National Institute for Health and Care Excellence

Public Health and Social Care Centre

Surveillance programme

Surveillance review consultation document

4-year surveillance review of PH41: Walking and cycling - local measures to promote walking and cycling as forms of travel or recreation

Background information

Guideline issue date: November 2012

Surveillance proposal for consultation

- We will not update the guideline at this time.
- Refresh with references to relevant NICE guidelines published since November 2012 (Physical activity: brief advice for adults in primary care and Behaviour change: individual approaches)

Reason for proposal

We found a total of 62 new studies, 2 reports and 4 pieces of on-going research through surveillance of this guideline:

- Literature searches for randomised controlled trials and systematic reviews published between 1st August 2011 to November 2015 for walking and/or cycling interventions found 52 new studies. The majority of evidence related to walking interventions, with only 4 studies on cycling interventions and 4 on walking and cycling interventions. We did not find any new evidence on personalised travel planning, or concerning local authority development of walking and cycling programmes. None of this new evidence was thought to have an effect on current recommendations.

- A focused literature search for any study published between 1st August 2011 and November 2015 for studies on the use of pedal-assisted electric bicycles (e-bikes) found only 6 studies applicable to the UK. While there is evidence that e-bikes are gaining popularity, and use may increase in OECD countries, the evidence base concerning their impact on cycling behaviour, general mobility and health is currently very small.
- We considered all evidence highlighted by topic experts for any potential impact on the guideline scope and remit, with 4 studies (including 1 on-going piece of research) and 2 reports meeting inclusion criteria.
- We checked for ongoing and newly published research from NIHR and Cochrane and new policy developments. One published study was included as evidence, and 3 pieces of on-going research were identified.
- Ongoing research was identified on specific walking and cycling interventions for people aged 50 years onwards[66,67], and encouraging active travel to school[68] and work[69]. Publications of this work will be looked at when PH41 undergoes its next surveillance review, if available.
- We found new evidence related to the research recommendations on how individual and local factors may influence the effectiveness of specific approaches to encouraging walking or cycling and on factors associated with people continuing to walk or cycle in the long term. This new evidence was not considered to fully address these research recommendations or affect current recommendations. We did not find any new evidence that would affect other research recommendations.
- We found some new evidence relating an identified gap in the evidence: a lack of UK evidence on the extent to which the provision of a free bus service impacts on walking levels. . This new evidence was not considered to fully address evidence gap or affect current recommendations. We did not find any new evidence that addressed any other gaps in the evidence.

We considered the views of topic experts, including those who helped to develop the guideline and other correspondence we have received since the publication of the guideline. There was a mix of opinions from topic experts concerning whether or not the guideline should be updated. The following issues were highlighted by topic experts:

- concern with separating environmental changes from other 'promotional' interventions that aim to increase walking and cycling. This was viewed as illogical given that interventions which focus on both aspects are more likely to be effective. It is recommended that given the inter-relationship between Physical activity and the environment (PH8) and PH41, that future surveillance reviews of PH41 may need to be aligned with future surveillance reviews of both PH8 and its update (Physical activity and the environment including accessibility for people with mobility problems or additional needs).
- that the impact of e-bikes on cycling and general mobility and health and wellbeing requires closer scrutiny and inclusion in the guideline. A focussed search was undertaken in this area (see above).
- that consideration could be given to evidence on the effectiveness of cycle training schemes and any schemes that have specifically trained people to use electric bicycles. Limited evidence of the effectiveness of cycle training schemes to increase cycling was identified, and the reason for recommending training relates primarily to safety rather than as a means to increase cycling behaviour.
- that older adult's walking and cycling mobility requires closer scrutiny and inclusion in the guideline, and this was highlighted as an equality issue. Further focus around ageing population and how to encourage active ageing was suggested, as was the effect of personal travel planning advice on those approaching retirement. A number of studies were identified that had older adults as participants, the findings of which were in line with existing recommendations in PH41.
- that easier, more widespread access to activity monitors such as using smartphones is likely to increase feasibility at low cost of some walking and cycling projects, for example, workplace initiatives. Only 2 studies were identified that used activity monitors (other than pedometers). This is recognised as an area where it is likely that further research will be undertaken and published in the future.
- that consideration could be given to evidence on the effect of personal travel planning advice on those approaching retirement. No evidence was identified.

- that reductions in central government grants to local government for support of bus services is leading to reductions in bus services nationally, identified as a particular issue for many people living in rural areas. Use of public transport where available was reported as being associated with increased walking (and in some places, cycling), so reduced access to public transport is likely to decrease walking and also to encourage uptake of driving (where this is an option for an individual). There was very little new evidence identified concerning the relationship between public transport and walking/cycling (see gaps in the evidence, Appendix 1).
- PH41 remains relevant to practice and the organisation of care but reducing recurrent funding of local authorities, and associated loss of staff is a big challenge to implementation of many of PH41 recommendations.

None of the new evidence considered in surveillance of this guideline was thought to have an effect on current recommendations.

Overall decision

After considering all the new evidence and views of topic experts, we are proposing that this guideline is not updated.

Further information

See Appendix 1 for further information.

For details of the process and update decision that are available, see ensuring that published guidelines are current and accurate in 'Developing NICE guidelines: the manual'.

Appendix 1: summary of new evidence

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
PH41 – 01. Recommendation 1 High-level support from the health sector evidence statements IDE; expert papers 2, 4, 6		
No evidence identified	Initial intelligence gathering identified the following: Physical activity and the environment (2008) NICE guideline PH8 provides recommendations on how to improve the physical environment to encourage physical activity. It covers strategy, policy and plans, transport, public open spaces, buildings and schools. Topic experts expressed concern with separating environmental changes from other 'promotional' interventions that aim to increase walking and cycling, and saw this as illogical given that interventions which focus on both aspects are more likely to be effective. This is relevant to the whole guideline.	**No new evidence was identified, no changes** Recommendation 1 provides guidance on policy and planning within local government to support walking and cycling, highlighting the need to address walking and cycling within joint strategic needs assessments; and to treat walking and cycling as separate activities that may require different approaches. Physical activity and the environment NICE guideline PH8 is referenced extensively throughout the recommendations in PH41. PH8 is currently being updated and when published, should be referred to within PH41 (i.e. refresh).
PH41 – 02. Recommendation 2 Ensuring all relevant policies and plans consider walking and cycling evidence statements IDE; expert papers 2, 4, 6		
No evidence identified	Topic experts identified the following: Transport for London's Health Action Plan[1] seeks to integrate public health considerations into transport policy and planning and is relevant to Recommendation 2.	**New evidence was identified that does not have an impact on the recommendation.** Recommendation 2 highlights the importance of ensuring local government strategies, policies and plans support walking and cycling, that plans are implemented and evaluated. The information within the Transport for London's Health Action Plan[1] reinforces the content within recommendation 2 and does not indicate that any

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
		changes are required to the recommendation.
PH41 – 03. Recommendation 3 Developing programmes **evidence statements R1.ES5, R1.ES6, R1.ES7; Additional evidence expert papers 2, 4, 6**		
No evidence identified	No evidence identified	**None**
PH41 – 04. Recommendation 4 Personalised travel planning **evidence statements R1.ES4, EM.ES4**		
No evidence identified	No evidence identified	**None**
PH41 – 05. Recommendation 5 Cycling programmes **evidence statements R1.ES3, R1.ES5, R1.ES6, R1.ES7, R1.ES9, R1.ES12, R1.ES19, R2.ES9, R2.ES15, R2.ES18, EM.ES3, EM.ES5; expert papers 2, 3, 4, 5, 6**		
Three systematic reviews[2-4] were identified that were relevant to cycling programmes: A systematic review[2] that included 19 studies investigating interventions that aimed to produce a modal shift from car use towards active transportation (cycling or walking) found that 16 studies showed a positive effect. Studies used a variety of intervention tools and included workplace interventions, architectural and infrastructure changes, population-wide interventions, and bicycle-renting. The authors noted that study quality was mostly low and intervention characteristics poorly described. A systematic review[3] included 12 studies (2 RCTs, 10 before-and-after studies) investigating interventions aiming to increase commuter cycling. Six of the 7 studies that evaluated individual- or group-based interventions reported increases in commuter cycling, but this was only significant in 3 studies. The remaining 5 studies were of environmental interventions (out of scope), which had small but positive effects in large populations. The authors concluded that 'robust evidence of what interventions	Topic experts identified the following studies as relevant to recommendation 5: A study on the Effectiveness and equity impacts of town-wide cycling initiatives in England: A longitudinal, controlled natural experimental study[5] provides additional evidence in support of evidence statement R1.ES5 on population-level change in cycle demonstration towns as interventions to increase cycling. A controlled before-and-after study of the effect of the Department for Transport Bikeability scheme for children in England[6] found no effect on cycling attributable to the intervention (Goodman et al., under review at Int J Behav Nutr Phys Act, abstract provided in confidence). A qualitative study investigating the rates and impacts of near misses and related incidents among UK cyclists[7] discusses people's experiences of non-injury incidents when cycling. It describes fear of injury as a barrier to cycling and that experiencing non-injury	**New evidence was identified that does not have an impact on the recommendation.** Recommendation 5 highlights the importance of addressing infrastructure so that it is supportive of cycling behaviour and needs of cyclists; it provides recommendations on the implementation and content of town-wide programmes that promote cycling for transport and recreation, and highlights need for available training and possibility of providing safety checks. The findings from the 3 systematic reviews[2-4] support the content of recommendation 5, as they highlight the importance of addressing infrastructure and planning issues along with providing information, activities and support to encourage cycling. The evidence from experts does not indicate that any changes to the recommendation are required. The findings from Effectiveness and equity impacts of town-wide cycling initiatives in England: A longitudinal, controlled natural experimental study[5] supports the content of recommendation 5. While the

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
will increase commuter cycling in low cycling prevalence nations is sparse' and that environmental interventions may have a greater benefit to public health than individual or group-based interventions. A systematic review[4] including 6 studies (2 RCTs, 1 cohort study and 3 controlled repeat cross-sectional studies) primarily aiming to promote cycling and 16 studies (2 cohort studies and 14 controlled repeat cross-sectional studies) using individualised marketing of walking, cycling, and public transport use as an alternative to car use concluded that individual and community intervention programs, changes to infrastructure, and marketing to households resulted in a small increase in cycling (usually measured through self-report). The authors concluded that 'environmental changes combined with advice and support may be needed to increase cycling substantially and in a sustainable way in the population'.	incidents (near misses) may contribute to this. It describes the most frightening incidents as those involving moving motor vehicles, particularly larger vehicles. This was identified as relevant to evidence statement R1.ES19: Individual-level change from cycle training interventions to increase cycling.	other 2 studies add to the evidence base, they alone do not indicate that recommendation 5 requires updating at this time: It should be noted that ES1.19 was based on 1 study in adults, not children, and found that cycle training interventions "may be effective in increasing individual levels of cycling for active travel amongst those not cycling at baseline". The addition of the controlled before-and-after study[6] of the effect of the DfT Bikeability scheme for children may change the evidence statement to 'inconsistent'. The evidence statement was part of the evidence base for recommendation 5 which does recommend training and references DfT's 'bikeability' programme: "Ensure training is available for those who are interested in cycling, either as a form of transport or as a recreational activity. An example of a cycle training programme is the Department for Transport's Bikeability." It is unlikely that this one study in children would change the recommendation as training is primarily intended for safety rather than to increase cycling *per se.* The evidence base for recommendation 5 included qualitative studies that addressed participants' views about taking part in interventions to increase cycling, views about barrier and facilitators to active travel to school, and adults' views of cycling for transport. This included issues around safety, perceptions of danger, and impact of motorised vehicle driving behaviours. The qualitative study[7] of people's experiences of non-injury incidents when cycling adds to the evidence base and supports existing findings. Recommendation 5 cross-refers to recommendation 3 which highlights the importance of addressing "measures to reduce road danger and the perception of danger".

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
PH41 – 06. Recommendation 6 Walking: community-wide programmes **evidence statements R1.ES1, R1.ES2, R1.ES7, R1.ES13, R1.ES18, R1.ES21, R1.ES22, R2.ES1, R2.ES2, R2.ES3, R2.ES5, R2.ES6, R2.ES10, R2.ES12, R2.ES13, EM.ES1, EM.ES3; expert papers 1, 5**		
Six studies (1 SR[8], 2 RCTs[9,12] and 3 cluster RCTs[10,11,13]) were identified that assessed the effectiveness of community-wide walking programmes: A systematic review[8] of 19 studies involving 4572 participants found that the effectiveness of interventions to promote walking in groups of adults was of medium size (d=0.52), statistically significant (95%CI 0.32 to 0.71, p<0.0001), and with large fail-safe of N=753 indicating that findings are robust. Moderator analyses showed that lower quality studies had larger effect sizes than higher quality studies, and studies with longer follow-up (over six months), targeting older adults and both genders (compared to women only) also had larger effect sizes. No significant differences were found between studies delivered by professionals versus lay people. An RCT[9] with overweight or obese African-American and Hispanic women (n=310) randomised to a group-based intervention to promote walking (met 6 times over 6 months) or an intervention to increase vegetable and fruit consumption, found that physical activity increased significantly in both groups (p<0.05) A cluster RCT[10] with non-Hispanic Black and Hispanic residents (n=NR) attending community-based or faith-based organisations randomised to a 32-week community health promoter-facilitated walking group intervention found that the intervention group significantly increased steps during the initial 8-week intervention period, compared with the lagged intervention control group (p = 0.000).	No new evidence	**New evidence was identified that does not have an impact on the recommendation.** Recommendation 6 highlights the importance of addressing infrastructure so that it is supportive of walking behaviour and the needs of walkers (such as safety, maintenance, road speeds). It recommends that walking programmes are developed based on behaviour change techniques, highlights the need to provide information to support people in walking and describes the materials and events that could be provided. The evidence overall indicates that community-based walking interventions can lead to an increase in amount of walkers and/or amount walked and supports the actions recommended in recommendation 6.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
A cluster RCT[11] with 3 matched African-American communities randomised to either a police-patrolled walking plus social marketing, a police-patrolled walking-only, or a no-walking intervention found that walking attendance in the social marketing community increased from 40 to 400 walkers per month at 9 months and sustained approximately 200 walkers per month through 24 months (significance not reported). An RCT[12] with people with mild to moderate osteoarthritis of the knee (n=222) randomised to either a 12 month Walking and Behavioural intervention (WB: a supervised community-based aerobic walking program + a behavioural intervention + an educational pamphlet on the benefits of walking for OA), a Walking intervention (W: supervised community-based aerobic walking program intervention and educational pamphlet), or Self-directed control (C: educational pamphlet) found that program adherence was greater in WB compared to C ($p<0.012$) after the first 3 months of the intervention but that there was no statistical significance in long-term adherence (6 to 12 months) nor total adherence between the three groups. A cluster RCT[13] with adults who were not regularly involved in physical activity and were from community-based organisations for people with intellectual disabilities (50 clusters, n=82) were randomly allocated to the Walk Well program (three face-to-face physical activity consultations incorporating behaviour change techniques, written resources for participants and carers, and an individualised, structured walking programme) or a 12-week waiting list control. There was no significant difference in mean step counts between groups.		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
PH41 – 07. Recommendation 7 Walking: individual support, including the use of pedometers **evidence statements R1.ES13, R1.ES14, R1.ES18, R1.ES21, R1.ES22, R2.ES3, R2.ES13, EM.ES2; expert paper 5**		
There were 35 studies identified that were relevant to recommendation 7. There were 25 studies (2 SRs[43,52], 22 RCTs[14-27,44-47,53-56] and 1 cluster RCT[48]) identified that assessed interventions which included the use of pedometers. Six of these studies (1 SR[43], 4 RCTs[44-47] and 1 cluster RCT[48]) were workplace-based studies and have been described under recommendation 9; and 5 studies are relevant to recommendation 10 on the NHS (1 SR[52] and 4 RCTs[53-56]) and are described there. The remaining 14 studies are described here; and there were 10 studies (1 SR[28], 9 RCTs[29-37]) identified that assessed individual-level walking interventions that did not involve the use of pedometers. **Pedometer studies, participants set a 10,000 steps/day goal:** An RCT[14] with middle-aged, overweight women (n=30) assigned to either a pedometer+10,000 steps/day goal or a 30mins/day activity goal reported that both groups significantly increased average steps/day from baseline to week 6 and week 12, but the 10,000 steps/day group increased their steps/day significantly more than the 30 mins/day group at 12 weeks (p=0.045). An RCT[15] with inactive middle-aged African American women (n=34) assigned to either a walking (instructed to increase daily pedometer-measured walking to ≥ 10,000 Steps per day) or walking plus supervised resistance training intervention reported significant increases in walking in both groups (p<0.001), with no difference between the groups. An RCT[16] with smokers (n=40) assigned to either a pedometer+10,000 steps/day goal intervention or	Initial intelligence gathering identified the following: Behaviour change: individual approaches (2014) NICE guideline PH49 makes recommendations on individual-level interventions aimed at changing health-damaging behaviours among people aged 16 or over. It includes a range of approaches, from single interventions delivered as the opportunity arises to planned, high-intensity interventions that may take place over a number of sessions. The behaviours covered include physical activity. The recommendations cover policy and strategy, commissioning, planning, delivery, training and evaluation of individual-level behaviour change interventions. They also cover behaviour change techniques, the maintenance of change and organisational and national support. Topic experts noted the following: That older adult's walking and cycling mobility requires closer scrutiny and inclusion in the guideline, and this was highlighted as an inequality issue. Further focus around ageing population and how to encourage active ageing was suggested, as was the effect of personal travel planning advice on those approaching retirement.	**New evidence was identified that does not have an impact on the recommendation. Refresh recommendation with a reference to Behaviour change: individual approaches (2014) NICE guideline PH49.** Recommendation 7 highlights that pedometers can be used to support individuals increasing their levels of walking, but that they should only be used as part of a package which includes goal setting (gradual increase in steps rather than a pre-determined set target), monitoring and feedback. The evidence from pedometer studies in which participants were set a 10,000 steps/day goal[14-20] seems to support the recommendation that pedometers can be effective at increasing walking if accompanied by a goal. While there is some evidence that a set-goal can work, it appears that an intervention is more likely to be effective if this goal is tailored to a person's performance[19] and if it includes the provision of motivation/support and feedback on performance[18]. The evidence from pedometer studies in which an undefined walking goal was set[21,22] does not contradict the recommendation that setting goals can be effective at increasing walking; it does however indicate that social support may be beneficial[21]. As this is based on one study and Behaviour change: individual approaches (2014) NICE guideline PH49 specifically recommends including social support in behaviour change interventions (including physical activity interventions), it is recommended that PH41 should be refreshed with the addition of a cross-reference to recommendation 7 of PH49.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
information booklet encouraging walking every day found significant increases in steps in participants who were physically inactive at baseline (less than 10,000 steps/day) and in the pedometer group. A randomised crossover trial[17] assigned smokers (n=31) to receive either a booklet encouraging walking every day in the first month, followed by the provision of a pedometer+10,000 steps/day goal in the second month or vice versa, followed by both groups using a pedometer for 3 months and asked to achieve 10,000 step/day goal. Participants were categorised as active (achieving 10,000 steps/day) or inactive (not achieving 10,000 steps/day) at baseline. There were no changes in steps/day in active participants. For inactive participants significant increases in steps/day were found after 1, 2 and 5 months in those who had received a pedometer first but those who received the booklet first did not significantly increase steps at 1 or 2 months (p=0.06), but did at 5 months (p=0.02). A pilot RCT[18] with inactive and insufficiently active older adults (n=61) with 4 conditions delivered over 12 weeks (1: control, 2: pedometer+10,000 step goal, 3: pedometer+step goal+individualised motivational feedback, 4: pedometer+step goal+individualised motivational feedback+biweekly telephone feedback) found no difference in steps/day between controls and group 2, but significant increases in steps/day in groups 3 (p<0.001) and 4 (p<0.001) compared to controls at the end of the intervention. An RCT[19] with inactive overweight adults (n=20) in which all participants received a pedometer, email and text message communication, brief health information, and biweekly motivational prompts and were assigned to either a 6 month 'adaptive' (received daily step goals based on individual		The evidence from pedometer studies in which no step/walking goals appear to have been set [23-27] overall supports the inclusion of pedometers within walking interventions and findings are in line with the content of recommendation 7. Recommendation 7 also states that regular one-to-one support should be provided; and that this could be provided face-to-face, via telephone, using print-based materials, email, the Internet or text message. The evidence from pedometer-based and other walking interventions continues to support the use of the telephone[18,37], print-based materials[16,17,37], email[19], the Internet[21,34] or text messages[19,24,32] in delivering walking interventions. The recommendation also highlights that this support could include individual, targeted information, goal setting (with or without a pedometer), monitoring and feedback; and that general practical information should also be provided to support walking such as walking route maps. The evidence from 4 studies[28-31] that assessed specific behaviour change techniques overall appears to support the behaviour change techniques recommended in PH41, but does indicate that there may be other relevant techniques to consider when designing a walking intervention. Given that Behaviour change: individual approaches (2014) NICE guideline PH49 provides guidance on the behaviour change techniques that should be used in the design of physical activity interventions it is recommended that the information on behaviour change techniques does not currently need to be updated. The evidence from the 6 remaining RCTs[32-37] involved a wide variety of interventions, all of which led to significant improvements in walking, at least in

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
performance and micro-incentives for goal attainment) or 'static' intervention (10,000 steps/day goal with incentives linked to uploading pedometer data) reported a significant increase in steps from baseline overall ($p<0.001$), with the adaptive group increasing steps significantly more than the static group ($p=0.017$). RCT[20] with overweight/obese military beneficiaries (n=106) assigned to a pedometer intervention (education and encouraged to obtain 10,000 steps per day) or 'usual lifestyle' control reported a significant increase in steps/day by time ($p<0.001$) but no difference in steps between groups. **Pedometer studies, step/walking goals not defined:** An RCT[21] with female college freshmen (n=63) where both groups received weekly step goals and tracked steps/day with a pedometer and were assigned to either a Facebook social support group (asked to post information about their steps/day and provide feedback to one another in a Facebook group) vs. a standard walking intervention, found increases in steps from baseline in both groups ($p<0.001$), but the increase was significantly higher in the Facebook group than the standard walking group by approximately 1.5 miles/day more ($p<0.001$). An RCT[22] with older adults (n=92) of a 16 week intervention involving a pedometer, daily walking goals, and weekly feedback on goal achievement provided via the internet and either one of 4 conditions: weekly feedback only (comparison), entry into a lottery to earn up to $200 each week if walking goals were met (financial incentive), linkage to four other participants through an online message board (Peer Network), or both interventions (Combined) found no differences in the proportion of days walking		the short term. It does not appear to indicate that an update to recommendation 7 is required. There is new evidence from 11 studies (1 SR[8] 7 RCTs[22,26,33,37,53-55] and 3 pilot RCTs[18,24,57]) that indicates walking interventions are effective overall at increasing walking in older adults (please also see recommendation 10 for details of these studies). Older adults were either those aged 60 years old or over or described in the study abstract as 'older'. The studies either had older adults as participants or there was an analysis of intervention effectiveness for older sub-populations. All studies were of walking interventions only (community or individual-level). Overall, the interventions led to significant improvements in walking from baseline, with only one study finding no significant effect[22]. This evidence does not indicate that PH41 should be updated with a recommendation concerning the content of walking interventions for increasing walking in older adults, or to commission a separate guideline on physical activity interventions for older adults because the new evidence supports the existing recommendations in PH41, which are for all age groups; there remains a paucity of evidence on cycling interventions for this age group; and there is also existing or in-development NICE guideline that addresses physical activity overall for older adults: Dementia, disability and frailty in later life – mid-life approaches to delay or prevent onset (2015) NICE guideline NG16 has looked at the effectiveness of physical activity interventions in people aged up to 64 years old (see recommendation 12: 'Providing physical activity opportunities') and there is a current topic referral for "Physical activity: encouraging activity in the general population".

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
goals were met in the intervention groups compared to comparison group and at 8 weeks follow-up there was an unexpected finding that the proportion of days walking goals were met was significantly lower in the Peer Network group compared to comparison group (18.7%; vs 34.5% p=0.025). **Pedometer, no goals set:** An RCT[23] with low active adults (n=79) assigned to either a pedometer-based walking programme plus physical activity consultations (Pedometer plus) or a pedometer-based walking programme and minimal advice intervention (Pedometer minimal) reported an overall increase in steps/day from baseline to 12 weeks (p<0.001), 24 weeks (p<0.001) and 48 weeks after the intervention (p<0.001). There were no differences between the groups. A pilot RCT[24] with older African American adults (n=36) assessed the effectiveness of a 6-week program of motivational text messaging (texts sent three times a day, 3 days a week, for 6 weeks) plus pedometers and walking manuals to record step counts vs a control that received pedometers and walking manuals only. The intervention group had a significantly greater increase in steps than the control group (p<0.05). An RCT[25] with postnatal women (n=66) assigned to either a 12 week tailored program encouraging increased walking using a pedometer or routine postpartum care reported that by there were significant increases in mean daily step count over the study period in the intervention group (p<0.001). An RCT[26] with people with low levels of activity/fitness (n=655) assigned to a pedometer plus toolkit or control group found no difference in activity between the groups but reported that the oldest		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
participants in the pedometer group reported significantly more walking time compared to controls (p=0.05) and that among participants who completed the intervention, a significant effect on total walking time was observed (p=0.04). An RCT[27] with obese women (n=84) assigned to a prescribed diet and physical activity with a three-month follow-up plan (comparison) or the same with an addition of a pedometer (intervention) found that the mean number of steps increased in the intervention group from 8817 +/- 2725 steps/day at baseline to 9716 +/- 2811 steps/day at the end of the study. **Individual-level walking interventions that did not involve the use of pedometers:** A systematic review[28] of 46 interventions of walking and cycling interventions targeted at adults assessed the behaviour change techniques (BCTs) used in the interventions which were associated with changes in walking and cycling. Twenty-one interventions reported a statistically significant effect on walking and cycling outcomes. There was considerable heterogeneity of BCTs but the authors concluded that there was support for including "self-monitoring" and "intention formation" BCTs in walking and cycling interventions. An RCT[29] of an intervention to increase walking in adults (n=35) assigned to either a 'motivation first' (motivational components designed to increase self-efficacy at Time 1 and volitional components designed to help translate intentions into action at Time 2), 'volition first' (volitional components at T1, motivational at T2) or 'combined' intervention (motivational and volitional components T1, filler task T2) found an overall increase in walking at T2 that did not differ between groups. At Time 3 (details not		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
provided) the 'combined' group produced a significant increase in self-efficacy, relative to the two other interventions and showed a large significant increase in walking behaviour (d = 1.06, p = 0.036) that was significantly greater than in the other groups (p = 0.003). An RCT[30] assessed the effectiveness of an 'enhanced cognitive awareness 'intervention to encourage outdoor walking that involved 'awareness plans' vs. a traditional walking intervention focused on developing and committing to a personalised walking schedule (control) in adults (n=117). All participants were asked to take at least three 30 minute outdoor walks each week for 2 weeks. There were significant increases in walking in both groups (p<0.05) but these were not sustained at 4 week follow-up. Authors reported that 'the Engagement condition was particularly effective for those individuals who had less prior experience maintaining a walking routine'. An RCT[31] with postnatal women (n=88) found that improvements in walking for exercise following a 12 week 'MobileMums' intervention (targeted social cognitive theory (SCT) constructs such as self-efficacy, goal setting skills, outcome expectancy, social support, and perceived environmental opportunity for exercise) vs. a minimal contact control were initially mediated by goal-setting skills. However none of the SCT outcomes significantly mediated the relationship between experimental condition and overall (baseline to 13 weeks) change in frequency of walking for exercise. An RCT[32] with adult working women (n=87) found that sending 3 text messages per week that were motivational, informational, and specific to performing physical activity led to a significant increase in mean		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
steps per day at 12 weeks into the intervention compared to controls (6540.0 vs. 5685.0, p= 0.01), but no significant difference at 24 weeks (6867.7 vs. 6189.0, p= 0.06). An RCT[33] with 'insufficiently active' 60-70 year olds from low to medium SES (n=375) found that a low-cost, home-based physical activity and nutrition program led to a significant increase in walking in the intervention group compared to controls (p=0.029). An RCT[34] of a culturally and linguistically adapted virtual advisor that provided tailored physical activity advice and support over 4 months to inactive adults (n=40) led to significant increases in self-reported minutes of walking/week compared to a waitlist control (p=0.0008) and objectively measured steps (p =0.002). There was continued use of the virtual advisor in the 20-week post-study period. An RCT[35] with overweight or obese pregnant women (n=37) of an unsupervised intervention (intermittent use of an activity monitor to collect data) that aimed to promote moderate-intensity physical activity (> 80 steps per minute) and 'meaningful walking' (moderate walking in > 8-min bouts) found significantly more meaningful walks in the intervention compared to control group at weeks 17-19 (p=0.054), 27-29 (p=0.01), and 34-36 of gestation (p=0.014). A pilot RCT[36] assessing the viability of an intervention promoting dog walking through materials on dog health from walking and a calendar to mark walks found that dog walkers (n=58) in the intervention had significantly higher step counts than controls at the end of the 12 week intervention. An RCT[37] of a 48 week walking programme that involved three mailed printed manuals and telephone		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
coaching in adult aged ≥65 years old living in the community (n=386) reported significant increases in time walking for exercise at the end of the intervention in intervention group (p=0.001)		
PH41 – 08. Recommendation 8 Schools **evidence statements R1.ES8, R1.ES9, R1.ES10a, R1.ES10b, R1.ES10c, R2.ES15, R2.ES16, EM.ES1; expert paper 1**		
Five studies (1 SR[38], 3 cluster RCTs[39,41,42] and 1 RCT[40]) were identified that aimed to encourage cycling and/or walking amongst children in the school setting: A systematic review[38] of 68 quantitative studies comparing activity levels in school children using 'active' or 'passive' travel found that the majority of studies showed that active school travel resulted in higher levels of physical activity and that cycling to/from school is associated with increased cardiovascular fitness. Quality of evidence was reported as moderate using GRADE. A cluster RCT[39] of 1014 adolescents at 14 schools investigated the effect of a multicomponent school-based physical activity intervention on adolescent active school transport (AST) that involved changes to schools' organisational and structural environment. While there was evidence of a positive attitude towards cycling at the intervention schools, there was no difference in self-reported active travel between intervention and comparison schools after the intervention or at 2 years follow-up. It was noted that baseline levels of cycling had been high. An RCT[40] of a cycling to school trial (n=53 children aged 10-13 years old) which encouraged cycling to school each day over 12 weeks found that there was an increase in starting cycling in the intervention	Topic experts identified one study as relevant to recommendation 8: A controlled before-and-after study of the effect of the Department for Transport Bikeability scheme for children in England[6] (Goodman et al., under review at Int J Behav Nutr Phys Act) found no effect on cycling attributable to the intervention. Initial intelligence gathering identified the following: Promoting physical activity for children and young people (2009) NICE guideline PH17 provides recommendations on promoting the benefits of physical activity and encourage participation, the importance of consultation with children and young people and how to set about it, planning and providing spaces, facilities and opportunities for physical activity, training people to run programmes and activities, how to promote physically active travel such as cycling and walking.	**New evidence was identified that does not have an impact on the recommendation.** Recommendation 8 highlights what can be done to support active travel to school and walking and cycling outside of school. It recommends walking buses and other activities, bicycle training, involvement of parents, carers and teachers in supporting walking and cycling. The evidence provides support for active travel[38], and a teacher-led "walking school bus"[42], which is in line with recommendation 8. New evidence concerning school cycling interventions[40,41] was mixed, but given that is based on only 2 studies, there does not seem ample evidence to indicate that changes to the content of recommendation 8 concerning school cycling interventions are currently required. The evidence from one cluster RCT[41] and a before-and-after study[6] of the effect of the DfT Bikeability scheme for children indicates that cycle training does not lead to increases in cycling behaviour. While recommendation 8 recommends cycle training for all children, this is about ensuring children are safe when cycling, rather than using cycle training to increase levels of cycling, so the outcome of interest in relation to this recommendation is whether the training improves a child's ability to cycle safely (consideration 3.30 of the guideline: "Local roads

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
(69.2%; 95% CI 50.1-88.2) compared to control group (40.8%; 95% CI 20.9-60.5) during that time period. A cluster RCT[41] across 3 schools evaluating the effect of cycle training with (n=34 children) or without parental involvement (n=25) and compared to a control (n= 35) found no significant intervention effect on children's level of cycling to school. A pilot cluster RCT[42] of 149 children in 8 schools evaluated the impact of a teacher-led "walking school bus" program on children's active commuting to school and physical activity. There was a significant increase in active commuting and minutes of daily moderate-to-vigorous physical activity in the intervention compared to control group during the intervention (weeks 4 and 5).		may act as a barrier to walking and cycling for children. Although it is not a panacea (addressing road conditions is vital), achieving 'Bikeability' level 3 would mean they could deal with all types of road conditions and more challenging traffic situations"). Because of this, it does not seem that studies concerning the effectiveness of training on taking up cycling would lead to a change in recommending training. Recommendation 8 has adapted Recommendation 12 from PH17 on active and sustainable school travel plans; and so no further changes are required in relation to referencing PH17. Given the close relationship between recommendation 8 within PH41 and the content of PH17, it is suggested that consideration is given to incorporating recommendation 8 from PH41 into PH17, along with any other update that may be identified during the next surveillance review for PH17.
PH41 – 09. Recommendation 9 Workplaces **evidence statements R1.ES11, R1.ES15, R1.ES16, R1.ES17, R1.ES23, R2.ES2, R2.ES4, R2.ES7, R2.ES9, R2.ES18; expert papers 1, 3**		
Seven studies (1SR[43], 4 RCTs[44-47] and 2 cluster RCTs[48,49]) were identified that took place within the workplace setting and aimed to increase walking amongst adult employees: A systematic review[43] included 4 RCTs/cluster RCTs of workplace health promotion interventions with a pedometer component in adults. Three studies compared a pedometer intervention with a minimally active control; only 1 of these studies reported an increase in physical activity from the intervention. One study compared a pedometer intervention to an alternative physical activity programme but the SR	Initial intelligence gathering identified the following: A large cluster RCT[50]: Employer schemes to encourage walking to work: feasibility study incorporating an exploratory randomised controlled trial has completed, but has not yet published the results on the effectiveness of the intervention. Physical activity in the workplace (2008) NICE guideline PH13 provides recommendations for employers that includes encouraging employees	**New evidence was identified that does not have an impact on the recommendation** Recommendation 9 highlights that workplaces should develop strategies to support walking and cycling in and around the workplace, should identify active travel champions and activities that support walking and cycling such as walking groups, provide access to bicycles or discounted cycle purchase schemes. Any programme should be developed using evidence based model of behaviour change and information should be tailored to the specific workplace environment/locale.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
authors concluded that it was not possible to identify "the true improvements associated with either programme". They concluded that the evidence was of low quality and insufficient to assess the effectiveness of pedometer interventions in the workplace and that more high quality RCTs are required. An RCT[44] with inactive employees from 20 worksites (n=241) found that a 6 month intervention consisting of a pedometer, group meeting and six e-mail messages led to a non-significant increase in the proportion self-reporting 'walking for transportation' at 2 months into the intervention (Odds ratio 2.12, 95%CI 0.94 to 4.81) and 'walking for leisure' at the end of the intervention (1.86, 95%CI 0.94 to 3.69) and at 6 months follow-up (OR 2.07, 95%CI 0.99 to 4.34) compared to the control group. A mixed methods study involving an initial RCT[45] phase that compared daily steps of 104 medical residents at a hospital assigned to either an activity monitor displaying feedback about steps and energy consumed (intervention) or to a blinded monitor (control) found no significant difference in step counts between the conditions. An RCT[46] compared the effectiveness of 3 workplace interventions (pedometer-based individual counselling, n = 53; pedometer-based group counselling, n = 48; aerobic training, n = 47) and a minimal treatment comparator (n=47) in inactive female employees at a university hospital. Both pedometer groups significantly increased total number of steps at the end of the 3 month intervention (P<0.05), with the group counselling participants achieving significantly higher steps per day than the individual counselling participants (P<0.05). Effects did not appear to remain at 3	to walk, cycle or use another mode of transport involving physical activity to travel part or all of the way to and from work and helping employees to be physically active during the working day, for example, by encouraging them to walk to external meetings.	Recommendation 9 highlights that pedometers may be used in activities to promote active travel. In the original evidence review evidence statement R1.ES15 focussed on workplace pedometer interventions, It reported that there was moderate evidence from 11 studies to suggest that pedometer based interventions delivered in the workplace may be effective in increasing individual levels of walking for leisure or travel, up to 12 months post intervention. The new evidence[43-49] identified since then appears to be more mixed in its findings, but study quality has not been assessed and there are still positive findings for the effectiveness of some pedometer-based workplace interventions. As such, it does not seem necessary to update the recommendation concerning the use of pedometers as part of wider initiatives. One cluster RCT[49] indicated that a web-based intervention can be effective at increasing daily walking in inactive female employees. The use of the internet is not highlighted in recommendation 9, however the findings of 1 study would not be sufficient to indicate that an update is currently required. The recommendation cross-refers to Physical activity in the workplace, which is due a surveillance review in October 2017. Given the close relationship between recommendation 9 within PH41 and the content of PH13, it is suggested that consideration is given to incorporating recommendation 9 from PH41 into PH13, along with any other update that may be identified as part of the surveillance process in October 2017.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
months follow-up. An RCT[47] examined the feasibility of a pedometer-based intervention (pedometer + brief intervention involving self-monitoring, goal setting and weekly emails + educational material) compared to a control group (education material only) to increase physical activity in meat processing adult workers (n=53). Both groups significantly increased daily step counts at the end of the 12 week trial, but the effect was significantly larger in the intervention group (d=1.94, $p < 0.005$). The increase in step counts remained at 3 months follow-up in the intervention group compared to baseline ($p<0.0005$). A cluster RCT[48] of adults employed in 8 workplaces (n=274) assessed a pedometer-based intervention that included information on how to increase steps and an Internet link for computer-tailored step advice. Participants were categorised according to step counts at baseline as at-risk if they did not achieve 10,000 steps/day (n=190). There was a significant intervention effect in daily step counts in both the total sample and the at-risk sample at 1 month and 3 months post baseline. The at-risk group in the intervention increased step counts, while the controls decreased step counts. There was a significant increase in self-reported time spent walking in the at-risk group at 1 month, but not 3 months post-baseline. A cluster RCT[49] of sedentary adults employed in 6 Spanish universities (n=264) found a significant group by program phase effect of a workplace web-based intervention “Walk@WorkSpain” on daily step counts ($p=0.0013$), with the intervention group increasing step counts during the intervention and at 2 months follow-up; and the control group decreasing step counts over the same period.		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
PH41 – 10. Recommendation 10 NHS evidence statements R1.ES20, R2.ES2, R2.ES4		
Seven studies (2 SRs[51,52], 4 RCTs[53-56] and 1 pilot RCT[57]) were identified that met the inclusion criteria: A systematic review[51] included 5 RCT studies (n=266) investigating the effects of interventions with adult stroke survivors living in the community or care homes that aimed to improve 'community ambulation' (the ability to walk in own community, outside of home and indoors). Interventions included practicing walking in a variety of settings and environments in the community, or indoor activity that mimicked community walking. There was no evidence that interventions led to improvements in walking ability or confidence in walking (Community Walk Test MD: -6.35, 95% CI -21.59 to 8.88; Walking Ability Questionnaire MD: 0.53, 95% CI -5.59 to 6.66; self-efficacy SMD: 0.32, 95% CI -0.09 to 0.72). Study quality was considered low and the authors concluded that there was insufficient evidence to determine the effectiveness of community ambulation interventions in stroke survivors living in the community. A systematic review[52] of 9 RCTs and 1 quasi-experimental study assessing the effectiveness of pedometer-based walking interventions at increasing activity in free-living adults with Type 2 diabetes reported that 9 of the 10 interventions led to an increase in activity in the short-term. An RCT[53] with 60-75 year olds (n=280) found that a primary care nurse-delivered complex intervention (4 physical activity consultations over 3 months, incorporating behaviour change techniques, pedometer step-count and accelerometer intensity feedback, an individual activity diary and plan) led to	Initial intelligence gathering identified the following: Physical activity: brief advice for adults in primary care (2013) NICE guideline PH44 aims to support routine provision of brief advice on physical activity in primary care practice. It provides recommendations on identifying adults who are inactive, delivering and following up on brief advice; incorporating brief advice in commissioning; systems, information and training to support brief advice.	**New evidence was identified that does not have an impact on the recommendation. Refresh recommendation with a reference to Physical activity: brief advice for adults in primary care (2013) NICE guideline PH44.** Recommendation 10 recommends that information on walking and cycling is incorporated into all physical activity advice given by healthcare professionals, that information on walking and cycling initiatives is provided, as well as individual support and follow-up to those who express an interest; and that for people with limited mobility they are directed to specialist centres with adapted equipment, etc to support walking and cycling. Recommendation 7 on individual walking support is cross-referred to as this provides details of intervention content. As such, recommendation 10 and 7 should be looked at together in terms of considering this new evidence. Recommendation 10 is informed by 1 study of effectiveness that reported on a multi-component intervention delivered in a healthcare setting that had a positive significant effect on cycling but no effect on walking (R1.ES20) and on several qualitative studies relating to participants' views about motivators and barriers to participating in interventions to increase walking and on the benefits of participating in a walking intervention (R2.ES2 and R2.ES4 respectively). The new evidence from the RCTs[53-57] adds to the evidence base for the content of recommendation 10, in particular supporting the delivery of walking interventions. It also supports the content of recommendation 7, as does the SR[52] on interventions for community-living adults with type 2 diabetes. As the SR[51] on interventions aiming to

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
significant increases in daily step-counts at the end of the intervention and 9 months follow-up compared to controls (by 1,037 steps/day (95% CI 513-1,560) and 609 steps/day (95% CI 104-1,115) respectively). An RCT[54] with low active older adults (≥65 years old) recruited through primary care compared the effectiveness of 2 physical activity prescriptions (standard time-based Green Prescription or a pedometer step-based Green Prescription) that consisted of a visit with the primary care practitioner and 3 telephone counselling sessions over 12 weeks. Pedometer use resulted in significantly more leisure walking time than the standard prescription at 12 months (49.6 min/wk vs. 28.1 min/wk, p=0.03) but did not impact on overall activity level. An RCT with sedentary older adults[55] with mild to moderate hypertension (n=45) assigned to either a 12-week intervention consisting of pedometers and guidelines to walk 10,000 steps/day (comparator) or the same intervention with chances to win $1-100 prizes for meeting recommendations (financial incentive) found that the financial incentive group were significantly more likely to meet walking goals during the intervention period ($p < 0.01$). While steps walked increased significantly in both groups relative to baseline, participants in the financial incentive condition walked significantly more during the intervention and at 24 week follow-up ($p<0.02$) than the comparator group. An RCT[56] with inactive adults recruited from primary care (n=83) assessed the effectiveness of a pedometer-based intervention consisting of either a self-determined goal or a specific goal of 2500 steps/day above (both groups also received 4 telephone support sessions up to 11 weeks). The mean increase in steps/day was greater in the self-		improve the ability of adult stroke survivors to walk in their community was not able to draw conclusions concerning the effectiveness of these interventions, it would not add to the existing content in recommendation 10. Overall, the new evidence supports the existing content of recommendation 10 and does not indicate that it needs updating. As PH41 was published before Physical activity: brief advice for adults in primary care (2013) NICE guideline PH44 it does not cross-refer to this guideline. Recommendation 10 should be refreshed with this important link.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
determined goal group (2602, SD 1957) than the specific-goal group (748, SD 1997) (p=0.005). A pilot RCT[57] with older adults (n=28) assigned to a 'Maine in Motion' program delivered in primary care over 6 months or the same program + a physical activity mentor, with follow-up at 12 months, found a significant increase in steps overall from baseline (p = 0.015) but no difference between groups.		
E-bikes		
Six studies (1 RCT[58], 3 observational studies[59-61], a review[62], literature review[63]) were identified that addressed e-bike use in OECD countries (excluding the USA as throttle-assisted e-bikes are licenced for use which do not require any level of physical activity to cycle): An RCT[58] in Norway, in which participants given an e-bike were compared with controls (n=226), reported that e-bike trips increased from 0.9 to 1.4 per day, distance from 4.8 km to 10.3 km and, as a share of all transport, from 28% to 48%, whereas with the control group there was no increase in cycling (statistic not reported). The effect of the e-bike increased with time and was greater for female than males. There were no differences with age. An observational study[59] (online survey, Global Positioning System (GPS) tracking campaign and a weekly travel diary) of e-bike users in Ghent, Belgium found that e-bikes were used often for commuting trips, while a car was used for more occasional trips (at most once per week); and that after getting an e-bike, it was used for trips in which a bicycle was previously used, but there was also an increase in the frequency of some trips, indicating that e-bikes may lead to an increase in cycling compared to when a conventional bicycle is used.	Topic experts identified the following studies: A study on the Effects of e-bikes on bicycle use and mode share (see reference[58]) and a project on The electric bicycle phenomenon and the implications for spatial planning and sustainable mobility policy in the Netherlands and Europe. Urban Planning. which finished in 2013, the study page states that there is a lot of evidence available on the growing use of e-bikes in the Netherlands and across Europe. Topic experts stated that the impact of electric bicycles on cycling and general mobility and health and wellbeing requires closer scrutiny and inclusion in the guideline.	**New evidence was identified concerning e-bikes which currently would not indicate that PH41 requires updating with a new recommendation on their use.** Topic experts stated that the impact of electric bicycles on cycling and general mobility and health and wellbeing requires closer scrutiny and inclusion in the guideline. However, only 6 studies were identified on e-bike use that are applicable to the UK context. E-bikes appear to be gaining popularity and with the increase in use of pedal-assist e-bikes in OECD countries we expect that further studies will be undertaken and published concerning their impact on cycling behaviour, general mobility and health. Evidence concerning e-bikes should be revisited at the next surveillance review.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
An observational study[60] (on-line survey) of e-bike users in Australia aged 65 years and older (n=69) found that most were retired and had been regular cyclists before getting an e-bike. The most frequently cited mode shift was from private motor vehicle (car) to electric bike across all trip purposes. Motivators for getting an e-bike were to ride with less effort and replace car trips. Approximately a third of participants rode their e-bike daily, and 88% rode it weekly. Respondents felt safer riding an electric bike than a conventional bicycle and the majority had not experienced an e-bike crash (84.1%). Structural equation modelling applied to survey data[61] from 1,398 Austrians 'early adopters' who purchased an e-bike between 2009 and 2011 indicated that they are mainly aged 60 years or older, mainly use the e-bike for leisure trips, and do not usually use it to substitute carbon-intensive travel modes on commuting trips. Comparison by trip purpose showed that a supportive social environment and personal ecological norms influence e-bike use on work and shopping trips, whereas leisure use of e-bikes was driven by attitudes towards physical activity. Use is more dependent on practical usefulness of the technology and road infrastructure in older adults. A series of studies (limited study design details provided) undertaken in the Netherlands to gain insight into the current and potential future use of e-bikes are described in a paper[62]. On the basis of study findings the authors report that they expect e-bike use to increase substantially in the next decade, that e-bikes are popular among older adults, that energy expenditure during cycling on an e-bike is sufficiently high to contribute to physical activity guidelines for moderate intensity physical activity for adults and that the gain in meeting the physical		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
activity guidelines in the Dutch population could be about 1% as a result of increased e-bike use; and that a study of employee use of an e-bike for commuting reported an increase in meeting physical activity guidelines during the intervention and after a year follow-up. The authors note the potential drawbacks of e-bikes: the (unexpected) higher speed and relative, which could result in higher accident rates. The authors of a literature review[63] assessing Swedish perceptions on cycling and policy to explore whether E-bikes can remove barriers or provide the same benefit as alternative modes for people in Goteborg, also explored the potential of e-bike use in Goteborg from the ratio of cyclists using cars for commuting purposes, distance travelled, and barriers. They concluded that e-bikes theoretically remove the barriers expressed by 53% of people in Goteborg when compared to regular bicycles and that up to 4% of the trips less than 10 km could be replaced by E-bikes.		
Activity monitors		
There is new evidence from 2 RCTs[35,45] concerning the use of activity monitors in walking interventions. An RCT[35] with overweight or obese pregnant women (n=37) of an unsupervised intervention (intermittent use of an activity monitor to collect data) that aimed to promote moderate-intensity physical activity (> 80 steps per minute) and 'meaningful walking' (moderate walking in > 8-min bouts) found significantly more meaningful walks in the intervention compared to control group at weeks 17-19 (p=0.054), 27-29 (p=0.01), and 34-36 of gestation (p=0.014). A mixed methods study involving an initial RCT[45] phase that compared daily steps of 104 medical	One topic expert noted that easier, more widespread access to activity monitors such as using smartphones is likely to increase feasibility at low cost of some walking and cycling projects, for example, workplace initiatives; however, none of the experts identified any published or on-going research on the effectiveness of using fitness trackers to increase walking.	**New evidence was identified that does not have an impact on the guideline** One topic expert noted that easier, more widespread access to activity monitors such as using smartphones is likely to increase feasibility at low cost of some walking and cycling projects, for example, workplace initiatives. At the time of publication of PH41 it was noted within the considerations that "The PDG discussed the role of other technologies that might replicate pedometers, including mobile phone apps. While these may have a role to play in getting people to

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
residents at a hospital assigned to either an activity monitor displaying feedback about steps and energy consumed (intervention) or to a blinded monitor (control) found no significant difference in step counts between the conditions.		walk more, there is a lack of robust evidence to indicate whether or not they are effective." This remains, as, to date, there appears to be very little research published on the effectiveness of activity monitors at increasing walking. This is an area of research that should be re-visited at the next surveillance review.
Research recommendations		
RR – 01 **How could existing guidance on evaluating complex, population-wide interventions be most usefully adapted and applied to approaches that aim to increase rates of walking and cycling?** Issues to consider include: population-level health outcomes such as pollution emissions and exposure, the impact of an intervention on risk and danger and other, wider outcomes of interest such as the impact on the local economy. Approaches should be developed to take account of the backgrounds and needs of the different professional groups involved in helping to influence walking and cycling for transport or recreation. This includes professionals working in public health, transport, environment, economic development and regeneration.		
No evidence	No evidence	None
RR – 02 **What key factors influence the effectiveness of population-level or whole-area approaches to encouraging walking or cycling? How do these factors interact? (Specifically, how do infrastructure changes, promotion of these changes, promotion of walking and cycling generally, the provision of individual support and approaches in specific settings interact?) How does effectiveness vary between different geographical areas?**		
No evidence	No evidence	None
RR – 03 **How do individual and local factors influence the effectiveness of specific approaches to encouraging walking or cycling? (This includes people's level and perception of risk, the degree of connectivity for cycling trips, and the local 'visibility' of cycling or walking as a mode of transport.) How do these factors interact with personal factors (such as willingness to try walking or cycling) and how do these personal factors influence effectiveness? In particular, do local factors influence the effectiveness of cycle training and personalised travel planning?**		
No evidence	Topic experts identified the following relevant work: A qualitative study[7] investigating the rates and impacts of near misses and related incidents among UK cyclists discusses people's experiences of non-injury incidents when cycling. It describes fear of injury as a barrier to cycling and that experiencing non-injury incidents (near misses) may contribute to this. It describes the most frightening incidents as	Work is on-going and should be re-visited in the next surveillance review. Currently no update required on the basis of this evidence.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
	those involving moving motor vehicles, particularly larger vehicles. And other work from The Near Miss project.	
RR – 04 **What key factors ensure people continue to walk or cycle in the long term (over a year)? How do individual interventions (such as follow-up or goal-setting) interact with environmental factors (such as distance, perception of danger or provision of facilities) in encouraging people to continue to walk or cycle?**		
Fourteen studies (10 RCTs[22,23,30,32,44,46,47,53-55], 2 cluster RCTs[39,49], a cross-over RCT[17] and a pilot RCT[57]) were identified that provided follow-up data: A randomised crossover trial[17] assigned smokers (n=31) to receive either a booklet encouraging walking every day in the first month, followed by the provision of a pedometer+10,000 steps/day goal in the second month or vice versa, followed by both groups using a pedometer for 3 months and asked to achieve 10,000 step/day goal. Participants were categorised as active (achieving 10,000 steps/day) or inactive (not achieving 10,000 steps/day) at baseline. There were no changes in steps/day in active participants. For inactive participants significant increases in steps/day were found after 1, 2 and 5 months in those who had received a pedometer first but those who received the booklet first did not significantly increase steps at 1 or 2 months (p=0.06), but did at 5 months (p=0.02). An RCT[22] with older adults (n=92) of a 16 week intervention involving a pedometer, daily walking goals, and weekly feedback on goal achievement provided via the internet and either one of 4 conditions: a financial incentive (entry into a lottery to earn up to $200 each week if walking goals were met), linkage to four other participants through an online message board (Peer Network), both interventions (Combined), or weekly feedback only (comparison) found no differences in the proportion of days walking goals were met in the intervention	No evidence	None. Fourteen studies (10 RCTs[22,23,30,32,44,46,47,53-55], 2 cluster RCTs[39,49], a cross-over RCT[17] and a pilot RCT[57]) were identified that provided follow-up data. Nine of the studies involved walking interventions that incorporated pedometers[17,22,23,44,46,47,53-55]. These were either individual level interventions[17,22,23], workplace interventions[44,46,47] or interventions relevant to people with a particular health condition or delivered within a healthcare setting[53-55]. The majority of these studies reported significant increases in steps maintained at follow-up periods of between 3 months and 12 months[17,23,44,47,53-55], with only 2[22,46] reporting no difference at follow-up of 2 and 3 months respectively. Four studies involved other types of walking interventions[49,57,30,32]. Those delivered in the workplace[49] or a healthcare setting[57] found significant increases in walking behaviour at 2 months and 12 months respectively, while the interventions delivered to other individuals[30,32] found no significant differences at 12 or 4 weeks' follow-up respectively. There was no evaluation in these studies of the factors that may interact to encourage walking and there were a variety of different interventions across the studies. One study looked at school active transport[39] and found no significant intervention effect at 2 years follow-up. This would not contribute to knowledge of factors that may ensure school children continue to partake in active travel.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
groups compared to comparison group and at 8 weeks follow-up there was an unexpected finding that the proportion of days walking goals were met was significantly lower in the Peer Network group compared to comparison group (18.7%; vs 34.5% p=0.025). An RCT[23] with low active adults (n=79) assigned to either a pedometer-based walking programme plus physical activity consultations (Pedometer plus) or a pedometer-based walking programme and minimal advice intervention (Pedometer minimal) reported an overall increase in steps/day from baseline to 12 weeks (p<0.001), 24 weeks (p<0.001) and 48 weeks after the intervention (p<0.001). There were no differences between the groups. An RCT[44] with inactive employees from 20 worksites (n=241) found that a 6 month intervention consisting of a pedometer, group meeting and six e-mail messages led to a non-significant increase in the proportion self-reporting 'walking for transportation' at 2 months into the intervention (Odds ratio 2.12, 95%CI 0.94 to 4.81) and 'walking for leisure' at the end of the intervention (1.86, 95%CI 0.94 to 3.69) and at 6 months follow-up (OR 2.07, 95%CI 0.99 to 4.34) compared to the control group. An RCT[46] compared the effectiveness of 3 workplace interventions (pedometer-based individual counselling, n = 53; pedometer-based group counselling, n = 48; aerobic training, n = 47) and a minimal treatment comparator (n=47) in inactive female employees at a university hospital. Both pedometer groups significantly increased total number of steps at the end of the 3 month intervention (P<0.05), with the group counselling participants achieving significantly higher steps per day than the individual counselling participants		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
(P<0.05). Effects did not appear to remain at 3 months follow-up. An RCT[47] examined the feasibility of a pedometer-based intervention (pedometer + brief intervention involving self-monitoring, goal setting and weekly emails + educational material) compared to a control group (education material only) to increase physical activity in meat processing adult workers (n=53). Both groups significantly increased daily step counts at the end of the 12 week trial, but the effect was significantly larger in the intervention group (d=1.94, p < 0.005). The increase in step counts remained at 3 months follow-up in the intervention group compared to baseline (p<0.0005). An RCT[53] with 60-75 year olds (n=280) found that a primary care nurse-delivered complex intervention (4 physical activity consultations over 3 months, incorporating behaviour change techniques, pedometer step-count and accelerometer intensity feedback, an individual activity diary and plan) led to significant increases in daily step-counts at the end of the intervention and 9 months follow-up compared to controls (by 1,037 steps/day (95% CI 513-1,560) and 609 steps/day (95% CI 104-1,115) respectively). An RCT[54] with low active older adults (≥65 years old) recruited through primary care compared the effectiveness of 2 physical activity prescriptions (standard time-based Green Prescription or a pedometer step-based Green Prescription) that consisted of a visit with the primary care practitioner and 3 telephone counselling sessions over 12 weeks. Pedometer use resulted in significantly more leisure walking time than the standard prescription at 12 months (49.6 min/wk vs. 28.1 min/wk, p=0.03) but did not impact on overall activity level.		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
An RCT[55] with sedentary older adults with mild to moderate hypertension (n=45) assigned to either a 12-week intervention consisting of pedometers and guidelines to walk 10,000 steps/day (comparator) or the same intervention with chances to win $1-100 prizes for meeting recommendations (financial incentive) found that the financial incentive group were significantly more likely to meet walking goals during the intervention period ($p < 0.01$). While steps walked increased significantly in both groups relative to baseline, participants in the financial incentive condition walked significantly more during the intervention and at 24 week follow-up ($p<0.02$) than the comparator group A cluster RCT[49] of sedentary adults employed in 6 Spanish universities (n=264) found a significant group by program phase effect of a workplace web-based intervention "Walk@WorkSpain" on daily step counts ($p=0.0013$), with the intervention group increasing step counts during the intervention and at 2 months follow-up; and the control group decreasing step counts over the same period. A pilot RCT[57] with older adults (n=28) assigned to a 'Maine in Motion' program delivered in primary care over 6 months or the same program + a physical activity mentor, with follow-up at 12 months, found a significant increase in steps overall from baseline ($p = 0.015$) but no difference between groups. An RCT[30] assessed the effectiveness of an 'enhanced cognitive awareness 'intervention to encourage outdoor walking that involved 'awareness plans' vs a traditional walking intervention focused on developing and committing to a personalised walking schedule (control) in adults (n=117). All participants were asked to take at least three 30 minute outdoor walks each week for 2 weeks. There were significant		

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
increases in walking in both groups ($p<0.05$) but these were not sustained at 4 week follow-up. Authors reported that 'the Engagement condition was particularly effective for those individuals who had less prior experience maintaining a walking routine'. An RCT[32] with adult working women (n=87) found that sending 3 text messages per week that were motivational, informational, and specific to performing physical activity led to a significant increase in mean steps per day at 12 weeks into the intervention compared to controls (6540.0 vs. 5685.0, p= 0.01), but no significant difference at 24 weeks (6867.7 vs. 6189.0, p= 0.06). A cluster RCT[39] of 1014 adolescents at 14 schools investigated the effect of a multicomponent school-based physical activity intervention on adolescent active school transport (AST) that involved changes to schools' organisational and structural environment. While there was evidence of a positive attitude towards cycling at the intervention schools, there was no difference in self-reported active travel between intervention and comparison schools after the intervention or at 2 years follow-up. It was noted that baseline levels of cycling had been high.		
RR – 05 **What key factors influence differences in walking and cycling behaviour among different groups – and what are the implications for interventions aiming to achieve population-level change and reduce inequalities? This should take into account transport-related variables such as level of car ownership.**		
No evidence	No evidence	None
Gaps in the evidence		
Gap – 01 **There is a lack of UK evidence on whether or not interventions to increase walking or cycling for transport or leisure result in a decrease or increase in participation in other types of physical activity. Evidence is needed for a range of groups within different community settings.**		
No evidence	No evidence	None

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
Gap – 02 **There is a lack of evidence on whether people who cycle or walk for recreational purposes, eventually adopt it as a form of transport.**		
No evidence	No evidence	None
Gap – 03 **There is a lack of evidence on the long-term health, social and environmental impact of short-term interventions to increase walking or cycling. Specifically, there is a lack of evidence on the impact of interventions to encourage walking, cycling or both, for a range of groups within different community settings.**		
No evidence	No evidence	None
Gap – 04 **There is a lack of evidence on whether it is effective and cost effective to support physically active travel as a segment of a longer journey. Specifically, it is not clear whether such support increases walking or cycling levels and, if it does, how this impacts on the environment.**		
No evidence	No evidence	None
Gap – 05 **There is a lack of UK evidence on whether differences in urban and rural settings and environments impact on the implementation and effectiveness of interventions to increase walking or cycling. Evidence is needed for a range of groups within different community settings.**		
No evidence	No evidence	None
Gap – 06 **There is a lack of evidence on the barriers to, and facilitators for, inter-sector and inter-agency collaboration to promote walking and cycling. Evidence is also needed on the interventions that could overcome any identified barriers. Barriers may include the working cultures of different professionals.**		
No evidence	No evidence	None
Gap – 07 **There is a lack of UK evidence on how effective and cost effective it is to address walking and cycling together or separately. Specifically, there is a lack of evidence on how combining interventions impacts on their effectiveness – and whether multiple interventions have a positive, synergistic effect. Evidence is needed for a range of groups within different community settings.**		
No evidence	No evidence	None
Gap – 08 **There is a lack of evidence on how people can be helped to make walking or cycling an habitual activity. Evidence is needed for a range of groups within different community settings.**		
No evidence	No evidence	None

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
Gap – 09 **There is a lack of UK evidence on the extent to which the provision of a free bus service impacts on walking levels. Evidence is needed for a range of groups within different community settings.**		
	Topic experts noted the following: Reductions in central government grants to local government for support of bus services is leading to reductions in bus services nationally - a particular issue for many people living in rural areas. Use of public transport where available is associated with increased walking (and in some places, cycling) - so reduced access to public transport is likely to decrease walking and also to encourage uptake of driving (where this is an option for an individual). Reference was made to: 'Buses in crisis. A report on bus funding across England and Wales 2010 – 2015'[64] which reports that bus services have been cut by half of all local authorities in England in the last year, and 70% have made cuts since 2010; and that these cuts have disproportionately affected people and communities that need buses the most as no alternative public transport exists. **Initial intelligence gathering identified the following:** On the buses: a mixed-method evaluation of the impact of free bus travel for young people on the public health[65] found that the free bus travel scheme for young people encouraged greater use of bus transport for short trips but did not have a significant impact on their overall active travel, and no evidence of change in distance walked.	There is very little new evidence; and the evidence that is available, does not indicate that free bus travel increases walking.

Summary of new evidence from 4-year surveillance	Summary of new intelligence from 4-year surveillance	Impact
Gap – 10 **There is a lack of UK evidence on the impact that an individual's perception of distance has on their view of how viable cycling or walking is as a mode of transport. There is also a lack of evidence on what interventions can effectively change someone's perception of distance as a barrier to walking and cycling. Evidence is needed for a range of groups within different community settings.**		
No evidence	No evidence	None
Gap – 11 **There is a lack of UK evidence on the social constructs which act as barriers to, and facilitators for, the uptake of walking or cycling as a mode of transport. Evidence is needed for a range of groups within different communities.**		
No evidence	No evidence	None

References

1 Transport for London. (2014) Improving the health of Londoners: Transport Action Plan.

2 Scheepers CE, Wendel-Vos GCW, den Broeder JM et al. (2014) Shifting from car to active transport: A systematic review of the effectiveness of interventions. Transportation Research Part A-Policy and Practice 70:264-280.

3 Stewart G, Anokye NK, and Pokhrel S. (2015) What interventions increase commuter cycling? A systematic review. BMJ Open 5:e007945.

4 Vuori I. (2011) Promoting cycling: a review of interventions. Clinical Journal of Sport Medicine 21:542-544.

5 Goodman A, Panetr J, Sharp SJ et al. (2013) Effectiveness and equity impacts of town-wide cycling initiatives in England: A longitudinal, controlled natural experimental study. Social Science & Medicine 97:228-237.

6 Goodman et al. (under review). A controlled before-and-after study of the effect of the Department for Transport Bikeability scheme for children in England.

7 Aldred R, Crosweller S (2015) investigating the rates and impacts of near misses and related incidents among UK cyclists. Journal of Transport & Health 2:379-393.

8 Kassavou A, Turner A, and French DP. (2013) Do interventions to promote walking in groups increase physical activity? A meta-analysis. International Journal of Behavioral Nutrition & Physical Activity 10:18.

9 Lee RE, O'Connor DP, Smith-Ray R et al. (2012) Mediating Effects of Group Cohesion on Physical Activity and Diet in Women of Color: Health Is Power. American Journal of Health Promotion 26:E116-E125.

10 Schulz AJ, Israel BA, Mentz GB et al. (2015) Effectiveness of a Walking Group Intervention to Promote Physical Activity and Cardiovascular Health in Predominantly Non-Hispanic Black and Hispanic Urban Neighborhoods: Findings From the Walk Your Heart to Health Intervention. Health Education & Behavior 42:380-392.

11 Wilson DK, Van Horn ML, Siceloff ER et al. (2015) The Results of the "Positive Action for Today's Health" (PATH) Trial for Increasing Walking and Physical Activity in Underserved African-American Communities. Annals of Behavioral Medicine 49:398-410.

12 Brosseau L, Wells GA, Kenny GP et al. (2012) The implementation of a community-based aerobic walking program for mild to moderate knee osteoarthritis (OA): a knowledge translation (KT) randomized controlled trial (RCT): Part I: The Uptake of the Ottawa Panel clinical practice guidelines (CPGs). BMC Public Health 12:871.

13 Melville CA, Mitchell F, Stalker K et al. (2015) Effectiveness of a walking programme to support adults with intellectual disabilities to increase physical activity: walk well cluster-randomised controlled trial. International Journal of Behavioral Nutrition & Physical Activity 12:125.

14 Pal S, Cheng C, and Ho S. (2011) The effect of two different health messages on physical activity levels and health in sedentary overweight, middle-aged women. BMC Public Health 11:204.

15 Hornbuckle LM, Liu PY, Ilich JZ et al. (2012) Effects of Resistance Training and Walking on Cardiovascular Disease Risk in African-American Women. Medicine and Science in Sports and Exercise 44:525-533.

16 Kovelis D, Zabatiero J, Furlanetto KC et al. (2012) Short-term effects of using pedometers to increase daily physical activity in smokers: a randomized trial. Respiratory Care 57:1089-1097.

17 Zabatiero J, Kovelis D, Furlanetto KC et al. (2014) Comparison of two strategies using pedometers to counteract physical inactivity in smokers. Nicotine & Tobacco Research 16:562-568.

18 Strath SJ, Swartz AM, Parker SJ et al. (2011) A pilot randomized controlled trial evaluating motivationally matched pedometer feedback to increase physical activity behavior in older adults. Journal of Physical Activity & Health 8:Suppl-74.

19 Adams MA, Sallis JF, Norman GJ et al. (2013) An Adaptive Physical Activity Intervention for Overweight Adults: A Randomized Controlled Trial. Plos One 8.

20 Staudter M, Dramiga S, Webb L et al. (2011) Effectiveness of pedometer use in motivating active duty and other military healthcare beneficiaries to walk more. US Army Medical Department Journal 108-119.

21 Rote AE, Klos LA, Brondino MJ et al. (2015) The Efficacy of a Walking Intervention Using Social Media to Increase Physical Activity: A Randomized Trial. Journal of Physical Activity & Health 12:Suppl-25.

22 Kullgren JT, Harkins KA, Bellamy SL et al. (2014) A mixed-methods randomized controlled trial of financial incentives and peer networks to promote walking among older adults. Health Education & Behavior 41:Suppl-50S.

23 Fitzsimons CF, Baker G, Gray SR et al. (2012) Does physical activity counselling enhance the effects of a pedometer-based intervention over the long-term: 12-month findings from the Walking for Wellbeing in the west study. BMC Public Health 12:206.

24 Kim BH and Glanz K. (2013) Text messaging to motivate walking in older African Americans: a randomized controlled trial. American Journal of Preventive Medicine 44:71-75.

25 Maturi MS, Afshary P, and Abedi P. (2011) Effect of physical activity intervention based on a pedometer on physical activity level and anthropometric measures after childbirth: a randomized controlled trial. Bmc Pregnancy and Childbirth 11.

26 Petersen CB, Severin M, Hansen AW et al. (2012) A population-based randomized controlled trial of the effect of combining a pedometer with an intervention toolkit on physical activity among individuals with low levels of physical activity or fitness. Preventive Medicine 54:125-130.

27 Cayir Y, Aslan SM, and Akturk Z. (2015) The effect of pedometer use on physical activity and body weight in obese women. European Journal of Sport Science 15:351-356.

28 Bird EL, Baker G, Mutrie N et al. (2013) Behavior change techniques used to promote walking and cycling: a systematic review. [Review]. Health Psychology 32:829-838.

29 French DP, Stevenson A, and Michie S. (2012) An intervention to increase walking requires both motivational and volitional components: a replication and extension. Psychology Health & Medicine 17:127-135.

30 Duvall J. (2012) A comparison of engagement strategies for encouraging outdoor walking. Journal of Physical Activity & Health 9:62-70.

31 Fjeldsoe BS, Miller YD, and Marshall AL. (2013) Social cognitive mediators of the effect of the MobileMums intervention on physical activity. Health Psychology 32:729-738.

32 Gell NM and Wadsworth DD. (2015) The Use of Text Messaging to Promote Physical Activity in Working Women: A Randomized Controlled Trial. Journal of Physical Activity & Health 12:756-763.

33 Burke L, Lee AH, Jancey J et al. (2013) Physical activity and nutrition behavioural outcomes of a home-based intervention program for seniors: a randomized controlled trial. International Journal of Behavioral Nutrition & Physical Activity 10:14.

34 King AC, Bickmore TW, Campero MI et al. (2013) Employing virtual advisors in preventive care for underserved communities: results from the COMPASS study. Journal of Health Communication 18:1449-1464.

35 Kong KL, Campbell CG, Foster RC et al. (2014) A pilot walking program promotes moderate-intensity physical activity during pregnancy. Medicine & Science in Sports & Exercise 46:462-471.

36 Rhodes RE, Murray H, Temple VA et al. (2012) Pilot study of a dog walking randomized intervention: effects of a focus on canine exercise. Preventive Medicine 54:309-312.

37 Voukelatos A, Merom D, Sherrington C et al. (2015) The impact of a home-based walking programme on falls in older people: the Easy Steps randomised controlled trial. Age & Ageing 44:377-383.

38 Larouche R, Saunders TJ, Faulkner GEJ et al. (2014) Associations Between Active School Transport and Physical Activity, Body Composition, and Cardiovascular Fitness: A Systematic Review of 68 Studies. Journal of Physical Activity & Health 11:206-227.

39 Christiansen LB, Toftager M, Ersboll AK et al. (2014) Effects of a Danish multicomponent physical activity intervention on active school transport. Journal of Transport & Health 1:174-181.

40 Borrestad LA, Ostergaard L, Andersen LB et al. (2012) Experiences from a randomised, controlled trial on cycling to school: does cycling increase cardiorespiratory fitness? Scandinavian Journal of Public Health 40:245-252.

41 Ducheyne F, De Bourdeaudhuij I, Lenoir M et al. (2014) Effects of a cycle training course on children's cycling skills and levels of cycling to school. Accident Analysis and Prevention 67:49-60.

42 Mendoza JA, Watson K, Baranowski T et al. (2011) The Walking School Bus and Children's Physical Activity: A Pilot Cluster Randomized Controlled Trial. Pediatrics 128:E537-E544.

43 Freak-Poli RLA, Cumpston M, Peeters A et al. (2013) Workplace pedometer interventions for increasing physical activity. Cochrane Database of Systematic Reviews .

44 Aittasalo M, Rinne M, Pasanen M et al. (2012) Promoting walking among office employees - evaluation of a randomized controlled intervention with pedometers and e-mail messages. BMC Public Health 12:403.

45 Thorndike AN, Mills S, Sonnenberg L et al. (2014) Activity Monitor Intervention to Promote Physical Activity of Physicians-In-Training: Randomized Controlled Trial. Plos One 9.

46 Ribeiro MA, Martins MA, and Carvalho CRF. (2014) Interventions to Increase Physical Activity in Middle-Age Women at the Workplace: A Randomized Controlled Trial. Medicine and Science in Sports and Exercise 46:1008-1015.

47 Mansi S, Milosavljevic S, Tumilty S et al. (2015) Investigating the effect of a 3-month workplace-based pedometer-driven walking programme on health-related quality of

life in meat processing workers: a feasibility study within a randomized controlled trial. BMC Public Health 15:410.

48 Compernolle S, Vandelanotte C, Cardon G et al. (2015) Effectiveness of a Web-Based, Computer-Tailored, Pedometer-Based Physical Activity Intervention for Adults: A Cluster Randomized Controlled Trial. Journal of Medical Internet Research 17:21-35.

49 Puig-Ribera A, Bort-Roig J, Gonzalez-Saarez AM et al. (2015) Patterns of Impact Resulting from a 'Sit Less, Move More' Web-Based Program in Sedentary Office Employees. Plos One 10.

50 Audrey s (2015) Employer schemes to encourage walking to work: feasibility study incorporating an exploratory randomised controlled trial.

51 Barclay RE, Stevenson TJ, Poluha W et al. (2015) Interventions for improving community ambulation in individuals with stroke. Cochrane Database of Systematic Reviews .

52 Funk M and Taylor EL. (2013) Pedometer-based walking interventions for free-living adults with type 2 diabetes: a systematic review. [Review]. Current Diabetes Reviews 9:462-471.

53 Harris T, Kerry SM, Victor CR et al. (2015) A primary care nurse-delivered walking intervention in older adults: PACE (pedometer accelerometer consultation evaluation)-Lift cluster randomised controlled trial. PLoS Medicine / Public Library of Science 12:e1001783.

54 Kolt GS, Schofield GM, Kerse N et al. (2012) Healthy Steps trial: pedometer-based advice and physical activity for low-active older adults. Annals of Family Medicine 10:206-212.

55 Petry NM, Andrade LF, Barry D et al. (2013) A Randomized Study of Reinforcing Ambulatory Exercise in Older Adults. Psychology and Aging 28:1164-1173.

56 Heron N, Tully MA, McKinley MC et al. (2014) Steps to a better Belfast: physical activity assessment and promotion in primary care. British Journal of Sports Medicine 48:1558-1563.

57 Croteau KA, Suresh V, and Farnham E. (2014) Efficacy of Using Physical Activity Mentors to Increase the Daily Steps of Older Adults in the Primary Care Setting: A Pilot Study. Journal of Aging and Physical Activity 22:16-24.

58 Fyhri A. (2015) Effects of e-bikes on bicycle use and mode share. Transportation Research Part D: Transport and Environment 2015/5.:-52.

59 Astegiano P. (2015) A Preliminary Analysis Over the Factors Related with the Possession of an Electric Bike. Conference Title: 18th Euro Working Group on Transportation, EWGT 2015 Location.

60 Johnson M. (2015) Extending Life on the Bike: Electric Bike Use by Older Australians. Journal of Transport & Health 2015/6.:-283.

61 Wolf A. (2014) Technology adoption of electric bicycles: A survey among early adopters. Transportation Research Part A: Policy and Practice 2014/11.:-211.

62 Hendriksen I, Engbers L, Simons M et al. (2012) Electrical assisted cycling: A new mode for meeting the physical activity guidelines? Journal of Science and Medicine in Sport.Conference: Be Active 2012 Sydney, NSW Australia.Conference Start: 20121031 Conference End: 20121103.Conference Publication: (var.pagings).15 (pp S270-S271), 2012.Date of Publication: December 2012. S270-S271.

63 Collado MY. (2014) Targeting the introduction of E-bikes based on behavior change potential and user perception. Conference Title: 20th International Conference on Urban Transport and the Environment Location:-265.

64 Campaign for better transport (date not reported) Buses in crisis. A report on bus funding across England and Wales 2010 – 2015.

65 Green J, Steinbach R, Jones A et al. (2014) On the buses: a mixed-method evaluation of the impact of free bus travel for young people on the public health. NIHR Journals Library. Public Health Research, No. 2.1.

66 Interventions to promote or maintain physical activity during and after the transition to retirement: evidence synthesis to inform recommendations for policy and practice.

67 www.cycleboom.org.

68 Development and feasibility of an incentive scheme to promote walking/cycling to school.

69 Travel to work study