidance 2 (PH2) suggested that brief interventions aimed at older groups are more effective than those aimed at younger age groups at increasing physical activity or physical fitness (PH2, ES BI.2.c). The evidence underlying this statement came from comparison of two RCTs focussing on older populations (Halbert et al., 2000 [-]; Petrella et al., 2003 [++]) three studies focussing on middle aged populations (one non-RCT: Bull and Jamrozik, 1998 [-]; two RCTs: Harland et al., 1999 [+]; Swinburn et al., 1998 [+], and one cluster RCT involving both middle aged and older populations (Elley et al., 2003 [++])) (PH2, ES BI.2.c). However, the original evidence statement in NICE public health guidance 2 cautioned that the studies aimed at older age groups were also the studies in which the interventions involved follow-up and it is therefore difficult to arrive at firm conclusions about whether this effect was linked to the age of the population or the design of the intervention (PH2, ES BI.2.c).

4.3.7 Diabetes risk reduction

A meta-analysis of 12 studies (Jarrett et al., 1979 [+]; Pan et al., 1997 [++]; Wein et al., 1999 [-]; Penn et al., 2009 [++]; Kosaka et al., 2005 [++]; Li et al., 2008 [-]; Ramachandran et al., 2006 [++]; Roumen et al., 2008 [++]; Lindstrom et al., 2006 [++]; Lindahl et al., 2009 [++]; Diabetes Prevention Program Research Group, 2009 [++]; Liao et al., 2002 [+]) carried out for an evidence review for NICE public health guidance 38 showed that lifestyle interventions involving diet, physical activity or both can reduce the progress to diabetes for people with impaired glucose tolerance (pooled HR 0.51, 95% CI 0.43 to 0.62) (PH38). Each type of lifestyle intervention, whether diet (HR 0.67, 95% CI

0.49 to 0.92), exercise (HR 0.53, 95% CI 0.34 to 0.83), or a combination of diet and exercise (HR 0.47, 95% CI 0.37 to 0.59) had a beneficial effect, although a combination of diet and exercise appeared to have more effect than either diet or exercise alone (PH38, ES2.1).

The exercise only hazard ratio is based on just one Chinese study (Pan et al., 1997 [++]). The exercise group in this study were taught and encouraged to increase the amount of their leisure physical exercise by at least one unit per day (such as slow walking for 30 minutes, fast walking for 20 minutes etc.) and by two units per day if possible (BCT29 Graded Tasks, BCT62 Goal setting (behaviour)).

Two systematic reviews of RCTs (Baker et al., 2011 [++]; Paulweber et al., 2010 [++]) provided evidence from five and seven RCTs respectively that advised participants to increase their level of physical activity to predefined frequency and intensity (BCT64 Action planning, BCT62 Goal setting (behaviour) of a reduction in incidence of type 2 diabetes (PH38, ES3.6).

One of the systematic reviews of RCTs (Baker et al., 2011[++]) looked at the use of behavioural strategies to enhance effectiveness of lifestyle interventions to prevent diabetes (PH38, ES3.8). For physical activity behaviour change it concluded that a prescriptive approach that gradually increased the frequency and volume of activity over time (BCT29 Graded Tasks) as well as providing observational and vicarious leaning opportunities (BCT89 Vicarious consequences) and encouraging self-monitoring (BCT11 Self-monitoring of outcomes) were reported in trials that demonstrated effectiveness. Three of the successful trials also included direct supervision of physical activity (PH38, ES3.8). No BCT was coded for “direct supervision” as it was unclear how the supervision was used to change behaviour, e.g. to provide external monitoring or feedback, instruction or a demonstration of the correct behaviour for modelling purposes.

Further evidence (Norris et al., 2007 [++]; Yuen et al., 2010 [++]) reviewed RCTs for prevention of diabetes (carried out in the US, UK, India, France,

Finland, the Netherlands and Japan). In agreement with Baker et al., 2011 they highlighted the importance of gradually increasing volume and frequency of physical activity levels over time (BCT29 Graded Tasks) and of the importance of encouragement through direct supervision (PH38, ES3.8). No BCT was coded for “direct supervision” as it was unclear how the supervision was used to change behaviour, e.g. to provide external monitoring or feedback, instruction or a demonstration of the correct behaviour for modelling purposes.

Evidence statement 11: Physical activity for diabetes risk reduction

There is a body of evidence (Baker et al., 2011 [++]; Paulweber et al., 2010 [++]; Pan et al., 1997 [++]) that shows that lifestyle interventions based on physical activity alone appear effective at increasing physical activity levels and reducing the incidence of type 2 diabetes in adults with existing impaired glucose tolerance.

There is evidence that lifestyle interventions combining physical activity and diet are more effective at reducing diabetes risk than those of diet or physical activity alone based on a meta-analysis of 12 RCTs (Jarrett et al., 1979 [+]; Pan et al., 1997 [++]; Wein et al., 1999 [-]; Penn et al., 2009 [++]; Kosaka et al., 2005 [++]; Li et al., 2008 [-]; Ramachandran et al., 2006 [++]; Roumen et al., 2008 [++]; Lindstrom et al., 2006 [++]; Lindahl et al., 2009 [++]; Diabetes Prevention Program Research Group, 2009 [++]; Liao et al., 2002 [+]).

Behaviour change components

Behavioural components associated with physical activity behaviour change interventions to reduce the risk of type 2 diabetes were analysed by three relatively recent reviews (Baker et al., 2011 [++]; Norris et al., 2007 [++]; and Yuen et al., 2010 [++]).These authors suggested that the following techniques were associated with effective interventions for reducing the risk of type 2 diabetes: a prescriptive approach that gradually increased the frequency and volume of activity over time (BCT29 Graded Tasks) as well as providing observational and vicarious (BCT89 Vicarious consequences) learning

opportunities and encouraging self-monitoring (BCT10 Self-monitoring of outcomes). Encouragement through direct supervision of physical activity was also highlighted. No BCT was coded for “direct supervision” as it was unclear how the supervision was used to change behaviour, e.g. to provide external monitoring or feedback, instruction or a demonstration of the correct behaviour for modelling purposes.

NICE public health guidance 38 (ES2.1, ES3.6, ES3.8)

Evidence statement 12: Physical Activity overview

Interventions that have broadly conclusive, moderate or high quality evidence in support of effectiveness included:

- Brief interventions for adults in primary care consisting of information and advice. This produced short term (6-12 weeks) effectiveness but had a limited effect in the medium (over 12 weeks) and long term (over 1 year). Based on six studies: five RCTs (Elley et al., 2003 [++]; Petrella et al., 2003 [++]); Harland et al., 1999 [+]; Swinburn et al., 1998 [+]; Halbert et al., 2000 [-]) and one non-RCT (Bull and Jamrozik, 1998 [-]).
- A small but short-lived (not accurately defined from summary evidence) effect of home-based, group-based, and educational physical activity interventions on increasing physical activity among older people. Based on two systematic reviews (van-der-Bij et al, 2002 [++] and Conn et al, 2003 [-]).

There is mixed quality evidence suggesting:

- Exercise referral may be effective at increasing physical activity in the in short term (6 to 12 weeks), but ineffective in the long term (over 12 weeks) or very long term (over 1 year). Based on four RCTs, (Lamb et al., 2002 [++], Taylor et al., 1998 [-]; Halbert et al., 2000 [-]; Harrison et al., 2005 [-]).

There was mixed quality equivocal evidence associated with the following approaches:

- Additional benefit of brief interventions containing a "written prescription" outlining physical activity goals and/or step testing during the consultation. Based on six studies: five RCTs (Elley et al., 2003 [++]; Petrella et al., 2003 [++]; Harland et al., 1999 [+]; Swinburn et al., 1998 [+]); Halbert et al., 2000 [-]) and one non-RCT (Bull and Jamrozik, 1998 [-]).
- Pedometer based interventions. Based on four weak quality RCTs (DuVall et al., 2004 [-], Moreau et al., 2001 [-], Tudor-Locke et al., 2004 [-], Talbot et al., 2003 [-]).
- Referral to community walking schemes. Based on two individual RCTs (Lamb et al., 2002 [++]; Hamdorf and Penhall, 1999 [-]), 1 cluster RCT (Fisher and Li, 2004 [++]), one delayed intervention study (Macrae et al., 1996 [-])
- Using biomarker feedback, brief motivational interventions and counselling interventions. Based on two systematic reviews (one of RCTs: McClure, 2002 [-]; one of RCTs and non-RCTs Eden et al., 2002 [+])

Behaviour change components

A systematic review of RCTs (Baker et al., 2011 [++]) looked at behaviour change characteristics associated with effective interventions for preventing diabetes. For physical behaviour change Baker et al., 2011 [++] concluded a prescriptive approach that gradually increased the frequency and volume of activity over time (BCT29 Graded Tasks) as well as providing observational and vicarious leaning opportunities (BCT89 Vicarious consequences) and encouraging self-monitoring (BCT11 Self-monitoring of outcomes) were reported in trials that demonstrated effectiveness. Three of the successful trials also included direct supervision of physical activity (PH38, ES3.8). No BCT was coded for "direct supervision" as it was unclear how the supervision was used to change behaviour, e.g. to provide external monitoring or feedback, instruction or a demonstration of the correct behaviour for modelling

purposes.

NICE public health guidance 2 and 38

4.4 Diet and physical activity combined

Evidence behind interventions highlighted in current NICE guidance

4.4.1 Diabetes risk reduction

A meta-analysis of hazard ratios (HR) shows that lifestyle interventions (pooled HR 0.51, 95% CI 0.43 to 0.62) can reduce the progress to diabetes for people with impaired glucose tolerance (IGT). Each type of lifestyle intervention, whether diet (HR 0.67, 95% CI 0.49 to 0.92), exercise (HR 0.53, 95% CI 0.34 to 0.83), or a combination of diet and exercise (HR 0.47, 95% CI 0.37 to 0.59) had a beneficial effect, although a combination of diet and exercise appeared to have more effect than either diet or exercise alone (PH38, ES2.1). The meta-analysis was carried out as part of an evidence review for NICE public health guidance 38. It does not have an associated quality rating. The hazard ratio for the diet combined with exercise interventions was based on nine studies, one study in each of the following countries: UK (Penn et al., 2009 [++]), Japan (Kosaka et al., 2005 [++]), China (Li et al., 2008 [-]), India (Ramachandran et al., 2006 [++]), Netherlands (Roumen et al., 2008 [++]), Finland (Lindstrom et al., 2006 [++]), Sweden (Lindahl et al., 2009 [++]) and two US studies, (Diabetes Prevention Program Research Group 2009 [++] and Liao et al., 2002 [+]).

4.4.2 Behavioural components of combined interventions to prevent diabetes

There was evidence from four systematic reviews of RCTs (Baker et al., 2011[++]; Burnet et al., 2006 [+]; Norris et al., 2007 [++]; Yuen et al., 2010 [++]), for the use of “behavioural strategies” to enhance effectiveness of lifestyle interventions (including elements of diet and/or physical activity) to prevent diabetes (PH38, ES3.8).

Baker et al., 2011 [++] suggest that information and advice alone (Intervention Function 1 Education) is insufficient to bring about lifestyle change compared to theoretically-based detailed lifestyle interventions such as those used in the major diabetes prevention trials. These include: staging of information provision and tailoring programmes to individual needs; using multiple sessions to reinforce information; delivery to small groups or individuals; delivering written information as well as verbal advice (Intervention Function 1 Education); and encouraging self-monitoring and logging of physical activity (BCT10 Self-monitoring of behaviour), diet, and weight change (BCT11 Self-monitoring of outcomes) (PH38, ES3.8).

Norris et al., 2007 [++] and Yuen et al., 2010 [++] also assessed RCTs for prevention of diabetes (carried out in the US, UK, India, France, Finland, the Netherlands and Japan) and reported on the importance of gradually increasing volume and frequency of physical activity levels (BCT29 Graded Tasks) and of the importance of encouragement through direct supervision. No BCT was coded for “direct supervision” as it was unclear exactly how the supervision was used to change behaviour, e.g. to provide encouragement through external monitoring or feedback, instruction or a demonstration of the correct behaviour for modelling purposes. Regular reinforcement of set goals (BCT Cluster 11 “Goals and Planning”) was reported as an important strategy in the early stages of an intervention. Burnett et al., 2006 [+] reported from three trials carried out in the US, Finland and Sweden that self-monitoring through the use of regular weighing (BCT11 Self-monitoring of outcomes), and recorded measurement of dietary input and physical activity (BCT10 Self-monitoring of behaviour) increased self-efficacy and empowerment. Family was a key social support in prevention efforts (BCT Cluster 1 “Social Support”). Trials carried out in the US, Finland, China and Sweden encouraged spouses, where appropriate, to co-participate in counselling sessions. Trials in the Norris and Yuen reviews were quality assessed and rated as generally having high risk for bias (PH38, ES3.8).

An expert paper cited in NICE public health guidance 38 (Greaves, 2012) also described in detail the relationship between specific intervention components and techniques and the effectiveness of diet and physical activity interventions to decrease risk of diabetes (PH38). This review based on 30 studies ([++] or [+]) is highly relevant for the current evidence review.

Based on causal analyses, intervention effectiveness was increased by engaging social support (BCT Cluster 1 “Social Support”), targeting both diet and physical activity, and using well-defined /established behaviour change techniques. Increased effectiveness was also associated with increased contact frequency and using a specific cluster of behaviour change techniques they described as “self-regulatory” that included goal-setting (BCT Cluster 11 “Goals and Planning”) and self-monitoring (BCT Cluster 3 “Feedback and Monitoring”). No clear relationships were found between effectiveness and intervention setting, delivery mode, study population or delivery provider. Evidence on long-term effectiveness suggested the need for greater consideration of behaviour maintenance strategies (Greaves, 2012).

The review also produced evidence statements highly relevant to the current evidence review. The most relevant of these to behaviour change techniques was Evidence Statement 4. This highlighted the following effective behaviour change techniques relating to diet and physical activity interventions (often combined), in order of evidence quality (Greaves, 2012):

- For interventions to change diet and/or physical activity, motivational interviewing (Intervention Function 2 Persuasion) is more effective than traditional advice-giving (Intervention Function 1 Education) for initial weight loss at 3 to 6 months’ follow-up (two meta-analyses of RCTs Rubak et al., 2005 [++], Burke et al., 2003 [+]).
- Adding social support (usually from family members) (BCT Cluster 1 “Social Support”) to interventions provided increased weight loss at up to 12 months (one meta-analysis of RCTs Avenell et al., 2004 [+]).

- Brief advice (Intervention Function 1 Education), usually alongside goal setting (BCT Cluster 11 “Goals and Planning”), increased walking activity at 12 months’ follow up (descriptive summary of one RCT Ogilvie et al., 2007 [+]).
- Pedometer interventions, i.e. self-monitoring of physical activity (BCT10 Self-monitoring of behaviour), usually alongside step-goals (BCT62 Goal setting (behaviour)) or step diaries (BCT10 Self-monitoring of behaviour) or both, increased walking activity (one meta-analysis: Bravata et al., 2007 [+]; and one descriptive summary of individual RCTs Ogilvie et al., 2007 [+]).
- Effectiveness for initial behaviour change to increase physical activity levels was associated with the following techniques: prompting practice (BCT23 Behavioural practice/rehearsal), encouraging self-monitoring of behaviour (BCT10 Self-monitoring of behaviour) and individual tailoring (e.g. of information or counselling content) (Moderate to low quality associative evidence from three meta-regression analyses (all [+]) and two “vote-counting” analyses, both [-], in three reviews Dombrowski et al., 2010 [+], Eakin et al., 2000, Michie et al., 2009; different analyses in these studies were given different evidence grades).
- Further associative evidence from two meta-regression analyses (both [+]) in one review (Dombrowski et al., 2010) suggested that increased maintenance of behaviour change was associated with the use of time management techniques (for physical activity) and encouraging self-talk (BCT43 Self-talk) for both dietary change and physical activity.

Evidence statement 13: Diet and physical activity interventions combined (Overview)

A meta-analysis of nine studies (Penn et al., 2009 [++], Kosaka et al., 2005 [++], Li et al., 2008 [-], Ramachandran et al., 2006 [++],Roumen et al., 2008 [++], Lindstrom et al., 2006 [++], Lindahl et al., 2009 [++], Diabetes Prevention Program Research Group 2009 [++] and Liao et al., 2002 [+]) showed that diet/physical activity interventions can reduce the progress to diabetes for

people with impaired glucose tolerance (pooled HR 0.51, 95% CI 0.43 to 0.62). Combined interventions were more effective than diet or physical activity interventions alone.

Behaviour change components.

Behavioural components associated with diet and physical activity behaviour change interventions to reduce the risk of type 2 diabetes were analysed by three relatively recent reviews (Baker et al., 2011[++]; Norris et al., 2007 [++]; and Yuen et al., 2010 [++]). They describe the following components as being associated with effective interventions:

- Delivering written information as well as verbal advice (Intervention Function 1 Education)
- Encouraging self-monitoring; and logging of physical activity, diet and weight change (BCT10 Self-monitoring of behaviour and BCT11 Self-monitoring of outcomes)
- Gradually increasing volume and frequency of physical activity levels (BCT29 Graded Tasks)
- Encouragement through direct supervision. No BCT was coded for “direct supervision” as it was unclear exactly how the supervision was used to change behaviour, e.g. to provide encouragement through external monitoring or feedback, instruction or a demonstration of the correct behaviour for modelling purposes
- Regular reinforcement of set goals (BCT Cluster 11 “Goals and Planning”)
- Social support (BCT Cluster 1 “Social Support”)
- Self-regulatory behaviour change techniques, e.g. goal-setting (BCT Cluster 11 “Goals and Planning”) and self-monitoring (BCT Cluster 3 “Feedback and Monitoring”)
- Motivational interviewing (Intervention Function 2 Persuasion)
- Brief advice, usually alongside goal setting (Intervention Function 1 Education alongside BCT Cluster 11 “Goals and Planning”) time management techniques (for physical activity) and encouraging self-talk

(BCT43 Self-talk) (for both dietary change and physical activity).

- Pedometer interventions, i.e. self-monitoring of physical activity (BCT10 Self-monitoring of behaviour), usually alongside step-goals (BCT62 Goal setting (behaviour)) or step diaries (BCT10 Self-monitoring of behaviour).

Importantly, earlier evidence on pedometer use in adults (Section 4.3.3 and evidence statement 12) concluded that the evidence was equivocal. New NICE public health guidance on Walking and Cycling will cover evidence around the use of pedometers for increasing physical activity and is expected in November 2012.

NICE public health guidance 38 (ES2.1, ES3.8)

4.4.3 Information and support from professionals

Qualitative evidence was available from two interview studies (Penn et al., 2008 [++] and Troughton et al., 2008 [++]) and one focus group study (Jallinoja et al., 2007 [++]) that health information and support may facilitate healthy lifestyle changes. Penn et al., 2008 [++] found from interview findings in a UK study that professional support (BCT Cluster 1 "Social Support") was appreciated, particularly in the way it helped to develop self-regulation strategies and keep to existing behaviour change plans. An example of profession support from the interviews in this study was a dietician discussing with a participant reasons for relapse in weight loss (weight gain), and lessons learned for future weight loss efforts. Motivational interviewing, a style of counselling that encourages behaviour change, was particularly appreciated (Intervention Function 2 Persuasion). They also found that attention to the optimal timing of information-giving (Intervention Function 1 Education) allowed gradual absorption of change and therefore was a facilitator in allowing adjustment to changes. Jallinoja et al., 2007 [++] conducted a study in Finland that reported that focus group participants found check-up visits helpful in maintaining new behaviours. The prospect of undergoing formal measurements was a motivator to increase efforts (BCT Cluster 3 "Feedback and Monitoring"). Similarly, Troughton et al., 2008 [++] interviewed people in

the UK who reported that having repeat tests (BCT Cluster 3 “Feedback and Monitoring”) was reassuring in terms of maintaining efforts to change behaviour (PH38 ES4.17).

The evidence for this information and support from professionals section comes solely from qualitative studies. This does not represent direct evidence (e.g. from experimental study designs) that greater information and support is effective at facilitating behaviour change. Only that this is regarded positively and described as useful by participants asked about their experiences of behaviour change interventions.

4.4.4 Weight loss in potential mothers, expectant mothers or new mothers with a BMI over 30

Findings from four qualitative studies (Gross and Bee 2004 [++]; Heslehurst et al, 2007 [++]; Wiles, 1998 [++] and Levy 1999 [+]) provide indirect evidence that women who may become pregnant (i.e. all women of child bearing age) need clearer, more relevant and tailored advice and information from health professionals about weight management including information about the potential effects of obesity during pregnancy (BCT Cluster 14 “Natural Consequences”) (PH27, ES1.19 and 1.20). These studies underlie the recommendation that health professionals should provide this information and advice to women with a BMI of 30 or more considering becoming pregnant through an opportunistic brief intervention (PH27). As this was a qualitative study assessing views on current practice, and not a test of a specific intervention as part of an RCT, no behaviour change coding was possible. However, this qualitative evidence provides indirect evidence that information may be needed and that this information should include the potential effects of obesity during pregnancy which, if included in an intervention, would fall under BCT Cluster 14 “Natural Consequences”.

There is evidence from four RCTs (Leermakers et al., 1998 [-]; Lovelady et al., 2000 and 2006 [-]; McCrory et al., 1999 [-]; and O’Toole et al., 2003 [-]) that: diet and exercise programmes are effective in enabling some women to lose

weight gained during pregnancy (Lovelady et al., 2000 [-] and 2006 [-]; McCrory et al., 1999 [-]); combining diet and physical activity interventions are more effective than diet or physical activity alone; and that integrated programmes of activity that support participants to promote weight loss are more effective than information alone (Leermakers et al., 1998 [-] and O'Toole et al., 2003 [-]) (PH11,ES3.1, 3.2, 3.4).

Leermakers et al., 1998 [-] and O'Toole et al., 2003 [-] also provide evidence on the characteristics of programmes which are effective in enabling some women to lose weight in the post-partum period. These included those which: combine diet and physical activity; include informing participants of strategies for behaviour change (no BCT coding possible); tailor the intervention to individual or group needs (no BCT coding possible); include some group sessions and written materials (no BCT coding possible); provide on-going support and contact with programme staff (BCT Cluster 1 "Social Support"); and are of a sufficient duration to make sustained lifestyle changes (PH11, ES3.5). In addition to this, information from the evidence tables suggest Leermakers et al., 1998 used interventions consisting of written lessons and homework (Intervention Function 1 Education), telephone contact (covering behaviour change progress, goals and problem solving (BCT Cluster 11 "Goals and Planning")) and daily self-monitoring of diet and physical activity (BCT10 Self-monitoring of behaviour and BCT11 Self-monitoring of outcomes). O'Toole et al., 2003 also used heart rate monitors to measure physical activity levels (BCT11 Self-monitoring of behaviour) and implemented individualised diet and physical activity prescriptions (BCT64 Action planning), food and activity diaries (BCT10 Self-monitoring of behaviour and BCT11 Self-monitoring of outcomes) and frequent group education sessions (Intervention Function 1 Education) dealing with behaviour change strategies (PH11, ES3.5).

There is evidence from one Australian based case series (Galletly et al., 1996 – not quality graded in the evidence review but described in the main text as "weak" evidence) that obese women trying to become pregnant but

experiencing infertility can achieve a statistically significant reduction in BMI through a programme that includes regular physical activity, advice about healthy eating and group support. This intervention contained a group programme including an hour of exercise (BCT23 Behavioural practice/rehearsal), coping strategies (BCT61 Problem Solving) and group support (no code, support for behaviour not specified, also deals with psychological impact of infertility) (PH27, ES1.1).

Evidence statement 14 Weight management associated with pregnancy

There is evidence from four RCTs (Leermakers et al., 1998 [-]; Lovelady et al., 2000 and 2006 [-]; McCrory et al., 1999 [-]; and O'Toole et al., 2003 [-]) that: diet and exercise programmes are effective in enabling some women to lose weight gained during pregnancy (Lovelady et al., 2000 and 2006 [-]; McCrory et al., 1999 [-]); combining diet and physical activity interventions are more effective than diet or physical activity alone; and that integrated programmes of activity that support participants to promote weight loss are more effective than information alone (Leermakers et al., 1998 [-] and O'Toole et al., 2003 [-])

There is further evidence from one Australian based case series (Galletly et al., 1996 – not quality graded in the evidence review but described in the main text as "weak" evidence) that obese women trying to become pregnant but experiencing infertility can achieve a statistically significant reduction in BMI through a programme that includes regular physical activity, advice about healthy eating and group support.

Behavioural change components

Leermakers et al., 1998 [-] and O'Toole et al., 2003 [-] provide evidence that the following characteristics are associated with effective interventions that enable some women to lose weight in the post-partum period: Intervention Function 1 Education, BCT Cluster 1 "Social Support", BCT Cluster 11 "Goals and Planning, BCT10 Self-monitoring of behaviour, BCT11 Self-monitoring of outcomes, and BCT64 Action planning. Evidence from Galletly et al., 1996

also identified BCT23 Behavioural practice/rehearsal and BCT61 Problem Solving.

NICE public health guidance 11 (ES3.1, 3.2, 3.4, 3.5).

Weight management after pregnancy

There is evidence from four US based RCTs[‡] (Leermakers et al., 1998 [+]; Lovelady et al., 2006 [+]; McCrory et al., 1999 [+]; O'Toole et al., 2003 [-]) addressing diet and physical activity post-partum that showed a significant reduction in total weight among women across the BMI spectrum in the intervention group compared to control (PH27, ES2.6). In contrast to the three RCTs above a further RCT showed no difference between intervention and control (Dewey et al., 1994 [+]) (PH27, ES2.3). Only one of these studies showed a significant increase in energy expenditure (O'Toole et al., 2003 [-]), while one other found no significant difference in total energy expenditure (Leermakers et al., 1998 [+]), and the third did not report results for physical activity (Lovelady et al., 2006 [+]) (PH27, ES2.3 and 2.6).

The behaviour changing coding for Leermakers et al., 1998 [+] and O'Toole et al., 2003 [-] is discussed in section 4.4.4. No further BCT coding was possible.

4.5 Alcohol

Overview

Three NICE public health guidance documents described interventions to reduce alcohol consumption in different groups: substance misuse amongst vulnerable young people (PH4); problem drinkers, pregnant women and drink drivers (PH6); and adults and young people with alcohol use disorders

[‡] Please note that the first three RCTs above (Leermakers et al., 1998 [+]; Lovelady et al., 2006 [+] and McCrory et al., 1999 [+]) were all graded as [+] in NICE public health guidance 27 but all graded as [-] in NICE public health guidance 11. However, the recommendations in each piece of guidance based on these studies are the same, despite the differences in reported quality of the studies.

(PH24). These covered both those at risk and those already classed as problem drinkers (prevention and treatment).

These assessed a variety of interventions including:

- motivational interviewing
- brief interventions (including reflection and goal setting)
- extended brief interventions and behavioural counselling in adults (self-control interventions)
- home visits for pregnant women who are problem drinkers
- interventions for drink drivers to reduce drink driving offences (ignition interlock and drink-driving remediation interventions)

Evidence behind interventions highlighted in current NICE guidance

4.5.1 Brief behaviour counselling – adult problem drinkers

Evidence statement 15 Brief behaviour counselling – adult problem drinkers

There was evidence from two systematic reviews (one systematic review of RCTs: Bertholet et al., 2005 [++]; one systematic review of RCTs and non-RCTs: Whitlock et al., 2004 [+]) quoted in NICE public health guidance 6 that showed evidence of a small positive effect of brief behavioural counselling interventions in reducing alcohol intake (mean reduction of approximately 4 drinks per week) in problem drinkers. There was evidence from a systematic review of RCTs (Walters Glenn, 2000 [-]) showing a small, positive effect of behavioural counselling interventions in reducing alcohol consumption (PH6).

Behavioural change components

Interventions for problem drinkers in the evidence review underlying PH6 were described as “behavioural self-control interventions” and “multi-contact behavioural counselling interventions” including “behavioural self-control training”. This included one or more of the following elements: abstinence training (BCT Cluster 5 “Repetition and Substitutions”), education, information (both Intervention Function 1 Education) coping skills (BCT61 Problem

solving), counselling (BCT3 Social support (unspecified)) and self-monitoring (BCT10 Self-monitoring of behaviour).

NICE public health guidance 6

4.5.2 Brief interventions – prevention in adults

NICE public health guidance 24 identified 27 systematic reviews (22 with quality rating [++] and 5 rated [+]) providing a considerable body of evidence supportive of the effectiveness of brief interventions for reducing alcohol consumption in people identified as hazardous drinkers, e.g. mortality, morbidity, alcohol-related injuries, alcohol-related social consequences, healthcare resource use and laboratory indicators of alcohol misuse (PH24,ES6.1). The majority of studies were conducted in primary care and the study population was primarily adults. Six of the systematic reviews demonstrated that interventions delivered in primary care are effective in reducing alcohol related negative outcomes (Ashenden et al., 1997 [++], Ballesteros et al., 2004 [++], Bertholet et al., 2005 [++], Kaner et al., 2007 [++], Poikolainen, 1999 [++], Whitlock et al., 2004 [++]). Evidence of effectiveness in other settings (emergency care, inpatient and outpatient settings and the workplace) was limited or inconclusive (PH24, ES6.1, 6.2).

Evidence statement 16 Prevention in adult problem drinkers

There is evidence from 27 systematic reviews that on balance show brief counselling interventions are effective in reducing consumption in hazardous drinkers.

Six of the systematic reviews demonstrated that interventions delivered in primary care are effective in reducing alcohol related negative outcomes (Ashenden et al., 1997 [++], Ballesteros et al., 2004 [++], Bertholet et al., 2005 [++], Kaner et al., 2007 [++], Poikolainen, 1999 [++], Whitlock et al., 2004 [++]). Evidence of effectiveness in other settings (emergency care, inpatient

and outpatient settings and the workplace) was limited or inconclusive.

Behavioural change components
Effective interventions described in the review underlying PH24 had components of BCT Cluster 1 “Social Support”, BCT Cluster 3 “Feedback and Monitoring” and specific examples of BCT78 Information about health consequences and BCT79 Information about emotional consequences. Some also described “self-control techniques” which map to BCT Cluster 3 “Feedback and Monitoring” and BCT Cluster 1 “Social Support”.

NICE public health guidance 24

4.5.3 Brief interventions-young people

There was inconclusive evidence for the effectiveness of brief interventions in young people (aged up to 25 years) based on mixed results from three systematic reviews (D'Onofrio and Degutis, 2002 [+]; Hunter Fager et al., 2004 [+]; Tait and Hulse, 2003 [++]) and five RCTs (Bailey et al., 2004 [+]; Spirito et al., 2004 [++];Monti et al., 1999 [++]; Monti et al., 2007 [++]; Boekeloo et al., 2004 [++]) (PH24, ES6.5).

NICE public health guidance 4 recommended offering one or more motivational interviews (Intervention Function 2 Persuasion), which include reflection on the issues related to their substance misuse (alcohol, tobacco or illicit drug use) and goal setting to reduce or stop misusing substances (BCT Cluster 11 “Goals and Planning”). Behind this recommendation there was evidence from one systematic review (Tait and Hulse, 2003 [+]), two RCTs (McCambridge and Strang, 2004 [+] and Oliansky et al., 1997 [-]) and one controlled non-randomised trial (Aubrey, 1998 [-]) to suggest that motivational interviewing and brief intervention can have short term effects (3-4 months) on the use of cigarettes, alcohol and cannabis. Evidence from one of the RCTs (McCambridge and Strang, 2004 [+]) indicated that motivational interviewing can have a positive effect on the use of these substances in the short term (3

months) but that this does not last in the medium term (12 months), although there is a non-significant trend favouring intervention compared with control.

The goal setting element of the recommendation comes solely from the study by Oliansky et al., 1997 [-] that reported using a “contract of personal goals” alongside pamphlets (BCT34 Adding objects to the environment, no further BCTs possible without details of the content of the pamphlet), motivational interviewing (Intervention Function 2 Persuasion) and verbal reinforcement from a physician (BCT70 Persuasive source).

Evidence statement 17 Prevention in young people

There is evidence from one systematic review (Tait and Hulse, 2003 [+]) and two RCTs (McCambridge and Strang, 2004 [+] and Oliansky et al., 1997 [-]) that one or more motivational interviews including reflection on the issues related to substance misuse (alcohol, tobacco or illicit drug use) in conjunction with goal setting to reduce or stop misusing substances, are effective at initiating behaviour change for (3-4 months) but are not effective in the medium- or long-term (at 12 months).

Behaviour change components

Goal setting was not described in detail and so only the cluster level categorisation was possible, BCT Cluster 11 “Goals and Planning”. Motivational interviews were also not described in detail in the evidence tables but were coded as Intervention Function 2 Persuasion. Oliansky et al., 1997 [-] reported using a pamphlets (BCT34 Adding objects to the environment), motivational interviewing (Intervention Function 2 Persuasion) and verbal reinforcement from a physician (BCT70 Persuasive source).

NICE public health guidance 24

4.5.4 Extended brief interventions - adults

Two systematic reviews demonstrated that extended brief interventions are effective in the reduction of alcohol consumption where interventions consisted of 2 to 7 sessions of information and advice with a duration of initial and booster sessions of 15 to 50 min (Kaner et al., 2007 [++]) or 10 to 15 min in 1 session with a number of specific booster sessions of 10 to 15 min duration (Ballesteros et al., 2004 [++]) (PH24, ES6.11). No behaviour change coding was possible from the evidence tables relating to these studies. However, extended brief interventions were described in the guidance document as having a primary objective of motivating people to change their behaviour, mapping to an intervention function of persuasion (Intervention Function 2 Persuasion).

4.5.5 Home visits for women

There was evidence from a single systematic review of RCTs (Doggett., 2005 [++]) that showed there was insufficient evidence of effect for home visits for women who were problem drinkers (PH6).

4.5.6 Interventions for drink drivers

For drink drivers, there was evidence from a single systematic review of RCT and non-RCT studies (Willis et al., 2004 [++]) that showed a possible effect on reducing drink driving of alcohol interlock programmes, a system where the car ignition is locked until the driver provides an appropriate breath specimen (BCT30 Restructuring the physical environment). The effect of drink driver remediation on reducing drink driving and alcohol related crashes was inconclusive due to the variable quality of the studies included in the systematic review (systematic review of RCTs and non-RCTs: Wells et al., 1995 [-]) (PH6).

Evidence statement 18 Alcohol reduction (overview)

The most effective interventions for reducing alcohol consumption in adults and vulnerable young people appear to be brief counselling interventions and

extended brief interventions. For people classed as problem drinkers there is evidence from multiple systematic reviews supportive of the effectiveness of brief interventions delivered in primary care with a range of underlying behavioural change components (see evidence statements 16 and 17 for references and further details).

Behavioural change components

Brief and extended behavioural counselling interventions for vulnerable young people were heterogeneous in their content but contained one or more of the following components: verbal and or written advice and information (IF1 Education), feedback on alcohol consumption (BCT8 Feedback on Behaviour), strategies to reduce consumption (not specific enough to code BCT), motivational interviewing (IF2 Persuasion) with some specifying use of "cognitive behavioural techniques".

NICE public health guidance 4 (ES52.1, 52.2, 53.1, 53.2)

NICE public health guidance 6 (Alcohol misuse, problem drinkers section)

NICE public health guidance 24 (ES5.1, 5.2, 5.5, 5.6, 5.7, 5.9, 5.10, 5.11, 7.3, 7.4, 7.5, 7.7) six systematic reviews

4.6 Sexual health

Limited evidence is available on effective interventions relating to sexual health from current NICE public health guidance (PH3). The current NICE public health guidance on behaviour change (PH6) did not identify any review level evidence assessing the effectiveness of individual-level interventions on sexual health behaviour.

We identified only one piece of NICE guidance (PH3) containing relevant individual-level recommendations which related specifically to the prevention of sexually transmitted infections in under 18s. This guidance provided

evidence to support the following interventions as part of its recommendations:

- Have one to one structured discussions with individuals at high risk of STIs (if trained in sexual health) (Recommendation 1 and 2)
- Help patients with an STI to get their partners tested and treated through providing patient and partner with infection-specific information, including advice about possible re-infection and if necessary refer to partner notification specialist (Recommendation 3)
- Provide one to one sexual health advice (Recommendation 5)
- Regularly visit vulnerable women aged under 18 who are pregnant or who are already mothers. Discuss with them and their partner (where appropriate) how to prevent or get tested for STIs and how to prevent unwanted pregnancies (Recommendation 6)

The evidence behind the individual-level intervention recommendations are discussed below.

Evidence behind interventions highlighted in current NICE guidance

4.6.1 One to one structured discussions

Sexually transmitted infections including HIV

Evidence statement 1.1 of NICE public health guidance 3 states that “In summary the evidence on the effectiveness of one to one interventions for the prevention of STIs is mixed but on balance marginally supports the interventions”. It further stated that “Project RESPECT a large US RCT (Kamb et al., 1998 [++]) showed that both a two session and a four session one to one counselling intervention [BCT3 Social support (unspecified)] can reduce STIs in the long and very long term in heterosexuals, and from one RCT that STIs in men can be reduced in the long term after one 90 minute session (Kalichman et al., 1996 [+]). However, the effect appeared to decrease over time, with one study finding a reduction in effect after six months (Kamb et al., 1998 [++])” (PH3, ES1.1).

Condom use

NICE public health guidance 3 evidence statement 1.4 reported that “twenty-five studies reported condom use, of which only eight showed a statistically significant increase in condom use in the intervention group compared to the control” (PH3, ES1.4). However, “overall there is weak evidence (that is it is mixed or conflicting but on balance marginally supports) that one to one STI/HIV prevention interventions can increase short and long-term condom use compared to control”. The 25 studies varied in their quality ([++] to [-]) (PH4, ES1.4). Furthermore, “Project RESPECT, a large US RCT found an increase in condom use in both the four and two session counselling intervention groups compared to a didactic control (Kamb et al., 1998 [++]). However, several studies found the effect of an intervention appears to decrease, or disappear over time. Greater uniformity is needed in the way in which condom use is measured in studies” (PH3, ES1.4).

Subgroup – Men who have sex with men (MSM)

EXPLORE, a large US RCT of ten sessions of one to one counselling for MSM, found a 15.7% reduction in HIV infection compared with twice yearly counselling, but this was not statistically significant (EXPLORE, 2004 [++]). Other counselling studies found no statistically significant effect on STIs in MSM but may have been underpowered for this outcome (PH3, ES1.2). Six studies in MSM evaluated condom use or unprotected sex and three found a significant beneficial effect (Dilley et al., 2002 [++]; EXPLORE, 2004 [++]; Gold and Rosenthal, 1995 [-]).

Subgroup – adolescents

Twelve studies evaluated one to one interventions aimed specifically at adolescents.

Six studies assessed the effects on STIs; two of these found that the intervention reduced STIs (Bolu, 2004; Downs, 2004). A subgroup analysis of Project RESPECT (Bolu, 2004 [++]) found that the intervention was particularly effective in adolescents (aged 12 to 18 years) compared with the

whole study population. It found a significant reduction in sexually transmitted infections in adolescents with both the four and two session interventions versus a didactic control. Although this was the only study to show a statistically significant difference, the general trend in this group of studies was towards a reduction in STIs (PH3, ES1.3).

There was insufficient evidence to determine the effect of one to one interventions on condom use and unprotected sex in adolescents. Nine studies assessed the effects on condom use or unprotected sex. Two studies found a significant increase in condom use (Bolu, 2004 [++]; Boekeloo, 1999 [-]); one of these studies found a beneficial effect at three months, but not at nine months (Boekeloo, 1999 [-]), the other found an effect at 12 months post intervention (Bolu, 2004 [++]).

Six studies looked at the effect of one to one interventions on number of partners/abstinence in adolescents. The aim of most of the studies was to promote safe sexual behaviour rather than abstinence. Only one found a decrease in number of partners (Downs, 2004 [+]); this was at short term follow up only, and was no longer significant by nine months. One study (Boekeloo, 1999 [-]) found an increase in vaginal sex in the intervention group and one study found an increase in the number of partners for both groups pre to post intervention (DeLamater, 2000 [-]).

Evidence statement 19: One to one structured discussions

STIs

There is evidence from two RCTs (Kamb et al., 1998 [++] and Kalichman et al., 1996 [+]) that one to one individual counselling can reduce STIs in the long and very long term in heterosexuals but the effect may reduce after 6 months.

Condom use

The evidence review in PH3 identified 25 studies of mixed quality [++ to -] reporting condom use. Overall the results showed a marginally positive effect

of one to one STI/HIV prevention interventions on increasing short and long term condom use. The effect may reduce over time. Six studies in MSM evaluated condom use or unprotected sex and three found a significant beneficial effect (Dilley et al., 2002 [++]; EXPLORE, 2004 [++]; Gold and Rosenthal, 1995 [-]).

HIV in MSM

There is evidence from a large U.S. RCT (EXPLORE, 2004 [++]) that one to one counselling can lead to a non-significant reduction in HIV infection in MSM.

STIs in adolescents

There is evidence from a subgroup analysis of a single RCT (Bolu, 2004 [++]) that one to one counselling sessions are effective in reducing STIs in adolescents (aged 12-18). There was insufficient evidence to determine the effect of one to one interventions on condom use in adolescents. There was little evidence that one to one interventions reduce the number of sexual partners of adolescents or promote abstinence.

Behaviour change components

Generally one to one discussions were not well described in the review evidence tables and so could not be coded. However, interventions in project RESPECT (Kamb et al., 1998 [++]) were described in good detail as containing behaviour goal setting (BCT62 Goal setting (behaviour)), risk reduction plan (BCT64 Action planning), and barriers to risk reduction (BCT61 Problem solving). Similarly, interventions described in the study by Kalichman et al., 1996 contained elements of behavioural practice/rehearsal (BCT23 Behavioural practice/rehearsal); instructions on how to perform a behaviour (BCT36 Instructions on how to perform a behaviour) and information about health consequences (BCT78 Information about health consequences).

NICE public health guidance 3 (ES1.1, 1.2, 1.4, 3.1, 3.2, 3.8)

4.6.2 Partner therapy plus additional information

Recommendation 3, PH3 advocates helping patients with an STI to get their partners tested and treated, and providing infection specific information to both patient and partner.

Evidence statement 20 partner therapy plus additional information

There is evidence from four large randomised controlled trials (Golden et al., 2005 [+]; Schillinger et al., 2003 [+]; Kissinger et al., 1998 [-], Kissinger et al., 2005 [-]) that patient-delivered partner therapy plus additional information for partners reduces persistent or recurrent infections in women and men diagnosed with gonorrhoea or *C. trachomatis* by approximately 5% compared to patient referral.

There is also evidence from two randomised controlled trials (Andersen et al., 1998 [-] and Ostergaard et al., 2003 [-]) that giving patients diagnosed with *C. trachomatis* sampling kits for their partner(s) can increase the number of partners who get tested when compared to getting the partner(s) to visit their doctor for testing.

Behaviour change components

Golden et al., 2005 [+] used “treatment packages” which were delivered to partners by index patients and contained antibiotics (BCT4 Pharmacological support); drug information (Intervention Function 1 Education); condoms (BCT34 Adding objects to the environment); study personal contact info (no coding possible); a brochure about STDs and information that care for STDs is free (Intervention Function 1 Education). The package as a whole also represented BCT34 Adding Objects to the external environment. Similar packages were used in the study by Kissinger et al., 1998 [-] with the addition of a phone number of a nurse for questions (BCT cluster “Social Support”) while Schillinger et al., 2003 [+] also used a treatment package (BCT34 Adding objects to the environment) coupled with index patients (patients diagnosed with STI) giving advice to their partners (Intervention Function 1

Education).

NICE public health guidance 3 (ES3.1, 3.2 and 3.8)

4.6.3 One to one sexual health advice

Evidence statement 21 One to one sexual health advice

Evidence from one RCT (Shlay 2003 [-]) and one non-randomised controlled study (Winter 1991 [+]) evaluated contraception advice and support in a clinic based setting in younger people. The non-RCT (Winter, 1991 [+]) found a significant reduction in pregnancies and the RCT (Shlay, 2003 [-]) showed a trend towards a reduction in the intervention group compared to control but this was not significant. The PH3 evidence review also identified four studies that showed a statistically significant reduction in pregnancy (three RCTs: O'Sullivan, 1992 [-]); Olds, 2002 [+]; Olds, 2004 [+]; one non-RCT: Winter, 1991 [+]) and the other studies showed a general trend towards a reduction. Therefore, it concluded that, "there appears to be evidence that one to one interventions with adolescents can reduce pregnancies". Multi-session nurse home visiting appears particularly effective, especially with low-income disadvantaged women, however, more research, is needed in this area with a focus on the under 18s and studies powered to detect a change in pregnancies. (PH3, ES1.18).

Evidence from seven studies reported the outcome of contraception use including oral contraception, emergency contraception and condom use (six RCTs: Boekeloo, 1999 [-]; Danielson, 1990 [+]; Gold, 2004 [++]; Harper, 2005 [++]; Quinlivan, 2003 [++]; Shlay, 2003 [-]; one non-RCT: Winter, 1991 [+]). Two RCTs (Quinlivan, 2003 [++] and Danielson, 1990 [+]) found one to one interventions with teenagers can improve contraception use in the long term. Of the two studies of advanced provision of emergency contraception (EC), one found an increase in the use of EC (Harper, 2005 [++]) and one an increase in condom use (Gold, 2004 [++]). In the other studies the general

trend was towards an increase in contraception use although one non-RCT found the effect on contraception use was no longer significant at 12 months (Winter, 1991 [+]). Therefore, there is “some evidence that one to one interventions with under-18s can increase contraception use. However, further research in this area is needed” (PH3, ES1.19).

Behaviour change components

The guidance described how one to one sexual health advice should include how to prevent and/or get tested for STIs and how to prevent unwanted pregnancies; all methods of reversible contraception, including long-acting reversible contraception (LARC) (in line with NICE clinical guideline 30); how to get and use emergency contraception; and other reproductive issues and concerns.

Studies providing evidence for increasing condom use (Quinlivan, 2003 [++], Danielson, 1990 [+], Harper, 2005 [++], Gold, 2004 [++], Winter, 1991 [+]) primarily described giving education and advice (Intervention Function 1 Education) either alone or alongside providing contraception (BCT34 Adding objects to the environment).

Studies reporting effectiveness for reducing unwanted pregnancies also described the provision of advice (Intervention Function 1 Education) and individual counselling (BCT3 Social support (unspecified)) about contraceptive methods coupled with provision of contraception (BCT34 Adding objects to the environment and BCT4 Pharmacological support) (Shlay, 2003 [-] and Winter, 1991 [+]).

NICE public health guidance 3 (ES1.18 and 1.19)

4.6.4 Sub group – pregnant women

Recommendation 6 of NICE public health guidance 3 outlines that vulnerable women aged under 18 who are pregnant or who are already mothers should

be visited regularly to discuss with them and their partner (where appropriate) how to prevent or get tested for STIs and how to prevent unwanted pregnancies (PH3).

There is good evidence from RCTs that multi-session support and home visiting for disadvantaged low-income pregnant women or mothers can prevent repeat pregnancies with studies (Olds, 2002 [+], Olds, 2004 [+], O'Sullivan, 1992 [-]) showing a significant reduction in repeat pregnancies in the intervention group compared to control. In addition one RCT (Olds, 1997 [-]) found a reduction in repeat pregnancies in the subgroup of poor unmarried women, although not in the sample as a whole (PH3, ES1.17).

Behaviour change components

Studies by Olds, 1997 [-], Olds, 2002 [+] and Olds, 2004 [+] all describe using skills based activities/education that aimed to improve foetal and maternal health while the frequency of the support and home visiting sessions varied. It is unclear exactly what type of skills based activities/education were used, particularly, whether they related directly to sexual health or were more generally targeted at general health or mother and infant. Due to the lack of detail no behaviour change codes are possible.

This evidence for this subgroup comes solely from PH3 ES1.17 and because no behaviour change coding was possible, the evidence statement has not been rewritten here.

5 Discussion

This review reflects the evidence behind effective individual-level behaviour change interventions described in current NICE public health guidance, and where possible, describes BCTs underlying these interventions.

Table 4 provides an overview of the behaviour change coding (BCT, BCT cluster or intervention function) described in effective individual-level

interventions identified from previous NICE public health guidance on behaviour change. Based on this table a descriptive synthesis suggests:

Intervention Function 1 Education is codable in seven effective interventions and population/settings:

- Brief behaviour counselling for adult problem drinkers
- Multifaceted interventions for diabetes risk reduction in adults
- Interventions enabling obese women to lose weight post-partum
- Brief interventions encouraging physical activity in primary care settings for adults
- Home based, group based and educational interventions encouraging physical activity for older people
- One to one sexual health advice for adolescents to reduce pregnancies or contraception use
- Partner therapy plus support for index patients with an STI and their partners for reducing incidence of STI

Intervention Function 1 Education was frequently coded for interventions that contained an element of providing “information and advice” about the behaviour. This was typically coded when no other BCTs or BCT clusters could be assigned.

Intervention Function 2 Persuasion is codable in five effective interventions and population/settings:

- Brief intervention (including elements of motivational interviewing and goal setting) for young people with substance misuse (including alcohol)
- Multifaceted interventions for diabetes risk reduction in adults
- Information and support from professionals (including motivational interviewing in some cases) for diabetes risk reduction in adults
- Brief interventions delivered in primary care for encouraging physical activity amongst adults
- Motivational interviewing for smoking cessation amongst pregnant women

Intervention Function 2 Persuasion was frequently coded in cases where "motivation interviewing" was mentioned but where further details to code BCTs or BCT clusters were absent. It is important to note that the definition of the Intervention Function Persuasion does not carry connotations of coercion or imposing external views, which are not features of motivational interviewing (Health Foundation 2011). The coding manual definition of the Intervention Function Persuasion is "Using communication to induce positive or negative feelings, or to stimulate action".

The following BCT clusters were commonly codable in effective interventions without the specificity required to code the technique:

- BCT Cluster 1 "Social Support" (10 instances)
- BCT Cluster 11 "Goals and Planning" (6 instances)
- BCT Cluster 3 "Feedback and Monitoring (4 instances)

Less common codable BCT clusters in effective interventions were:

- BCT Cluster 5 "Repetition and Substitutions" (one instance)
- BCT Cluster 14 "Natural Consequences" (one instance)

The following BCTs were codable in effective interventions based on the information provided:

- BCT3 Social support (unspecified) was universally codable for all topic areas (alcohol, diet, physical activity, sexual health and smoking) and across population groups (adolescents, adults, pregnant women and older people). This was coded in nine effective interventions. This code was frequently assigned to interventions that described "behavioural counselling".
- BCT4 Pharmacological support was commonly coded (six instances) for smoking cessation interventions (usually NRT) or for sexual health interventions (contraception).

- BCT10 Self-monitoring of behaviour or BCT11 Self-monitoring of outcomes was codable in the effective interventions for interventions targeting healthy diet or physical activity or both, particularly those multifaceted interventions aimed at diabetes risk reduction, physical activity intervention for adults or reducing BMI in pregnant women. It was codable once in a brief behaviour counselling intervention delivered to problem drinkers,
- BCT61 Problem solving was another almost universally codable BCT in effective interventions for alcohol, diet, physical activity and sexual health (6 instances) but was not reported among the effective interventions for smoking cessation
- Brief behaviour counselling for adult problem drinkers could also be coded for BCT61 Problem solving
- BCT62 Goal setting (behaviour) and BCT64 Action planning were more common in intensive interventions such as:
  - Lifestyle targeting diet and multifaceted interventions to prevent diabetes in adults or for pregnant women/new mothers
  - Regular exercise, advice about healthy eating and group support for obese women trying to become pregnant
  - One to one structured discussions for adults (including MSM) and adolescents for preventing STIs including HIV and increasing condom use
- BCT64 Action planning was codable in effective interventions for adults such as:
  - Those enabling women to lose weight post-partum
  - Brief interventions for encouraging physical activity delivered in primary care (containing advice and/or: motivational interviewing, follow up calls or an activity plan)
  - Lifestyle interventions containing specific physical activity elements
  - One to one structured discussions for adults (including MSM) and adolescents for preventing STIs including HIV and increasing condom use

- BCT78 Information about health consequences, BCT79 Information about emotional consequences and BCT89 Vicarious consequences were rarely specifically described enough to be consistently codable.
- Other BCT codes may be extractable from more recent publications of these interventions when these are reviewed in Review 2.

This summary of findings should be seen as descriptive, and any counts of the frequency of BCT reporting should be interpreted with caution. It is possible that interventions featured BCTs which were not coded here because they were not clearly reported. It should not therefore be inferred that only the identified BCTs are effective or that the pattern described above is what will be found when more recent research (with better descriptions of the techniques used) is analysed using more rigorous statistical procedures (meta-regression modelling) in Review 2.

There are several other limitations inherent in this review that should be considered which are outlined below.

It is not possible to conclude that the BCTs identified as being associated with effective interventions in this NICE guidance will always result in effective behaviour change. This review focuses on examining effective studies underpinning interventions currently recommended by NICE, but there may be other studies using the same BCTs that were not effective that would not have been captured by this review. An analytical quantitative synthesis, which should overcome these limitations, is one of the aims of Review 2.

As BCTs are rarely used in isolation, there are likely to be interactions between BCTs influencing effectiveness. This has not been assessed in this review. There will most likely be contextual factors that influence how effective a certain BCT or group of BCTs are at effecting behaviour change - not simply whether the intervention contains a specific BCT or not. Similarly, the sequence and timing of BCTs within an intervention may also influence their

individual or combined effectiveness. Comments on this will be made in Review 2.

Behaviour change techniques were coded from evidence tables and studies identified in existing reviews. It was clear that the contents of behaviour change interventions were not generally described in sufficient detail in these evidence tables to be able to code specific BCTs. As there was only limited information available there is likely to be a discrepancy between the actual BCTs used in the intervention and those that could be coded from the evidence tables. Because of this it is also possible that the BCTs coded may be biased toward those that are simply more frequently used or better reported in the evidence tables, rather than those that are the most effective. BCT coding ultimately depends on clear and unambiguous reporting, but Review 2 aims to minimise problems arising from this limitation by examining more detailed information obtained from primary research papers. Review 2 and will also be better able to assess which BCTs are associated with effective interventions through meta-regression analysis.

Important new evidence published since the original guidelines performed their literature searches for evidence may exist. For example, we became aware that there is a body of Cochrane systematic review evidence for smoking cessation interventions that were published after some of the early smoking cessation NICE public health guidance. Similarly, the current smoking guidance documents reference systematic reviews that have since been updated and may have incorporated new studies. This limitation will be addressed by Review 2 which includes a search of RCTs published from 2003 to the present day, and which aims to capture the latest body of research across all five health topics.

A strength of this review is that it gives an overview of the pattern of behaviour change techniques as reported for each health topic from current NICE public health guidance. For example, the area of smoking cessation appears well researched with high quality systematic review level evidence available for a

variety of different interventions. Similarly, behaviour change techniques associated with effective physical activity and dietary interventions for the prevention of type 2 diabetes have been the subject of several recent primary research papers included in NICE public health guidance 38 (2012). By contrast, there is very little evidence surrounding individual-level sexual health interventions from current guidance. Some of these evidence gaps may be addressed in Review 2 through the updated literature search of RCT evidence. The broad patterns identified here in Review 1 will inform the final guideline “context” and will be useful in interpreting the findings of Review 2.

The conclusions of NICE public health guidance 6 in addressing the question of whether there is evidence that some interventions are effective across a range of health topics and populations are summarised in brief below (PH6). This guidance identified interventions that it described as having conclusive evidence showing they were “effective” or “ineffective” and where there was “inconclusive” evidence. Further evidence to address this question will be incorporated in Review 2.

Effective

- Interventions aimed at pregnant women (e.g. smoking cessation, nutritional advice, or exercise) show some evidence of effectiveness.
- Physician advice or counselling was effective for smoking cessation, reducing alcohol consumption and promoting healthy eating.
- Counselling interventions appear to have an effect in tobacco cessation and alcohol consumption, but the evidence was inconclusive for preventing unwanted pregnancies.

Inconclusive

- Motivational interventions and biomarker feedback have inconclusive evidence of effectiveness for smoking cessation and physical activity.

Ineffective

- Hypnotherapy was not found to be effective for smoking cessation.

6 Conclusions

This review, examining evidence presented in existing NICE guidance, has identified the following evidence patterns and has shown areas where there is a relatively secure evidence base and additional areas of uncertainty that could be prioritised for consideration in Review 2.

There is a relatively secure evidence base:

- Suggesting the majority of effective interventions include elements of social support across all five health areas
- Supporting brief interventions for smoking cessation that include social and pharmacological support alongside other BCTs provided through referral to Stop Smoking Services
- Showing that more intensive interventions combining dietary and physical activity elements help to prevent progression of impaired glucose tolerance to type 2 diabetes. The techniques used here require multiple sessions and fall into the BCT Cluster 3 “Feedback and Monitoring” or BCT Cluster 11 “Goals and Planning”
- Brief behaviour counselling for adult problem drinkers can be effective and in this review was unique in describing techniques in the BCT Cluster 5 “Repetition and Substitutions”
- For reducing weight in adults or postpartum women who are obese or overweight the interventions that combined dietary and physical activity interventions are more effective than those that used diet or exercise alone. These also use techniques from BCT Cluster 3 “Feedback and Monitoring” and BCT Cluster 11 “Goals and Planning” that require continued engagement and follow up over time

Existing uncertainties:

- The sustainability of any behaviour change achieved with interventions designed to initiate behaviour change is rarely reported beyond 12 months

and few interventions appear in these guidelines to have been designed specifically for maintaining behaviour change

- Sexually transmitted infections (including HIV) and unwanted pregnancy are the primary clinical outcomes considered in sexual health guidance. However, only a small proportion of the evidence identified in current guidance has been reported in terms of behavioural outcomes (e.g. condom use)

These broad patterns within recent guidance suggest that the coding and analytical synthesis planned in Review 2 could usefully focus on:

- The context in which effective individual-level behaviour change interventions are delivered
- Those interventions that maintain positive changes once a change has been initiated
- The combinations of BCTs that are effective at changing behaviour in brief or opportunistic interventions as compared to the combinations that are only possible with extended follow up and specialised training. There may be effective interventions that lie between these extremes
- The complexity of interventions, that is how many BCTs are required to effect change
- Are some BCTs specific for certain behaviours only, such as alcohol or smoking, and is the finding from this review of guidance that social support is common to all individual-level interventions confirmed in a systematic review of the recent primary research planned for Review 2
- Individual-level interventions relying on remote communication (SMS, web based support or gaming) have not so far been covered in public health guidance

7 Acknowledgements

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8 Tables

Table 1 Included guidance and recommendations overview

No	NICE public health guidance short title	Health topic	Date issued	Review date	Relevant recommendations
PH1	Brief interventions and referral for smoking cessation (PH1)	Smoking	Mar-06	Mar-13	1-6
PH2	Four commonly used methods to increase physical activity (PH2)	Physical activity	Mar-06	Mar-13	1-2,5-6
PH3	Prevention of sexually transmitted infections and under 18 conceptions (PH3)	Sexual practices	Feb-07	Mar-14	1-3,5-6
PH4	Interventions to reduce substance misuse among vulnerable young people (PH4)	Alcohol	Mar-07	Mar-14	2,5
PH5	Workplace interventions to promote smoking cessation (PH5)	Smoking	Apr-07	May-14	4
PH6	Behaviour change (PH6)	Smoking, alcohol, physical activity, diet	Oct-07	Oct-14	Principle 4
PH10	Smoking cessation services (PH10)	Smoking	Feb-08	Jul-14	Cross references “proven cessation interventions” PH5
PH11	Maternal and child nutrition (PH11)	Diet	Mar-08	Jul-14	6
PH15	Identifying and supporting people most at risk of dying prematurely (PH15)	Smoking	Sep-08	Oct-13	2
PH24	Alcohol-use disorders - preventing harmful drinking (PH24)	Alcohol	Jun-10	May-13	8,10-11
PH26	Quitting smoking in pregnancy and following childbirth (PH26)	Smoking	Jun-10	TBC	1-2,4-5. Cross references list of "effective stop smoking interventions" in NICE PH1, PH5 and PH10
PH27	Weight management before, during and after pregnancy (PH27)	Diet and physical activity	Jul-10	Jul-13	1-2,4 and cross references “principles of individual behaviour change” in PH6
PH38	Preventing type 2 diabetes - risk identification and interventions for individuals at high risk (PH38)	Diet and physical activity	Jul-12	TBC	5-6, 8-9, 11-14

Table 2 Excluded NICE public health guidance

Guidance short title	Reason for exclusion
School-based interventions on alcohol (PH7)	Wrong age group
Physical activity and the environment (PH8)	Recommendations not individual-level
Community engagement (PH9)	Recommendations not individual-level
Social and emotional wellbeing in primary education (PH12)	Wrong age group
Promoting physical activity in the workplace (PH13)	Recommendations not individual-level
Preventing the uptake of smoking by children and young people (PH14)	Recommendations not individual-level
Identifying and supporting people most at risk of dying prematurely (PH15)	Not one of the five health topics
Mental wellbeing and older people (PH16)	Not one of the five health topics
Promoting physical activity for children and young people (PH17)	Recommendations not individual-level
Needle and syringe programmes (PH18)	Not one of the five health topics
Management of long-term sickness and incapacity for work (PH19)	Not one of the five health topics
Social and emotional wellbeing in secondary education (PH20)	Not one of the five health topics
Reducing differences in the uptake of immunisations (PH21)	Not one of the five health topics
Promoting mental wellbeing at work (PH22)	Not one of the five health topics
School-based interventions to prevent smoking (PH23)	Recommendations not individual-level
Prevention of cardiovascular disease (PH25)	Recommendations not individual-level
Looked-after children and young people (PH28)	Not one of the five health topics
Strategies to prevent unintentional injuries among under-15s (PH29)	Wrong age group
Preventing unintentional injuries among under-15s in the home (PH30)	Wrong age group
Preventing unintentional road injuries among under-15s: road design (PH31)	Wrong age group
Skin cancer prevention: information, resources and environmental changes (PH32)	Not one of the five health topics
Increasing the uptake of HIV testing among black Africans in England (PH33)	Recommendations not individual-level
Increasing the uptake of HIV testing among men who have sex with men (PH34)	Recommendations not individual-level
Preventing type 2 diabetes - population and community interventions (PH35)	Recommendations not individual-level
Prevention and control of healthcare-associated infections (PH36)	Not one of the five health topics
Tuberculosis - hard-to-reach groups (PH37)	Not one of the five health topics

Table 3 Included NICE public health guidance by health topic

Topic	Relevant guidance
Smoking	Brief interventions and referral for smoking cessation (PH1) Workplace interventions to promote smoking cessation (PH5) Behaviour change (PH6) Smoking cessation services (PH10) Quitting smoking in pregnancy and following childbirth (PH26)
Physical activity	Four commonly used methods to increase physical activity (PH2) Behaviour change (PH6) Weight management before, during and after pregnancy (PH27) Preventing type 2 diabetes - risk identification and interventions for individuals at high risk (PH38)
Diet	Behaviour change (PH6) Maternal and child nutrition (PH11) Weight management before, during and after pregnancy (PH27) Preventing type 2 diabetes - risk identification and interventions for individuals at high risk (PH38)
Alcohol	Interventions to reduce substance misuse among vulnerable young people (PH4) Behaviour change (PH6) Alcohol-use disorders - preventing harmful drinking (PH24)
Sexual health	Prevention of sexually transmitted infections and under 18 conceptions (PH3)

Table 4 High level overview of interventions with evidence of effectiveness and their associated behaviour change coding

These represent the interventions highlighted in NICE guidance that show effectiveness and where it was possible to code behaviour change.

Topic	Population	Interventions with evidence of effectiveness	Associated behaviour change coding
Smoking	Adults	Brief interventions including advice to stop smoking (can also include pharmacotherapy and referral to NHS Stop Smoking services)	BCT36 Instructions on how to perform behaviour Can also include: BCT4 Pharmacological support BCT Cluster 1 "Social Support"
	Adults	Individual behavioural counselling	BCT3 Social support (unspecified)
	Adults	Group behaviour therapy	BCT3 Social support (unspecified)
	Adults	NRT	BCT4 Pharmacological support
	Adults	Self-help materials	BCT34 Adding objects to the environment
	Adults	Telephone counselling and quit lines	BCT4 Pharmacological support
	Adults	Rapid smoking form of aversion therapy	BCT7 Paradoxical instructions
	Pregnant women	Cognitive behaviour therapy	BCT3 Social support (unspecified)
	Pregnant women	Motivational interviewing	Intervention Function 2 Persuasion
	Pregnant women	Self-help and support from NHS Stop Smoking services	BCT Cluster 1 "Social Support" often with BCT4 Pharmacological support
Diet	Adults	Nutritional Counselling	No behaviour change coding possible (insufficient detail)
	Diabetes risk	Lifestyle interventions targeting diet to prevent diabetes cases	BCT29 Graded Tasks BCT89 Vicarious consequences BCT61 Problem Solving
	Pregnant women/new mothers	Large, diverse, multi-faceted "lifestyle interventions" including a dietary element	BCT3 Social support (unspecified) BCT61 Problem solving BCT Cluster 1 "Social Support" BCT Cluster 3 "Feedback and Monitoring" BCT Cluster 11 "Goals and Planning"
Physical Activity	Adults	Brief interventions in primary care (containing advice and/or motivational interviewing, follow up calls or an activity plan)	Intervention Function 1 Education Intervention Function 2 Persuasion BCT Cluster 1 "Social Support" BCT64 Action planning

Topic	Population	Interventions with evidence of effectiveness	Associated behaviour change coding
	Adults	Physical activity interventions	BCT3 Social support (unspecified) BCT10 Self-monitoring of behaviour BCT23 Behavioural practice/rehearsal BCT Cluster 1 "Social Support BCT Cluster 11 "Goals and Planning"
	Older people	Home based, group based and educational interventions.	BCT3 Social support (unspecified) BCT Cluster 11 "Goals and Planning" Intervention Function 1 Education
	Adults preventing diabetes	Lifestyle interventions containing specific physical activity elements.	BCT11 Self-monitoring of outcomes BCT29 Graded Tasks BCT64 Action planning BCT62 Goal setting (behaviour)) BCT89 Vicarious consequences BCT61 Problem Solving BCT23 Behavioural practice/rehearsal BCT36 Instructions on how to perform a behaviour
Diet and physical activity	Diabetes risk reduction in adults	Multifaceted interventions	BCT10 Self-monitoring of behaviour BCT11 Self-monitoring of outcomes BCT23 Behavioural practice/rehearsal BCT29 Graded Tasks BCT61 Problem solving BCT62 Goal setting (behaviour) BCT Cluster 1 "Social Support", BCT Cluster 3 "Feedback and Monitoring", BCT Cluster 11 "Goals and Planning" Intervention Function 1 Education Intervention Function 2 Persuasion
		Information and support from professionals (including motivational interviewing in some cases)	BCT Cluster 1 "Social Support" BCT Cluster 3 "Feedback and Monitoring" Intervention Function 2 Persuasion

Topic	Population	Interventions with evidence of effectiveness	Associated behaviour change coding
	Weight loss in women of child bearing age; expectant mothers and new mothers with BMI over 30	Opportunistic brief intervention	BCT Cluster 14 "Natural Consequences"
	Obese women post-partum	Characteristics of effective interventions in enabling women to lose weight post-partum	BCT Cluster 1 "Social Support" BCT Cluster 11 "Goals and Planning" BCT10 Self-monitoring of behaviour and BCT11 Self-monitoring of outcomes BCT64 Action planning Intervention Function 1 Education
	Obese women trying to become pregnant	Regular exercise, advice about healthy eating and group support.	BCT23 Behavioural practice/rehearsal BCT61 Problem Solving
Alcohol	Adult problem drinkers	Brief behaviour counselling	One or more of the following components: BCT3 Social support (unspecified) BCT10 Self-monitoring of behaviour BCT61 Problem solving BCT Cluster 5 "Repetition and Substitutions" Intervention Function 1 Education
	Reducing alcohol consumption in adults identified as hazardous drinkers	Brief interventions in primary care	BCT Cluster 1 "Social Support" BCT Cluster 3 "Feedback and Monitoring" BCT78 Information about health consequences BCT79 Information about emotional consequences
	Young people with substance misuse (including alcohol)	Brief intervention (including elements of motivational interviewing and goal setting)	Intervention Function 2 Persuasion BCT Cluster 11 "Goals and Planning"
Sexual Health	Adolescents to reduce pregnancies and or contraception use.	One to one sexual health advice	Intervention Function 1 Education BCT34 Adding objects to the environment (contraception) BCT3 Social support (unspecified) BCT4 Pharmacological support

Topic	Population	Interventions with evidence of effectiveness	Associated behaviour change coding
	Adults (including MSM) and adolescents for preventing STIs including HIV and increasing condom use	One to one structured discussions	BCT3 Social support (unspecified) BCT23 Behavioural practice/rehearsal BCT36 Instructions on how to perform a behaviour BCT61 Problem solving BCT62 Goal setting (behaviour BCT64 Action planning BCT78 Information about health consequences
	Index patients with an STI and their partners	Partner therapy plus support	BCT4 Pharmacological support BCT34 Adding objects to the environment BCT cluster “Social Support Intervention Function 1 Education

9 Appendix A

[For data extraction tables see separate document]

10 Appendix B

[For BCT taxonomy, BCT cluster and Intervention Function coding structures and descriptions see separate document]

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