Appendix A: Summary of new evidence

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
PH49 – 01. Recommendation 1 Develop a local behaviour change policy and strategy **evidence statements EP3, EP4, EP6–9, EP13**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 1 provides guidance to national and local and policy makers on ensuring policies and strategies aiming to improve everyone's health and wellbeing, using health equity audits and joint strategic needs assessments (JSNAs), ensuring proportionate universalism is employed and that evidence-based behaviour change programmes are commissioned.
PH49 – 02. Recommendation 2 Ensure organisation policies, strategies, resources and training all support behaviour change **evidence statements 3.1.1, 3.1.2, 3.1.3 EP 10, EP11**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 2 provides guidance on ensuring policies, strategies and resources are in place to provide behaviour change support for staff, as well as service users, that job descriptions acknowledge behaviour change skills and competencies, and that training is provided.
PH49 – 03. Recommendation 3 Commission interventions from services willing to share intervention details and data **evidence statements EP4–6, EP9, EP13**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 3 provides guidance on commissioning behaviour change interventions/programmes that aim to initiate and

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		maintain behaviour change, that are evidence-based, that include collection of behavioural data, process assessment and health outcomes.
PH49 – 04. **Recommendation 4 Commission high quality, effective behaviour change interventions** **evidence statements EP1, EP3–5, EP14**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 4 provides guidance on finding out whether behaviour change interventions/programmes already in place are effective, cost effective and apply evidence-based principles; and highlights the importance of planned evaluation of short-, medium- and long-term outcomes and quality assurance when interventions are commissioned. It also recommends commissioning a pilot if it is not clear that an 'effective' intervention is generalisable to a different behaviour, population or setting; only commission an intervention with no evidence of effectiveness if it is accompanied by an evaluation; and to disinvest if there is evidence that an intervention/programme is not effective or harmful.
PH49 – 05. **Recommendation 5 Plan behaviour change interventions and programmes taking local needs into account** **evidence statements EP1–3, EP5, EP14**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 5 provides guidance on co-production when planning behaviour change interventions, of taking local needs, social and cultural contexts into account.

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PH49 – 06. Recommendation 6 Develop acceptable, practical and sustainable behaviour change interventions and programmes **evidence statements EP1–3**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 6 provides guidance on co-production when developing behaviour change interventions to ensure they are acceptable, practical and sustainable; ensure detailed descriptions of interventions are provided in a manual which is publicly available.
PH49 – 07. Recommendation 7 Use proven behaviour change techniques when designing interventions **evidence statements 1.2, 1.4, 1.6, 1.7, 1.9, 1.10–1.19, 1.20, 1.21, 2.1.8, 2.3.7, 2.3.11, 2.3.13, 2.3.17, 2.4.4, 2.4.5, 2.4.8, 2.5.5, 2.5.6, 2.5.7, 2.5.9, 2.5.11, 2.5.15, 3.3.3, 3.3.4, 3.3.6, 3.3.7, EP14**		
Twenty-six studies (22 SRs and 4 RCTs) were identified that reported on behaviour change techniques (BCTs) in behaviour change interventions for adults: **Physical activity, Diet and Weight** Eighteen studies (15 SRs and 3 RCTs) reported the BCTs used and associated with effectiveness in physical activity, diet and/or weight interventions for adults which did not involve any technology elements: A systematic review of 14 studies involving 648 participants found that those interventions to promote exercise in adult cancer survivors which reported better levels of adherence (3 trials) shared some common behaviour change techniques: setting programme goals, prompting practise and self-monitoring, encouraging participants to attempt to generalise behaviours learned in supervised exercise environments to other, non-supervised contexts.[1]	Initial intelligence gathering identified the following: A Cochrane review on Interventions for promoting habitual exercise in people living with and beyond cancer included 14 studies (n=648). It reported that interventions with better levels of adherence shared some common BCTs: setting programme goals, prompting practise and self-monitoring and encouraging participants to attempt to generalise behaviours learned in supervised exercise environments to other, non-supervised contexts.[52] A Cochrane review (Incentives for smoking cessation) of 21 RCTs (n>8,400) looking at the effectiveness of incentives and contingency management programmes in smoking quit rates reported that incentives boost cessation rates in adults, but only while they are in place, they noted two work sites trials achieved sustained success rates beyond the reward schedule,	**New evidence was identified that does not have an impact on the recommendation.** Recommendation 7 provides guidance on the behaviour change techniques (BCTs) that should be included in interventions: goals and planning, feedback and monitoring and social support; to consider using other evidence-BCTs that may also be effective and to consider delivering an intervention remotely (or providing remote follow-up) if there is evidence that this is an effective way of changing behaviour. Overall, there is strong support for the effectiveness of a combination of **goals, planning, feedback and monitoring BCTs** in improving physical activity, diet and weight [1-5, 7-15, 17, 18]. Only 1 SR appears to contradict this finding – it reported that in adults aged over 60 years old that these BCTs were associated with lower levels of physical activity [6]; and there was 1 RCT using only feedback (rather than the recommended combination of BCTs), which did not

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A systematic review and meta-analysis of 14 studies found that the common BCTs reported in interventions that aimed to reduce the decline of physical activity in pregnant women were: goal setting and planning, feedback, repetition and substitution, shaping knowledge and comparison of behaviours; and regular face-to-face meetings were also commonly employed. The relationship between BCTs and effectiveness was not reported but the authors reported that 'in 8 out of 10 studies, which provided adequate data, participants in the intervention group were more physically active post intervention than controls'.[2] A systematic review of 20 controlled studies and meta-analysis (n=14) of physical activity interventions with post-natal women found that efficacious interventions always included the following BCTs: goal setting (behaviour) and prompt self-monitoring of behaviour.[3] A systematic review and meta-analysis of 19 RCTs of physical activity interventions for adults aged 55-70 years with outcomes reported >12 months after randomisation found that interventions were effective in promoting physical activity compared with no/minimal intervention comparators. Goal setting was the most commonly used BCT across interventions. Interventions using the BCT feedback appeared to be more effective, while those using information on where and when to perform the behaviour and information on consequences of behaviour to the individual 'may be less effective'. There was no relationship between effect size and number of BCTs nor self-regulatory BCTs.[4] An analysis of BCTs and intervention features within studies from a SR of physical activity interventions in adults with Type 2 diabetes (n=1,975) found that the	which was likely due to substantial cash payments for abstinence. There was also evidence of effectiveness of contingency management programmes (aka Deposit-refund trials) and an indication that participants may achieve higher quit rates than reward-only participants, however the interventions can suffer from relatively low rates of uptake. Incentive schemes conducted among pregnant smokers improved the cessation rates, both at the end-of-pregnancy and post-partum assessments.[53] A Cochrane review of 28 studies N>16,000) of motivational interviewing (MI) smoking cessation interventions reported that MI compared to brief advice or usual led to a modest but significant increase in quitting smoking. The authors noted that 'the results should be interpreted with caution, due to variations in study quality, treatment fidelity, between-study heterogeneity and the possibility of publication or selective reporting bias'.[54]	report a significant effect of the intervention on physical activity [16]. Where intervention content was reported within technology-based interventions, it seems that many of these studies used personalised feedback and/or goal setting and/or monitoring [31, 34, 40- 47, 55] (see recommendation for research 6 for further details). When **social support** was mentioned, there was also shown to be support for the effectiveness of this BCT [13, 8]. There were relatively few studies identified in the areas of smoking, alcohol and sex. Within the smoking studies there was evidence of effectiveness of goals, planning, monitoring and social support BCTs in reducing smoking but no mention of feedback [19-22]. Within the alcohol studies prompting self-recording (monitoring) was highlighted as associated with larger effect sizes [23]. The 1 SR of interventions on sex noted that goal and planning BCTs were associated with effective interventions [26]. There were also several **other BCTs identified** in SRs of effective interventions, ones reported in more than one SR include 'prompt practice', instruction on how to perform behaviour, BCTs around comparing behaviour with others and normative feedback/information, linking condition with behaviour (in people with a medical condition), rewards and relapse prevention. Recommendation 7 does recommend considering using other evidence-based behaviour change techniques that may also be effective, and directs the reader to existing NICE guidelines for further information on effective interventions. Studies of **motivational interviewing** (MI) indicate that these are effective in leading to behaviour change across physical activity, diet, weight, smoking

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BCTs with statistically significant associations within increased physical activity: prompt focus on past success, barrier identification/problem-solving, use of follow-up prompts and provide information on where and when to perform physical activity. Pedometer use was associated with decreased levels of physical activity.[5] A systematic review of 24 studies looking at changes in self-efficacy for physical activity in adults aged 60 years and over reported that self-regulatory BCTs led to lower levels of self-efficacy and physical activity: setting behavioural goals, prompting self-monitoring of behaviour, planning for relapses, providing normative information and providing feedback on performance.[6] A systematic review and meta-analysis of 45 studies of multi-component goal setting interventions for changing physical activity reported that these had a medium significant positive effect on physical activity.[7] A systematic review and meta-analysis of 42 interventions reporting changes in physical activity in obese adults, reported a medium significant effect and that 21 BCTs were associated with positive changes in physical activity, including: prompt self-monitoring of behavioural outcome and plan social support/social change; and largest effects were found with interventions containing: teach to use prompts/cues, prompt practice or prompt rewards contingent on effort or progress towards behaviour.[8] A Cochrane review of 38 RCTs involving 9445 participants that measured diet adherence outcomes between an intervention group and a control/usual care group reported that the following interventions effectiveness is inconclusive as they improved at least one diet adherence outcome but also showed		and sex [15, 29, 30, 54]. Motivational interviewing was not explicitly recommended within PH49 due to difficulty in identifying the techniques used within studies that purported to use MI, however the approach taken to behaviour change recommended in the guideline is in line with the principles of MI. The considerations section of PH49 highlighted the following: 'The PDG noted that a lack of detail in published journal articles on studies claiming to use motivational interviewing had affected the Group's ability to determine the behaviour techniques used. The PDG recognised that motivational interviewing is based on a clear set of principles and components. But as the articles did not specify which principles and components were used, the Group could not assume that motivational interviewing was used. This made it impossible to recommend this approach. It also added further support to the Group's recommendation that manuals should provide details of all the intervention components used.' No evidence was identified that indicated whether or not the situation has changed. A Cochrane review reported that smoking cessation interventions using **incentives** and contingency management programmes (individuals deposit money that is refunded contingent on reaching a goal) are effective while they are in place and that contingency management programmes may be more effective, but are less popular [53]. One SR of financial incentives for changing smoking, diet, alcohol and physical activity found that these led to behaviour change during the period of reward, but only continued up to 3 months after incentives were removed [27]. One SR reported that interventions involving contingency management programmes are effective for weight loss, but that the effect does not last after the interventions. [28]

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no difference in some diet adherence outcomes: telephone follow-up, video, contract, feedback, nutritional tools and more complex interventions including multiple interventions. And the following interventions showed no significant effect: studies investigating interventions such as a group session, individual session, reminders, restriction and BCTs. The authors noted that studies were generally of short duration and low quality, and adherence measures varied widely.[9] A meta-CART analysis was applied to effect sizes from 122 interventions targeted at physical activity and healthy eating, and intervention BCTs were coded from a previous SR. This identified that the following BCTs are the most effective combination: provide information about behaviour-health link + Prompt intention formation, and provide information about behaviour-health link + Provide information on consequences and Use of follow-up prompts. The least effective interventions were those using provide feedback on performance without using provide instruction.[10] A systematic review and meta-analysis of RCTs (n=NR) of behavioural interventions targeting dietary and/or physical activity change for obese adults with risk factors and follow-up data > 12 weeks found that the BCTs linked to more successful interventions were: provision of instructions, self-monitoring, relapse prevention and prompting practice. They also reported that studies including more BCTs aimed at dietary change that were congruent with Control Theory were associated with greater weight loss; and there is not a link between increasing numbers of BCTs and better outcomes.[11] A systematic review and meta-analysis of 37 RCTs involving over 16,000 participants on behavioural		Please see Research recommendation 6 for a discussion on the impact of studies assessing the effectiveness of **behaviour change interventions delivered remotely.**

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weight management programmes found that there was a significant loss in weight at 12 months. Variables associated with greater weight loss: calorie counting, contact with a dietitian and use of BCTs that compare participants' behaviour with others. Programme effectiveness was not associated with supervised physical activity sessions, more frequent contact or in-person contact.[12] A systematic review of 32 papers describing 27 weight loss interventions in overweight and obese cancer survivors found that those with a robust study design (n = 8) generally showed <5% weight loss and did not evaluate effects at >12 months after intervention completion. Effective interventions promoted both diet and physical activity and used the BCTs: goal setting (behaviour), action planning, social support (unspecified) and instruction on how to perform the behaviour.[13] A systematic review of 84 studies of various designs investigating strategies for treating obesity in men reported that: reducing diets tended to produce more favourable weight loss than physical activity alone; a reducing diet + physical activity + behaviour change gave the most effective results; low-fat reducing diets combined with physical activity and behaviour change training led to the most effective long-term weight change. Men preferred interventions that were individualised, fact-based and flexible, which used business-like language and which included simple to understand information.[14] A systematic review and meta-analysis of 48 RCTs involving obese adults aged over 40 years old reporting short-term (<6 months) and long term (>12 months) outcomes found that the BCTs goal-setting and self-monitoring, and the number of BCTs unique to the intervention group predicted short and long-		

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term effects. The total number of BCTs and following BCTs predicted the effect in the long-term: goal setting of outcome, feedback on outcome of behaviour, implementing graded tasks, and adding objects to the environment, e.g. using a step counter. All between study variations in long-term effects could be explained by: autonomy supportive and person-centred methods such as Motivational Interviewing, the BCTs goal setting of behaviour, and receiving feedback on the outcome of behaviour.[15] A parallel group RCT with healthy adults (n=466) randomised to receive either no feedback until the end of the trial or one of three different types of personalised feedback: simple, visual, or contextualised found no effect of the intervention conditions on physical activity. The authors concluded that 'measurement and feedback may have a role in promoting behaviour change but are ineffective on their own.'[16] An RCT with participants not meeting recommended levels of physical activity (n=124) randomised to goal-setting + self-monitoring + feedback (GS + SM + F), goal-setting + self-monitoring (GS + SM), or goal-setting only (GS) conditions, found that participants in the GS + SM + F condition significantly outperformed those in the GS condition, and marginally outperformed those in the GS + SM condition in terms of total physical activity at follow-up.[17] A pilot RCT with overweight and obese adults with type 2 diabetes (n=23) randomised to receive a behavioural intervention that used goal setting, time management, and self-monitoring to target dimensions of self-regulation and moderate-to-vigorous physical active (MVPA) or a control condition providing information regarding physical		

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activity habits, found that the intervention had no impact on dimensions of MVPA across time.[18] **Smoking** Four studies (3 SRs and 1 RCT) reported the BCTs used and associated with effectiveness in smoking cessation interventions for adults which did not involve any technology elements: A systematic review and meta-analysis of 17 RCTs involving 7446 participants with chronic obstructive pulmonary disease (COPD) found that the BCTs associated with significantly larger effect sizes in smoking cessation interventions were: Facilitate action planning/develop treatment plan, Prompt self-recording, Advise on methods of weight control, and Advise on/facilitate use of social support. Three new COPD-specific BCTs were also identified (details not given) and it was found that linking COPD and smoking resulted in large effect sizes.[19] A systematic review of 19 studies (n=3,663) of interventions that reduced smoking in lesbian, gay, bisexual, transgender, and intersex people reported that common BCTs included providing action planning, social support, normative information, boosting motivation/self-efficacy, relapse prevention, and discussing consequences.[20] A study identified BCTs within 7 interventions within an existing Cochrane review of smoking cessation behavioural support in pregnancy that had been shown to increase the odds of cessation by at least 50%, and were statistically significant compared to control conditions. 11 BCTs were present in at least 2 effective interventions, the following were highlighted: facilitate goal setting, advise on social support, action planning, provide rewards contingent on successfully stopping smoking.[21]		

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An RCT with adult smokers (n=168) randomised to either ‘if-then’ plans or ‘when-then’ plans using supporting tools, or to 1 of 2 control conditions in which they were exposed to identical supporting tools but were not asked to form if-then plans or when-then plans, found that smokers who formed implementation intentions (planning) were significantly more likely to quit.[22] **Alcohol** Two studies reported the BCTs used and associated with effectiveness in alcohol interventions for adults which did not involve any technology elements: A study identified BCTs within studies included in the Cochrane Review of brief alcohol interventions. A meta-regression to assess the associations between the BCTs and effectiveness found that brief interventions that included the BCT 'prompt self-recording' were associated with larger effect sizes. [23] A meta-analysis of 41 RCTs involving 17,445 adults in social influence-based interventions on alcohol intake reported that providing normative information about others' behaviour and experiences was the most effective BCT to change social influences - changes in social influences were significantly associated with changes in alcohol intake BUT only led to a small change in drinking behaviour; and changing social influences did not reduce alcohol-related problems.[24] **Across behaviours** A systematic review of SRs (n=19) on the effectiveness of personalised risk information in changing smoking, physical activity, diet and alcohol consumption reported that results were inconclusive, but ‘most promising’ with smoking cessation and		

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dietary behaviour outcomes. The authors concluded that 'presenting risk information on its own … does not produce strong effects on health-related behaviours or changes which are sustained'.[25] **Sex** A systematic review and meta-analysis of 10 trials of interventions that aim to reduce risky sexual behaviour among MSM after a negative HIV infection test found that the approaches and BCTs associated with significant effectiveness: face-to-face contact immediately after testing, theory-based content and BCTs drawn from 'goals and planning' and 'identity' groups. Authors noted that 'the lack of detailed intervention manuals limited the assessment of intervention content, delivery and fidelity.'[26] **Technology-based interventions are reported under recommendation for research 6.** **Incentives** Two SRs reported on the effectiveness of incentives in changing behaviour: A systematic review and meta-analysis of 34 studies on financial incentives for changing smoking, diet, alcohol and physical activity found that these interventions resulted in behaviour change sustained 18 months from baseline and 3 months after incentives were removed. High deprivation of participants was associated with higher intervention effects but only at 6-12 months from baseline.[27] A systematic review and meta-analysis of RCTs (n=NR) testing the effect of weight loss-related Monetary Contingency Contracts (MCCs: require individuals to deposit money that is refunded contingent on reaching a goal) reported a significant small-to-medium effect of MCCs on weight loss		

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during treatment but no significant effect post-treatment. The following were associated with greater weight loss during treatment: group refunds, deposit not paid as lump sum, participants setting their own deposit size and additional behaviour change techniques (not listed).[28] **Motivational interviewing** Two SRs reported on the effectiveness of behaviour change motivational interviewing interventions: A systematic review and meta-analysis of 15 studies of interventions involving motivational interviewing to target sex, physical activity or diet behaviour in adolescents found that these interventions produced a small but significant effect compared to a control condition, which was sustained at a follow-up period averaging 34 weeks.[29] A systematic review of 14 RCTs found that motivational interviewing interventions for people with Type 2 diabetes that targeted dietary changes, physical activity, smoking cessation, and alcohol reduction had significant impact on some dietary behaviours and on weight loss.[30]		
PH49 – 08. Recommendation 8 Ensure interventions meet individual needs **evidence statements EP1–3, EP5, EP6, EP9**		
No evidence identified	Initial intelligence gathering identified the following: A Cochrane review of 11 studies (n=5862 adults) on remote and web 2.0 interventions for promoting physical activity found a positive, moderate effect of interventions on self-reported physical activity at one year; and that the most effective interventions used a tailored approach and telephone contact to provide feedback and	**New evidence was identified that does not have an impact on the recommendation.** Recommendation 8 provides guidance on making services acceptable and accessible and tailoring an intervention to individual's needs, capability, opportunity, motivation and any specific needs with regards to sexual orientation, gender identity, gender, culture, faith or any type of disability.

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	support changes in physical activity levels. The authors noted 'a paucity of cost effectiveness data and studies that include participants from varying socioeconomic or ethnic groups'.[55] A topic expert noted that existing diet, physical activity and smoking interventions can lead to small changes in these areas for people with on a low income: Are interventions for low-income groups effective in changing healthy eating, physical activity and smoking behaviours? A systematic review and meta-analysis included 35 studies containing 45 interventions (n=17 000). Post-intervention effects were positive but small for diet, physical activity and smoking and in studies reporting follow-up results effects appeared to be maintained for diet, but not physical activity or smoking.[56]	The findings of the Cochrane review are in line with the current recommendation. The study showing that interventions can lead to behaviour change in people on a low income supports the recommendation content.
PH49 – 09. Recommendation 9 Deliver very brief, brief, extended brief and high intensity behaviour change interventions and programmes **evidence statements EP10–12**		
No evidence identified	A topic expert identified Making Every Contact Count: an evaluation which reports that Making Every Contact Count has considerable potential for changing staff behaviour in relation to promoting health enhancing behaviour among members of the general public coming into contact with services.[57]	**New evidence was identified that does not have an impact on the recommendation.** Recommendation 9 provides guidance on the content and circumstance for health, wellbeing and social care staff to deliver very brief, brief, extended brief and/or high intensity behaviour change interventions and programmes. The report on Making Every Contact Count supports the recommendation.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
PH49 – 10. Recommendation 10 Ensure behaviour change is maintained for at least a year **evidence statements 1.2, 1.4, 1.6, 1.7, 1.9, 1.10–1.19, 1.20, 1.21, 2.4.4, 2.4.5, 2.5.5, 2.5.6, 3.3.3, 3.3.4, 3.3.6, 3.3.7, EP14**		
Feedback, monitoring, action plans and social support are discussed under recommendation 7. The following 2 studies specifically address relapse: A systematic review and meta-analysis of RCTs (n=NR) of behavioural interventions targeting dietary and/or physical activity change for obese adults with risk factors and follow-up data > 12 weeks found that the BCTs linked to more successful interventions were: provision of instructions, self-monitoring, relapse prevention and prompting practice. They also reported that studies including more BCTs aimed at dietary change that were congruent with Control Theory were associated with greater weight loss; and there is not a link between increasing numbers of BCTs and better outcomes.[11] A systematic review of 24 studies looking at changes in self-efficacy for physical activity in adults aged 60 years and over reported that self-regulatory BCTs led to lower levels of self-efficacy and physical activity: setting behavioural goals, prompting self-monitoring of behaviour, planning for relapses, providing normative information and providing feedback on performance.[6]	No evidence identified	**New evidence was identified that does not have an impact on the recommendation.** Recommendation 10 provides guidance on how to help people maintain behaviour change in the long-term: regular feedback and monitoring, having well-rehearsed action ('if-then') plans, making changes to their immediate physical environment, having good social support, developing supportive routines/habits. Overall, there is support for feedback, monitoring, action plans and social support. Relatively few studies have highlighted the effectiveness of planning for relapses – 1 SR [11] reported the importance of relapse prevention in dietary and/or physical activity change in obese adults but another indicates that in older adults planning for relapse does not work [6].
PH49 – 11. Recommendation 11 Commission training for all staff involved in helping to change people's behaviour **evidence statements EP5, EP10–12**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 11 provides guidance on commissioning training for relevant staff to meet the service specification for any behaviour change intervention or programme, content of training

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
		programmes, regular training and evaluation of training.
PH49 – 12. Recommendation 12 Provide training for behaviour change practitioners **evidence statements 3.3.1–3, 3.2.1, 3.2.2, 3.3.1–9, EP5, EP10–12**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 12 provides guidance on the skills and competencies required of behaviour change practitioners, including the need to be person-centred and tailor interventions to an individual's needs, to communicate well, develop rapport, assess behaviour, understand factors that may affect behaviour change, know how an intervention works and how to deliver it.
PH49 – 13. Recommendation 13 Provide training for health and social care practitioners **evidence statements EP5, EP10–12**		
No evidence identified	A topic expert identified two reports on the role of health trainers in behaviour change: Governance Framework for Health Trainer Services: Management, Delivery and Evaluation (RSPH & Health Education Wessex, 2014) provides a checklist of recommendations and best practice standards for health trainer services, including recommendations for providing training in behaviour change. Indicators of change The adaptation of the health trainer service in England (RSPH, DCRS, 2015) provides evidence for the effectiveness of the health trainer service.	**New evidence was identified that does not have an impact on the recommendation** Recommendation 13 provides guidance on ensuring all health and social care professionals can, as a minimum, deliver a very brief intervention and that behaviour change knowledge, skills and delivery techniques comprise a formal element of initial training, work placements and ongoing continuous professional development for all those who deliver health and social care services. The 2 reports on health trainer services support the current recommendation.

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PH49 – 14. Recommendation 14 Assess behaviour change practitioners and provide feedback **evidence statements EP5, EP10–12**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 14 provides guidance on assessing the ability of those delivering behaviour change interventions regularly and providing them with feedback on performance.
PH49 – 15. Recommendation 15 Monitor behaviour change interventions **evidence statements EP1–3**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 15 provides guidance on ensuring all interventions are monitored for health inequalities impact, behavioural outcomes, process measures and intervention fidelity.
PH49 – 16. Recommendation 16 Evaluate behaviour change interventions **evidence statements EP1–3, EP14**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes** Recommendation 16 provides guidance on ensuring all interventions have clear plans for evaluation from the outset, using objective, validated measures of outcomes and processes where available, to include quantitative and qualitative assessment and assessment of long-term outcomes.
PH49 – 17. Recommendation 17 National support for behaviour change interventions and programmes **evidence statements IDE**		
No evidence identified	No evidence identified	**No new evidence was identified, no changes**

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		Recommendation 17 provides guidance on the monitoring, collection and surveillance of routine data that national organisations should consider to monitor the outcomes of activities to improve the public's health, to track the prevalence of behaviours over time, region and social group and to support local implementation of behaviour change interventions; that national organisations responsible for behaviour change training and curricula provide a central repository for behaviour change training curricula and guidance on behaviour change competency frameworks; and national organisations responsible for research funding should ensure research related to behaviour change includes certain minimum details about intervention content, delivery and fidelity.
Research recommendations		
RR – 01 **Which choice architecture interventions help to reduce increased-risk and higher-risk drinking of alcohol, improve sexual health behaviours, help stop or reduce smoking, or increase the physical activity levels of the general UK population? How is this related to sociodemographic variables?**		
See the surveillance report for Behaviour change: general principles (PH6), recommendation 6	See the surveillance report for Behaviour change: general principles (PH6), recommendation 6	**New evidence was identified that does not have an impact on the guideline** The majority of evidence identified addressed the effectiveness of choice architecture interventions for diet. There remains a paucity of evidence in the areas of alcohol, sex, smoking and physical activity.
RR – 02 **What evidence of effectiveness is there on the use of choice architecture interventions in commercial settings to influence health-related behaviours? How can findings from commercial settings support non-commercial choice architecture approaches to support behaviour change to improve health?**		
No evidence identified	No evidence identified	**No new evidence was identified that has an impact on the guideline**

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RR – 03 **Which combinations of behaviour change techniques and modes of delivery are effective and cost effective in initiating particular behaviour changes, and in maintaining those changes? How does this vary among people from different socio-demographic groups or with different levels of motivation, access to information or skills?**		
See recommendation 7	See recommendation 7	**New evidence was identified that does not have an impact on the guideline**
RR – 04 **Which behaviour change interventions and programmes are effective and cost effective at changing multiple behaviours and maintaining behaviour change? How does this vary among people from different sociodemographic groups?**		
No evidence identified	A topic expert noted that this was still an area requiring research, that there was some evidence (references not provided) to indicate that smoking should not be addressed at the same time as changing other behaviours – they should be addressed sequentially rather than in parallel, however, the evidence is not robust. Further research is required across the different target behaviours; and exploration of appropriate outcome measures is needed.	**New evidence was identified that does not have an impact on the guideline** The views of the topic expert indicate that this is still a relevant recommendation for research.
RR – 05 **What characteristics of behaviour change training influence the effectiveness of behaviour change practitioners?**		
No evidence identified	No evidence identified	**No new evidence was identified that has an impact on the guideline**
RR – 06 **How effective and cost effective are behaviour change interventions delivered remotely (that is, by telephone, text message, phone and tablet apps or the internet)? How does this vary among behaviours and among people from different sociodemographic groups?**		
Twenty-one studies (13 SRs and 8 RCTs) reported on the effectiveness of technology-based interventions at changing behaviour [31-51]. **Across behaviours** There were 2 SRs assessing the effects of technology-based interventions across behaviours: A systematic review of 55 articles on the effectiveness of periodic messaging and prompts to change behaviour (behaviours included studies on	Initial intelligence gathering identified the following: An interactive digital intervention to increase condom use in heterosexual men in sexual health clinics: A feasibility RCT with men (n=159) comparing the 'Men's Safer Sex' website plus usual care vs usual care only found no group difference in condom-less sex with female partners.[58]	**New evidence was identified that does have an impact on the guideline** This research recommendation will be removed from the NICE version of the guideline and the NICE research recommendations database. If needed, a new research recommendation may be made as part of the update process. There is a body of evidence on technology-based interventions for diet, physical activity, weight and

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
smoking, physical activity, diet) delivered via text messages, email, mailed communications, and sometimes via phone reported that these interventions 'yield positive results for short-term health behaviour changes' and that 'interventions including feedback and prompts that included strategies were more likely to report significantly positive outcomes'.[31] A systematic review of 10 experimental studies involving 113,988 participants in online social network health behaviour interventions targeting smoking, alcohol, diet, physical activity and sedentary behaviour found that effect sizes for behaviour change had a wide range, but were generally small in magnitude and statistically non-significant; and that there was only 'very modest evidence that interventions incorporating online social networks may be effective', noting however that research in this area is 'in its infancy'. [32] **Diet, physical activity and weight interventions** There was 1 SR assessing the effects of technology-based interventions on diet and physical activity, 4 SRs on weight and 2 meta-analyses on physical activity interventions. Eight RCTs assessed the effects of technology-based interventions on diet and/or physical activity in adults: A systematic review of 27 studies of health and fitness Apps to improve diet, physical activity or sedentary behaviour as stand-alone or part of multi-component interventions found that a larger proportion of multi-component interventions (8 out of 13) showed significant between-group improvements compared to stand-alone App interventions (5 out of 14). The authors noted that 'future research is needed on the optimal number and combination of App features, behaviour change techniques, and	A Cochrane review of 11 studies (n=5862 adults) on remote and web 2.0 interventions for promoting physical activity found a positive, moderate effect of interventions on self-reported physical activity at one year; and that the most effective interventions used a tailored approach and telephone contact to provide feedback and support changes in physical activity levels. The authors noted 'a paucity of cost effectiveness data and studies that include participants from varying socioeconomic or ethnic groups'. [55] A Cochrane review of 77 trials on the effect of telephone counselling for smoking cessation found that telephone counselling with smokers who seek help from quit-lines leads to an increase in quit rates, as does proactive telephone counselling not initiated by calls to helplines. There was some evidence of a dose response, with 1 or 2 brief calls less likely to provide a measurable benefit compared to 3 or more calls when compared to a minimal intervention such as standard self-help materials, brief advice, or pharmacotherapy alone.[59] A Cochrane review of 11 RCTs (n=1381) assessing the effectiveness of telephone delivered interventions for reducing morbidity and mortality in people with HIV infection reported evidence from 1 study that telephone interventions reduce risky sexual behaviour in young substance abusing HIV positive people, while a trial of older persons found no benefit. The authors noted that current evidence is sparse, and further research is needed.[60] Two topic experts noted an interest in whether there was research on the effectiveness of	smoking in adult populations on which recommendations could be based [31-51]. There is a paucity of interventions aiming to reduce alcohol intake and improve safe sex practices; and a lack of research on the effectiveness of technology-based interventions across behaviours with children and adolescents. Content of interventions (where details are provided) are in line with existing recommendations in PH49 on the importance of personalised/tailored feedback and the use of goal setting and feedback. In terms of impact on recommendation 7, this evidence does not negate what has been recommended: 'Consider delivering an intervention remotely (or providing remote follow-up) if there is evidence that this is an effective way of changing behaviour. For example, use the telephone, text messaging, apps or the internet.' It may however be possible to provide further details concerning the content of technology-based interventions, how they are delivered and to whom. Systematic reviews assessing the use of technology-based interventions across behaviours reported that periodic messaging and prompts delivered via text messages, email, mailed communications, and sometimes via phone show positive results in the short-term and that interventions including feedback and strategy-based prompts were more likely to report significantly positive outcomes [31]; whereas interventions using online social networks were not effective at changing behaviour. [32]. The majority of studies reported on the effectiveness of mobile technology or the use of computers/internet, while only a few studies reported on the success of Apps. It was noted during the literature search sift that there are many studies reporting on the BCT content of Apps, but they did not report on the effectiveness of

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
level of participant contact needed to maximise user engagement and intervention efficacy.' [33] A systematic review and meta-analysis of 12 studies on internet-delivered weight loss interventions providing personalised feedback found that these were effective for weight loss in overweight and obese adults in comparison with control groups receiving no personalised feedback at 3 and 6 month time points, but not in studies with interventions lasting for >12 months.[34] A systematic review and meta-analysis of 17 RCTs on mobile device interventions for weight loss in adults reported a medium significant effect size favouring mobile devices.[35] A systematic review of 14 studies of weight management programmes incorporating text messaging in children (5 studies – results not reported) and adults (9 studies), with a meta-analysis of data from 6 studies in adults found that there was a significantly greater weight loss in intervention participants compared to controls.[36] A systematic review of RCTs investigating the effectiveness of using smartphones in the treatment of child and adolescent overweight or obesity found only 2 RCTs, both of which were not effective in achieving weight loss. The trials did report that smartphone usage was linked to improved engagement and reduced dropout rates during sustainability phases of these long-term interventions.[37] A meta-analysis of 34 articles reported a small significant effect of internet-delivered interventions that aim to increase physical activity. There was significant heterogeneity across studies; and moderating variables such as larger sample size,	behaviour change interventions delivered remotely but did not provide any references.	these interventions – as Apps are relatively new to the market it is likely that studies on the effectiveness of Apps will emerge in the near future. Overall there was general support for the short-term effectiveness of technology-based interventions in adults for diet, physical activity and/or weight [31, 34, 38, 42, 45]. There was some indication of long-term effectiveness of physical activity interventions from a Cochrane review on remote and web interventions [55] and a pilot RCT using telephone support [46]. Where intervention content was reported, it seems that many of these studies used personalised feedback and/or goal setting and/or monitoring [31, 34, 40- 47, 55]. The one systematic review of interventions using smartphones with overweight or obese children and adolescents (population out of scope for PH49 but within DH referral) reported that these were not effective in achieving weight loss, however this was based on only 2 RCTs [37]. Two SRs assessing the effects of technology-based interventions on smoking cessation were based on a large number of studies and reported that internet sites, computer programs, mobile telephone text messages and other electronic aids for smoking cessation are effective [48, 49]. While effects may be small, they were reported as likely to be cost-effective when added to non-electronic behavioural support, however it is not yet clear what the most effective/cost-effective type of electronic intervention is [48]. A Cochrane review reported that telephone support can be effective at helping smokers quit [59]. There appears to be a lack of research into the effects of technology-based interventions on alcohol intake and safe sex. There was only 1 study on alcohol: a meta-analysis study on the effects of self-directed computer-delivered interventions vs controls

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
screening for baseline physical activity levels and inclusion of educational components significantly increased intervention effectiveness. Long-term effects were unknown.[38] A meta-analysis of 11 studies involving 1351 participants found that interventions using mobile phones or personal digital assistants have a significant effect on physical activity behaviour.[39] A pilot RCT with adults (n=17) randomised to receive personalised actionable, low-effort suggestions on diet and physical activity that are contextualised to the user's environment and previous behaviour via an App (MyBehaviour) or to receive non-personalised suggestions, found that walking increased significantly in the intervention group compared to control group; and there was a non-significant increase in choosing lower calorie foods in the intervention vs control group.[40] An RCT with obese adults (n=210) randomised to a paper diary (PD), personal digital assistant (PDA), or PDA plus daily tailored feedback messages (PDA + FB) found that the PDA+FB significantly reduced their energy intake compared to both other groups combined.[41] An RCT with low active participants (n=97) randomised to an intervention including a pedometer, step goal walking programme and access to the Stepwise website (containing interactive self-monitoring and goal feedback tools, motivational messages and action and coping planning strategies) or control group receiving a pedometer and locally available physical activity information, found that both groups' step counts significantly increased from baseline to week 12 and that the intervention group’s		to reduce alcohol consumption, which found a small significant effect, with larger effect sizes found in interventions incorporating goal setting, feedback, and the **normative information/social norm** approach; while providing **information on the consequences** of alcohol consumption was associated with smaller effects [50]. Three studies reported on safe sex interventions. A Cochrane review found only 2 studies assessing telephone delivered interventions that aim to reduce risky sexual behaviour in HIV positive people, which indicated a reduction in risky sex amongst young, but not older people [60]. A SR assessing the effects of mobile technology-based interventions on sex found mixed results: an increase in uptake of sexual health services using SMS reminders but no significant increase in condom use [51]; And one feasibility RCT found no evidence of effectiveness of a safer sex website for men [58].

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
step counts were significantly higher at 24 weeks compared to the control group.[42] An RCT with inactive overweight adults (n=20) randomised to a static intervention which set a goal of 10,000 steps/day (SI; pedometer, email and text message communication, brief health information, and biweekly motivational prompts) or an adaptive intervention (AI) which 'ensured goals were always challenging but within participants' abilities' and included the same elements as SI plus adaptive goal setting and feedback, found that steps/day increased significantly more in the AI group over the 6 month intervention.[43] An RCT with smartphone users who were outpatients at an ambulatory cardiology centre (n=48) sequentially randomised to an automated mobile health intervention with unblinded vs blinded tracking and texting components (smart texts provided coaching 3 times/day aimed at individual encouragement and fostering feedback loops by a fully automated, physician-written, theory-based algorithm using real-time activity data and 16 personal factors with a 10 000 steps/day goal), found that the automated tracking-texting intervention significantly increased physical activity with, but not without, the texting component.[44] An RCT with patients with type 2 diabetes (n=126) randomised to a 'Text to Move' (TTM) intervention (physical activity monitoring and coaching via automated and personalised text messages to help patients achieve physical activity goals) or control arm receiving pedometers, found that physical activity increased significantly in the intervention group in the third and fourth months of the study compared to the control group, but was not		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
significantly higher over the 6-month follow-up period. [45] A pilot RCT with participants aged >50 years old (n=75) randomised to a control, goal-setting or goal-setting plus mentoring via telephone found that at 12-month follow-up, the two goal-setting groups, taken together increased their level of physical (small effect size) relative to controls; and the addition of follow-up mentoring produced further benefits compared to goal-setting alone in physical activity, body composition.[46] A pilot RCT with obese adults (n=39) randomised to a self –monitoring (SM) and/or + real-time feedback (FB) of food intake intervention - SM using the Lose It! smartphone App (Group 1); SM + FB (Group 2); and SM + FB + attending three in-person group sessions (Group 3) - found that at the end of the 12 week pilot all groups showed a significant weight loss, with no between group differences.[47] **Smoking** There were 2 SRs assessing the effects of technology-based interventions on smoking: A systematic review of 60 RCTs/quasi-RCTs reported in 77 publications on the effectiveness of internet sites, computer programs, mobile telephone text messages and other electronic aids for smoking cessation and/or reducing relapse found that computer and other electronic aids result in a small, but significant increase in the likelihood of cessation compared with no intervention or generic self-help materials; and that there is no significant difference in effectiveness between interventions delivered to smokers who are ready to quit vs those who are not yet ready to quit; Cost-threshold analyses indicated that electronic intervention is likely to be cost-effective when added to non-electronic behavioural		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
support, but it is not clear what the most effective/cost-effective type of electronic intervention is.[48] A systematic review of 26 RCTs that investigated the use of mobile technology-based health interventions on changing health behaviours reported a significant effect of text messaging smoking cessation support on biochemically verified smoking cessation. The authors reported that there was 'suggestive evidence of benefit in some other areas' but that 'high quality adequately powered trials of optimised interventions are required to evaluate effects on objective outcomes'.[49] **Alcohol** There was 1 meta-analysis assessing the effects of technology-based interventions on alcohol: A meta-analysis of RCTs (n=NR) comparing self-directed computer-delivered interventions vs controls to reduce alcohol consumption found a small significant effect of these interventions on some alcohol related outcomes and reported that larger effects occurred with: provision of normative information or feedback on performance, prompting commitment or goal review, the social norms approach; personal contact and in samples with more women. Smaller effects occurred when information on the consequences of alcohol consumption was provided.[50] **Sex** There was 1 SR assessing the effects of technology-based interventions on sex: A systematic review of 10 RCTs that used mobile technology to improve sexual health outcomes reported that 2 trials reported statistically significant improvements in the uptake of sexual health services		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance (from topic experts or initial internal intelligence gathering)	Impact
using SMS reminders compared to controls; 1 trial increased knowledge; 1 trial reported increased condom use but none reported statistically significant increases in condom use; and 1 trial found that collection of sexual health information using mobile technology was acceptable. The authors concluded that 'High quality trials of interventions using standardised objective measures and employing a wider range of behavioural change techniques are needed to assess if interventions delivered by mobile phone can alter safer sex behaviours carried out between couples and reduce STIs'. [51]		
RR – 07 **How do behaviour change techniques lead to change? What are the best methods of testing the relationship between the theories that describe change processes and the effectiveness of interventions in practice?**		
No evidence identified	No evidence identified	**No new evidence was identified that has an impact on the guideline**
Gaps in the evidence (not addressed within the recommendations for research)		
Gap – 01 There is a lack of recent evidence (post-2003) on behaviour change techniques used to influence sexual behaviour. In particular, there is a lack of UK randomised control trials with populations aged 16 and over.		
No individual RCTs were identified. One SR that included 10 RCTs was identified but did not provided details on BCTs. [51]	A Cochrane review including 11 RCTs was identified but did not provided details on BCTs.[60]	**New evidence was identified that does not have an impact on the guideline** There remains a lack of evidence on behaviour change techniques used to influence sexual behaviour [51, 60].

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69. A randomised controlled trial of a safer sex intervention delivered through mobile phone messaging

70. Identifying effective behavioural components of Intervention and Comparison group support provided in SMOKing cEssation (IC-SMOKE) interventions: a systematic review protocol