Physical activity and the environment update

Evidence Reviews – Appendix 4

GRADE Evidence Profiles

FINAL

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Effectiveness and cost-effectiveness of public open space and transport interventions: GRADE evidence profiles

1. Introduction

The outcomes reported in the evidence reviews were appraised and presented using GRADE (Grading of Recommendations Assessment, Development and Evaluation). This approach to assessing the quality of a body of evidence and has been used in development of NICE clinical guidelines for a number of years. The evidence is rated across studies for specific outcomes as opposed to rating study by study. This approach assesses consistency of results across different studies, provided the studies are measuring the same outcome.

GRADE looks at "the extent to which one can be confident that an estimate of effect of association is close to the quantity of specific interest"[1]. GRADE is concerned with how certain we can be that the observed effect is close to the real effect. When using GRADE we consider the risk of bias, consistency, directness, and precision of the studies reporting on a particular outcome. The evidence regarding that outcome is then graded as either of **very low, low, moderate, or high quality**.

2. GRADE and Physical Activity Outcomes

The committee considered the Minimal Important Difference (MID), defined as *the smallest change in an outcome that is considered important by patients or health care professionals.* The committee agreed that for this topic MID would be any change observed as a result of an intervention. It was discussed that in certain population groups the smallest of changes in activity would benefit health and wellbeing.

As highlighted in the protocol and scope, the outcomes for Evidence Review 1 are:

Primary outcomes

- total physical activity (PA) (measured by, for example, time/ distance/ number of steps/ levels of activity/ levels of recommended PA)
- total sedentary time (measured by time)
- domain-specific physical activity levels (active travel or physical activity in everyday life, such as measures of walking, cycling or active play)
- public transport use (proxy measure of PA)

Secondary outcomes

[1] Higgins JPT, Green S (editors). 12.2.1 The GRADE Approach. *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from www.handbook.cochrane.org

- changes to road environment (such as introduction of traffic calming measures)
- changes to transport (such as changes in modal share)
- vehicle speeds
- car use

The committee agreed that all primary outcomes were to be regarded as critical outcomes and all secondary outcomes were to be regarded as important outcomes.

The committee noted that the complexity and scale of the interventions makes this an extremely challenging area of research. For some interventions, it may not be possible, practical or ethical to undertake a randomised controlled trial (RCT) and natural experiments may be the most valid approach. So a modified version of GRADE was used as follows:

- When a natural experiment study design was the most feasible and valid approach, these studies started the GRADE process as 'high quality'.
- When an RCT was feasible and optimal but a natural experiment design was used, the natural experiment started the GRADE process as 'low quality'.

The starting quality for each study is specified in the heading for each section in this document. All included studies for all reviews were natural experiments.

The committee noted that the majority of studies included in the evidence reviews were graded as low or very low quality. However, they also noted that the body of evidence as a whole indicated a consistent 'direction of travel' whereby sympathetic changes to the environment and/or public transport provision were shown to increase physical activity.

The committee also noted that variations in methodology used to evaluate the impact of interventions in different groups over different time points meant that they did not feel comfortable pooling the heterogeneous outcome data. For example, for the following reasons:

- Physical activity outcomes being presented both as continuous (i.e change in METmins achieved) and dichotomous (i.e. whether guidelines on physical activity were met).
- Outcomes measured at follow-up points which were varied in length i.e. immediately after intervention implementation compared with 18 months after implementation.

The GRADE evidence profiles presented below show the appraised outcomes for Reviews 1, 2 and 3. Details of how the evidence for each outcome was appraised across each of the quality domains is given below:

Quality domain	Description
Risk of bias	Limitations in study design and implementation may bias the estimates of the treatment effect. Major limitations in studies decrease the confidence in the estimate of the effect. Examples of such limitations are selection bias (often due to poor allocation concealment), performance and detection bias (often due to a lack of blinding of the participants, healthcare professional or assessor) and attrition bias (due to missing data causing systematic bias in the analysis). Natural experiments were also assessed for the appropriateness of the control group/s, and the extent to which they adjusted for potential confounders. Where there are no study limitations, evidence is assessed as having 'no serious' risk of bias. Alternatively, evidence may be downgraded one level ('serious' risk of bias) or two levels ('very serious' risk of bias).
Indirectness	Indirectness refers to differences in study population, intervention, comparator and outcomes between the available evidence and the review question. Where the evidence is directly applicable to the PICO, it is assessed as having 'no serious' risk of indirectness. Alternatively, evidence may be downgraded one level ('serious' risk of indirectness) or two levels ('very serious' risk of indirectness).
Inconsistency	Inconsistency refers to an unexplained heterogeneity of effect estimates between studies combined into the same GRADE profile due to presenting the same outcomes in the same way. If pooled in a meta-analysis, the I^2 statistic describes the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance). For the purposes of this review, as it was rarely possible to combine results into a meta-analysis, the committee agreed that the heterogeneity of the results be considered by the reviewers. Where heterogeneity could be explained by differences in study design, content of interventions and comparators, it was assessed as having 'no serious' inconsistency. Where inconsistency could not be explained by these factors, results could be downgraded by one level for some heterogeneity, and by two levels for a large amount of unexplained heterogeneity.
Imprecision	95% confidence intervals denote the possible range of locations of the true population effect at a 95% probability, and so wide confidence intervals may denote a result that is consistent with conflicting interpretations (for example a result may be consistent with both public health benefit AND public health harm) and thus be imprecise. Imprecision can be caused by studies having relatively few individuals or few events. For the purpose of these reviews, the committee chose a Minimal Important Difference (MID) of any change, as any change at a population level was considered to be meaningful. Imprecision was judged using the following criteria; • Where confidence intervals for an effect spanned the line of no effect, the result was downgraded for 'serious' imprecision because we are uncertain of where the true effect lies. • Where confidence intervals for an effect do not span the line of no effect, we are certain of where the true effect lies, and so there is no serious imprecision.

Quality domain	Description
	For the majority of studies reviewed for this guideline it was not possible to assess the degree of precision due to confidence intervals not being reported or able to be imputed from information provided in the paper. However, the committee considered it important to note that in public health, the approach often taken to assess whether an intervention is effective is one of hypothesis testing using P Values. P Values denote the probability of obtaining a given result assuming the null hypothesis (no effect) is true. For example, assuming the intervention has no effect, a P Value of 0.05 means you would obtain the observed difference (or more) in 5% of studies due to random sampling error. The committee appreciated this is different from assessing the precision of an effect. In these instances, the P Value was used as follows; • Where the P Value for an effect was >0.05, the confidence intervals would be likely to span the line of no effect. The result was downgraded for 'serious' imprecision. • Where the P Value for an effect was <0.05, the confidence intervals would be unlikely to span the line of no effect. The result was not downgraded as it had 'no serious' imprecision. Where a study did not provide confidence intervals for an effect (or information to work this out), or P Values, confidence intervals of change over time in the intervention group and change over time in the control group were calculated and compared. Results were judged as follows: • Where these confidence intervals overlapped each other, it was judged that the results were not significantly different between groups. The result was downgraded for 'serious' imprecision as we are not certain where the true effect is. • Where confidence intervals did not overlap each other, it was judged that the results were significantly different. The result was not downgraded as it had 'no serious' imprecision as we are certain where the true effect is. Where a study did not provide confidence intervals, P-Values, or sufficient data to be able to calculate these, the review team could not be certain that the result was meaningful. Therefore the result was downgraded for serious imprecision.
Other issues	Potential conflicts of interest, often caused by excessive pharmaceutical company involvement in the publication of a study, should be noted. Additionally, serious flaws to the methodology of the study which are not justified may lead to bias and so can result in a downgrade. The option to upgrade confidence in the evidence by one level for consistency was applied. Evidence is upgraded for consistency if a number of studies from different settings investigating the same intervention report the same outcome and show the same direction of effect.

Review 1

Congestion charging

[To note that all studies on congestion charging started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Congestion charging										
Total physical activity as measured by total time spent in physical activity (PA)										
1 Bergman 2010	Non-randomised controlled study	Serious[2]	NA	No serious	Serious[3]	None	165	138	Change in time spent in physical activity (self-reported using IPAQ questionnaire) (intervention vs control) (baseline to 5-month follow-up): **Control** / **Intervention** / **P value** Overall PA: No difference / Increase / 0.015 There was a statistically significant increase in physical activity compared to the control group	LOW
Total physical activity as measured by total time spent on moderate PA (4 METS)										
1 Bergman 2010	Non-randomised controlled study	Serious[4]	NA	No serious	Serious[5]	None	165	138	Change in time spent on moderate PA (self-reported using IPAQ questionnaire) (intervention vs control) (baseline to 5-month follow-up): **Control** / **Intervention** / **P value** Moderate PA: No difference / Increase / 0.036	LOW

[2] Serious risk of bias due to no adjustments for any potential confounders

[3] Serious imprecision due to no effect size given, so magnitude of effect cannot be determined

[4] Serious risk of bias due to no adjustments for any potential confounders

[5] Serious imprecision due to no effect size given, so magnitude of effect cannot be determined

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>There was a statistically significant increase in moderate physical activity compared to the control group</td><td></td></tr>
<tr><td colspan="11">Total sedentary time as measured by the total time spent sitting</td></tr>
<tr><td>1
Bergman 2010</td><td>Non-randomised controlled study</td><td>Serious[6]</td><td>NA</td><td>No serious</td><td>Serious[7]</td><td>None</td><td>165</td><td>138</td><td><u>Change in total time spent sitting</u> <u>(self-reported using IPAQ questionnaire) (intervention vs control) (baseline to 5-month follow-up):</u>
<table><tr><th></th><th>Control</th><th>Intervention</th><th>P value</th><th>Effect size -r[8]</th></tr><tr><td>Sitting</td><td>No difference</td><td>Decreased</td><td>0.009</td><td>0.03</td></tr></table>Subjects in the intervention group reported statistically significant less time spent sitting compared to the comparator group</td><td>LOW</td></tr>
<tr><td colspan="11">Changes to transport as measured by % of car drivers switching to public transport</td></tr>
<tr><td>2
Transport for London 2008
Karlstrom and Franklin 2009</td><td>Non-randomised uncontrolled studies</td><td>Very serious[9]</td><td>No serious</td><td>No serious</td><td>Serious[10]</td><td>None</td><td>1550</td><td>n/a</td><td><u>Percentage of car drivers switching to public transport (self-reported) (baseline to 18 months follow-up)</u>

About 25% of car drivers crossing the toll cordon (treated individuals) switch to public transport compared to 10% in the control group (car drivers not crossing the toll cordon).
Initial car drivers crossing the toll cordon had a 15% higher rate of switching to public transport compared with those car drivers not crossing the cordon. There is a background rate of 8-11% of all travellers switching mode between baseline and follow-up, indicating a range of factors influence transport mode choice.

<u>Proportion of survey respondents switching transport mode post London congestion charge (follow-up period not clear) (self-reported) (intervention group only):</u>

Of residents living outside of charging zone, around half would not continue driving to the extension zone. Of these, 40% are estimated to have changed transport method as a result of the charge.</td><td>VERY LOW</td></tr>
</table>

[6] Serious risk of bias due to no adjustments for any potential confounders

[7] Serious imprecision due to no effect size given, so magnitude of effect cannot be determined

[8] An effect size of up to 0.1 is considered small

[9] Very serious risk of bias due to potential selection bias. Data collection tools were not validated. Other interventions during the study period likely to impact on outcome and were not controlled for (Karlstrom). No adjustments for demographic factors over time (TfL).

[10] Unable to tell whether intervention is effective as no measure of variance reported or p values – downgraded one level

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="11">Changes to transport as measured by traffic make-up on the road and bus patronage, various data collection methods, 12 months follow-up (important)</td></tr>
<tr><td>1
Transport for London</td><td>Non-randomised uncontrolled study</td><td>Serious[11]</td><td>NA</td><td>No serious</td><td>Serious[12]</td><td>None</td><td>n/a</td><td></td><td>
<u>Change in vehicles using the free passage route (percentage change between baseline and 12-month follow-up figures) (intervention only):</u>
<table>
<tr><th>Chargeable</th><th>2005-2006 & 2007 % change</th></tr>
<tr><td>Car and minicabs</td><td>-3%</td></tr>
<tr><td>Vans and lorries</td><td>+7%</td></tr>
<tr><td>Non chargeable</td><td></td></tr>
<tr><td>Licensed taxis</td><td>+9%</td></tr>
<tr><td>Two wheelers</td><td>+12%</td></tr>
<tr><td>Pedal cycles</td><td>+18%</td></tr>
</table>
<u>Traffic make-up in vehicle-kilometres driven (% of total) within western extension zone during charging hours (direct observation):</u>
<table>
<tr><th>Chargeable</th><th>% change</th><th>Baseline</th><th>Follow-up</th></tr>
<tr><td>Car and minicabs</td><td>-6%</td><td>60%</td><td>54%</td></tr>
<tr><td>Vans, lorries and others</td><td>+2.5%</td><td>13%</td><td>15%</td></tr>
<tr><td>Non chargeable</td><td></td><td></td><td></td></tr>
<tr><td>Licensed taxis</td><td>+2%</td><td>11%</td><td>13%</td></tr>
<tr><td>Buses and coaches</td><td>+1%</td><td>3%</td><td>4%</td></tr>
<tr><td>Two wheelers</td><td>+1%</td><td>5%</td><td>6%</td></tr>
<tr><td>Pedal cycles</td><td>+1%</td><td>5%</td><td>6%</td></tr>
</table>
<u>Bus patronage changes between baseline and 1-year follow-up (record-kept data):</u>
Bus passengers entering the charging zone increased by 6% (96,500/day to 102,000 /day) in charging hours, and 9% during
</td><td>LOW</td></tr>
</table>

[11]Serious risk of bias due to no controlling for other environmental changes i.e. Increased bus users could be a result of increased bus capacity created in advance of the changes,. .
[12] Unable to tell whether intervention is effective as no measure of variance reported or p values – downgraded one level

								morning peak period (34,100 to 37,200) (07:00-10:00). Increases for exiting the charging zone were 5% (90,100 to 94,200) and 2% (24,300 to 24,900) for charging hours and peak hours respectively. Percentages and absolute figures are slightly mismatched, likely to do with rounding of absolute figure	
SUMMARY: see evidence statement 1.1									

Guided busway[13]

[To note that all studies on the guided busway started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
Guided Busway										
Active travel as measured by the average time spent in active commuting										
1 Panter et al 2016	Non-randomised uncontrolled study	Very serious[14]	NA	Serious[15]	No serious	None	364	n/a	Average time (mins in last 7 days) spent in active commuting and physical activity (self-reported) (baseline to 6-18 month follow up): **Activity** / **% (N) Reporting Any Activity At Baseline** / **Time Spent In Activity (Min/W** — Baseline / Follow-Up / P-Value Active Weekly Commuting: 77.6 (364) / 120 (33-200) / 100 (33-200) / 0.001	VERY LOW

[13] The Guided Busway comprised a new bus network and an adjacent 22km traffic-free walking and cycling route
[14] Very serious risk of bias due to self-reported activity measure and a high loss to follow-up with only minimal adjustments, i.e. did not control for bike ownership.
[15] Sample is commuters and therefore not generalizable to the population of the guideline.

									Walking: 27.8 (131); 0 (0-20); 0 (0-40); 0.487 Cycling: 56.6 (266); 70 (0-160); 40 (0-160); 0.016 Time spent on active commuting decreased significantly at follow-up, largely attributed to the decrease in median time spent on cycling Association between exposure to intervention (measured as proximity of participants' residence to the guided bus way) and PA: Exposure to the busway was associated with a significantly greater likelihood of an increase in weekly cycle commuting time (relative risk ratio [RRR] 1.34, 95% CI1.03, 1.76), but not for active commuting as a whole and walking.	
Physical activity in everyday life as measured by the average time spent in recreational walking and cycling										
1 Panter et al 2016	Non-randomised uncontrolled study	Very serious[16]	NA	Serious[17]	Serious[18]	None	364	n/a	Change in average time (mins in past 7 days) spent in walking and cycling for recreation and physical activity (self-reported) (baseline to 6-18 month follow-up): **ACTIVITY** | **% (N) REPORTING ANY ACTIVITY AT BASELINE** | **TIME SPENT IN ACTIVITY (MIN/WEEK) MEDIAN (IQR)** Baseline | Follow-Up | P-Value RECREATION (TOTAL): 83.3 (391); 75 (28-150); 79 (30,180); 0.640 Walking: 78.0 (366); 57 (15-135); 60 (0,150); 0.551 Cycling: 32.6 (153); 0 (0-22.5); 0 (0,19); 0.416 There was no significant difference between the time spent walking and cycling for recreation at follow up compared to baseline	VERY LOW
Changes to transport as measured by changes in proportion of journeys to work made by active travel (proximity)										

[16] Very serious risk of bias due to self-reported activity measure and a high loss to follow-up with only minimal adjustments, i.e. did not control for bike ownership.
[17] Sample is commuters and therefore not generalizable to the population of the guideline
[18] No significant effect of intervention as P values greater than 0.05– downgraded one level

1 Heinen et al 2015	Non-randomised uncontrolled study	Serious [19]	NA	Serious[20]	No serious	None	470	n/a	Change in proportion of all journeys to work in past 7 days made by active modes of travel as opposed to non-active modes such as car (self-reported) (subgroup analysis) (baseline to 3-year follow-up) [Relative Risk Ratio and 95% confidence interval]: Proximity to the busway was a predictor of large and significant increase in active travel (1.80 [1.27 to 2.55] p<0.01) and reduced the likelihood of a small decrease in active travel as a proportion of all journeys made (0.47 [0.28 to 0.81]) i.e. commuters living 4 km from the busway were almost twice as likely to report a substantial increase in active travel as a proportion of all journeys, and half as likely to report a small decrease, than those living 9 km away.	LOW
Changes to transport as measured by changes in proportion of journeys to work made by active travel (urban / rural)										
1 Heinen et al 2015	Non-randomised uncontrolled study	Serious[21]	NA	Serious[22]	No serious	None	470	NA	Urban / Rural (self-reported) (baseline to 3-year follow-up): Living in villages or smaller settlements rather than urban areas predicted an increase in public transport trips as a proportion of all commuting trips (RRR 2.53 (1.06, 6.05), pp<0.05)	LOW
Changes to transport as measured by changes in proportion of journeys to work made by active travel (baseline active commuting)										
1 Panter et al 2016	Non-randomised uncontrolled study	Very serious[23]	NA	Serious[24]	No serious	None	364	NA	Active commuting changes by baseline level of active commuting: The intervention had a significant effect on total active commuting only for those who reported the lowest levels of active commuting at baseline (RRR 1.76, 95% CI 1.16, 2.67).	VERY LOW
SUMMARY: see evidence statement 1.2										

7

[19] Serious risk of bias due to large loss to follow up and no adjustments for ethnicity or socioeconomic status.

[20] Sample is commuters and therefore not generalizable to the population of the guideline

[21] Serious risk of bias due to large loss to follow up and no adjustments for ethnicity or socioeconomic status.

[22] Sample is commuters and therefore not generalizable to the population of the guideline

[23] Very serious risk of bias due to self-reported activity measure and a high loss to follow-up with only minimal adjustments, i.e. did not control for bike ownership.

[24] Sample is commuters and therefore not generalizable to the population of the guideline

Upgrading of bus routes[25]

[To note that all studies on upgrading bus routes started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Upgrading of bus routes										
Public transport use (as a proxy of physical activity) as measured by bus use										
1 Loader and Stanley 2009	Non-randomised controlled study	Very serious[26]	NA	No serious	Serious [27]	None	Unclear[28]	Unclear[29]	<u>Change in bus use (patronage) between baseline and 10-year follow-up (counts) (intervention vs control):</u> Follow-up data shows intervention total bus patronage growth of 4.6% between baseline and 1-year follow-up. Control routes grew by 1.3% in the same period. <u>Change in bus use (patronage) between baseline and 10-year follow-up (counts) by area (intervention vs control):</u> Greatest increases in use of intervention routes are seen in the Central Business District (CBD) and outer regions (13.8% and 10.8% respectively). A decrease is seen in usage of unchanged routes in the outer area (-0.9%). <u>Bus patronage growth by time, Saturdays only (baseline to 1-year follow-up):</u> For intervention buses whose finishing times had previously been between 4pm and 5pm (n = 2), their afternoon validations “more than doubled” after extension of running hours. For buses whose previous finishing time was between 5pm and 6pm, afternoon demand increased by around 20%.	VERY LOW

[25] This includes interventions to upgrade stops to show real-time passenger information, and increase bus frequency
[26] Very serious risk of bias due to no information given about whether baseline outcome measures or characteristics were similar. Detail on data collection methods not given. No mention of whether other changes occurring during study period.
[27] No measures of variance provided – downgraded one lev
[28] Participants numbers were not given
[29] Participants numbers were not given

SUMMARY: see evidence statement 1.3

New light rail service

[To note that all studies on the new light rail service started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
New light rail service										
Public transport use (as a proxy measured of physical activity) as measured with train trips, walk trips and walk minutes										
1 Boarnet 2013	Non randomised controlled study	Serious[30]	NA	No serious	Serious[31]	None	103	101	Change in train trips, walk trips, and walk minutes by household (intervention vs control) (baseline to 3-7 month follow-up) (self-reported data): Between group differences were not significantly different for train trips, walk trips, or walk minutes between baseline and follow-up in intervention group and control group. Both reportedly increased over time by a similar amount.	LOW
Public transport use (as a proxy measured of physical activity) as measured by 7-day accelerometer wear										
1 Boarnet 2013	Non randomised controlled study	Serious[32]	NA	No serious	Serious[33]	None	103	101	Moderate to Vigorous Physical Activity in average minutes over past 7 days (accelerometer data) (intervention vs control) (data from 3-7 month follow-up): Intervention Control Mean difference P value	LOW

[30] Serious risk of bias due to self-reported data and no adjusting for demographic characteristics.
[31] Unable to tell whether the intervention had a significant effect as no difference between intervention and control – downgraded one level
[32] Serious risk of bias due to no adjusting for demographic characteristics
[33] P values greater then 0.05, showing no significant effect of intervention – downgraded one level

									MVPA	22.04	18.73	3.31	0.674	
									No difference between baseline and follow-up PA for either group					
SUMMARY: see evidence statement 1.4														

14

New rail stop

[To note that all studies on new rail stops started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
New Rail Stop										
Public transport use (as a proxy measure of physical activity) as measured by rail ridership										
1[34] Brown and Werner (2007) Brown and Werner (2009)	Non-randomised uncontrolled studies	Very serious[35]	NA	No serious	No serious	None	51	n/a	Percentage of people travelling by rail in past 2 weeks (baseline to 7-11 month follow-up) (intervention only) (self-reported data): Before: Participants Riding The Rail* 50%; After: 68.75%; % Change: 37.5%; P Value: 0.001* Evidence shows the addition of a rail stop significantly increased train use.	LOW
1[36] Brown and Werner (2007) Brown and Werner (2009)	Non-randomised uncontrolled studies	Very serious risk of bis[37]	NA	No serious	Serious[38]	None	51	n/a	Mean rail rides (baseline to 7-11 month follow-up) (intervention only) (self-reported data): Before: Mean Rail Rides 3.72 (Sd 6.46); After: 5.02 (Sd 7.90); Mean difference (95% CI)*: 1.30 (-1.50, 4.10) The mean difference over time was not significant	VERY LOW

[34] One study but two publications
[35] Very serious risk of bias due to self-reported data and data collection methods which were not validated. Authors did not control for all potential confounders such as education level and age. High levels of drop out.
[36] One study but two publications
[37] Very serious risk of bias due to self-reported data and data collection methods which were not validated. Authors did not control for all potential confounders such as education level and age. High levels of drop out.
[38] Confidence intervals span the MID, therefore downgraded one level on imprecision

									*Calculated by reviewers.	
Total physical activity as measured by an accelerometer per hour										
1 As reported in Brown and Werner (2007) Brown and Werner (2009)	Non-randomised uncontrolled study	Serious risk of bias[39]	Not assessable as is one study	No serious indirectness	Serious imprecision[40]	None	51	n/a	Change in number of moderate bouts[41] of activity per hour (accelerometer data) (baseline to 7-11 month follow-up) (intervention only): (Participants) | Before | After | Mean difference (95% CI)* Moderate bouts*/hr (7-11 months follow up) | 0.06 (sd 0.09) | 0.06 (sd 0.08) | 0.00 (-0.03,0.03) The mean difference over time was not significant. The moderate activity bouts* at baseline were related to bouts at follow-up, and follow-up rail rides (r=0.46, beta=0.39, p =0.01) and larger households (r=0.15, beta=0.43, p=0.01) accounted for the significant variance beyond the effects of baseline activity levels. Subgroup analysis shows that number of mean moderate activity bouts is significantly different between groups[42] (p = 0.03). Non riders have the lowest (1.07 (SE 0.76)) followed by new riders (1.77 (SE 0.83)) and then continuing riders (3.68 (SE 0.60)). Proportion of bouts related to walking to a rail stop increased from 0.1 to 0.15 – no statistical significance reported. *Calculated by reviewers.	LOW
SUMMARY: see evidence statement 1.5										

[39] Serious risk of bias due to minimal adjusting for confounders (income and employment only)
[40] Confidence intervals span the MID, therefore downgraded one level on imprecision
[41] *Moderate bouts defined as accumulations of 8 or more moderate minutes
[42] Subgroup analysis splits population into non-riders, new riders, and continuing riders. Baseline and follow-up results for these individuals are combined.

Complete Street interventions[43]

[To note that all studies on complete street interventions started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Complete Street interventions										
Total physical activity as measured by accelerometer (counts per minute)										

[43] New light rail, new bike lanes, improved pavements

<table>
<tr>
<td>1
As reported in Brown et al 2015
Miller et al 2015</td>
<td>Non-randomised uncontrolled study</td>
<td>Serious[44]</td>
<td>NA</td>
<td>No serious</td>
<td>Serious[45]</td>
<td>None</td>
<td>537</td>
<td>n/a</td>
<td>
<u>Activity, counts per minute (accelerometer data) (intervention only) (baseline to 7-11 month follow-up):</u>
<table>
<tr><th>Riders (N)</th><th>Baseline (SE)</th><th>Follow-Up (SE)</th><th>Beta[46]</th><th>95% CI</th><th>P Value</th></tr>
<tr><td>Never (393)</td><td>308.36 (6.63)</td><td>320.33 (7.11)</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Former (41)</td><td>391.05 (27.15)</td><td>376.93 (23.18)</td><td>-49.35</td><td>-78.75, -19.94</td><td>0.001</td></tr>
<tr><td>Continued (51)</td><td>361.08 (27.63)</td><td>317.96 (25.73)</td><td>-6.25</td><td>-34.62, 22.12</td><td>N.S.</td></tr>
<tr><td>New (52)</td><td>333.23 (20.75)</td><td>381.04 (23.73)</td><td>37.40</td><td>10.41, 64.39</td><td>0.007</td></tr>
</table>
Former riders experienced a significant decline in PA compared to the never riders, new riders accrued statistically significant more PA compared to never riders

<u>Comparison of average minutes per day of physical activity for days using public transport versus days not using public transport: Point estimates and 95% confidence intervals</u>
<table>
<tr><td>Overall PA</td><td colspan="3">Public transport versus non-public transport days in 2012</td></tr>
<tr><th>Group (n)</th><th>Mean mins</th><th>95% CI</th><th>P value</th></tr>
<tr><td>public transport days (207)</td><td>19.65</td><td>17.28, 22.02</td><td>0.0001</td></tr>
<tr><td>Non public transport days (285)</td><td>9.59</td><td>7.97, 11.21</td><td></td></tr>
<tr><td></td><td colspan="3">Within-person differences for public transport users</td></tr>
<tr><td>Public transport days (75)</td><td>8.54</td><td>5.00, 12.08</td><td><0.0001</td></tr>
</table>
Evidence suggests that subjects are more likely to have higher levels of physical activity on days when they use public transport compared todays when they do not. This difference is statistically significant for the group as well as within person
</td>
<td>LOW</td>
</tr>
</table>

[44] Serious risk of bias due to selection methods and high levels of drop out.

[45] Results do not specify extent of change in exposed population. Instead, they show extent of change in those who take up using the intervention without detail on how many begin using the intervention.

[46] Authors tested change scores of the 4 public transport ridership groups with 3 planned comparisons that compared never-riders with former, continuing, and new riders, respectively after adjustment for control variables

<table>
<tr><td colspan="10">Total physical activity as measured by moderate-vigorous physical activity (MVPA[47])</td></tr>
<tr><td>1
As reported in Brown et al 2015
Miller et al 2015</td><td>Non-randomised uncontrolled study</td><td>Serious[48]</td><td>NA</td><td>No serious</td><td>Very serious[49]</td><td>None</td><td>537</td><td>n/a</td><td>
<u>MVPA per 10 hours of accelerometer wear (baseline to 7-11 month follow-up) (intervention group only):</u>
<table>
<tr><th>Riders (N)</th><th>Beta (Se)</th><th>95% Ci</th><th>P Value</th></tr>
<tr><td>Never Riders (393)</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Former (41)</td><td>-6.37</td><td>-10.32, -2.43</td><td>N.S</td></tr>
<tr><td>Continued (51)</td><td>-0.81</td><td>-4.62, 3.00</td><td>N.S</td></tr>
<tr><td>New (52)</td><td>4.16</td><td>0.54, 7.78</td><td><0.05</td></tr>
</table>
New riders gained 4.16 minutes per 10 hours compared to never riders. Evidence suggests that MVPA was significantly increased in new train users

<u>Within person differences average mins of PA per 10 hrs wear by year and public transport user group - Point estimates and 95% Cis</u>
<table>
<tr><th></th><th>Change in total physical activity</th><th></th><th></th></tr>
<tr><th>Riders (n)</th><th>Point Estimate</th><th>95% CI</th><th>P Value</th></tr>
<tr><td>Never Riders (391)</td><td>1.27</td><td>-0.60, 3.14</td><td>0.20</td></tr>
<tr><td>Continued (51)</td><td>-2.86</td><td>-8.60, 2.88</td><td>0.32</td></tr>
<tr><td>Former (41)</td><td>-5.54</td><td>-11.88, 0.80</td><td>0.085</td></tr>
<tr><td>New (52)</td><td>5.27</td><td>-1.01, 11.55</td><td>0.098</td></tr>
</table>
Evidence suggests there was group to group changes but not within person changes in MVPA.
</td><td>VERY LOW</td></tr>
<tr><td colspan="10">Total physical activity as measured by light physical activity (LPA[50]) per 10 hours accelerometer wear</td></tr>
</table>

[47] The cut off point for MVPA was at least 2020cpm
[48] Serious risk of bias due to selection methods and high levels of drop out.
[49]P values greater then 0.05, showing no significant effect of intervention.. Results do not specify extent of change in exposed population. Instead, they show extent of change in those who take up using the intervention without detail on how many begin using the intervention.
[50] The cut off point for light PA was defined as less than 1000 counts per minute, ≤5 minutes

<table>
<tr>
<td>1
Brown et al 2015</td>
<td>Non-randomised uncontrolled study</td>
<td>Serious[51]</td>
<td>NA</td>
<td>No serious</td>
<td>Very serious[52]</td>
<td>None</td>
<td>537</td>
<td>n/a</td>
<td><u>LPA per 10 hours of accelerometer wear (baseline to 7-11 month follow-up) (intervention group only):</u>
<table>
<tr><th>Group (n)</th><th>Beta (SE)</th><th>95% CI</th><th>P Value</th></tr>
<tr><td>Never Riders (393)</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Former Riders (41)</td><td>-9.99(±5.60)</td><td>-21, 1.01</td><td>0.075</td></tr>
<tr><td>Continuing Riders (51)</td><td>3.64(±5.41)</td><td>-6.98 , 3.00</td><td></td></tr>
<tr><td>New Riders (52)</td><td>8.67±5.14)</td><td>-1.43,18.77</td><td>0.092</td></tr>
</table>
There were increases in light PA for new riders and continuing riders, however these were not statistically significant.</td>
<td>VERY LOW</td>
</tr>
<tr><td colspan="10">Total sedentary time as measured by sedentary physical activity (SPA[53])</td></tr>
<tr>
<td>1
Brown et al 2015</td>
<td>Non-randomised uncontrolled study</td>
<td>Serious[54]</td>
<td>NA</td>
<td>No serious</td>
<td>Serious[55]</td>
<td>None</td>
<td>537</td>
<td>n/a</td>
<td><u>SPA per 10 hours of accelerometer wear (baseline to 7-11 month follow-up) (intervention group only):</u>
<table>
<tr><th>Group (n)</th><th>Beta (SE)</th><th>95% CI</th><th>P Value</th></tr>
<tr><td>Never Riders (393)</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Former Riders (41)</td><td>16.38 (+/-6.09)</td><td>4.41, 28.35</td><td><0.01</td></tr>
<tr><td>Continuing Riders (51)</td><td>-2.84 (+/-5.88)</td><td>-14.39, 8.71</td><td></td></tr>
<tr><td>New Riders (52)</td><td>-12.83 (+/-5.59)</td><td>-23.82, -1.85</td><td><0.05</td></tr>
</table>
There were significant increases in sedentary PA time for former riders and significant decreases for new riders</td>
<td>LOW</td>
</tr>
<tr><td colspan="10">Active transportation as measured by the number of bike trips undertaken</td></tr>
</table>

[51] Serious risk of bias due to selection methods and high levels of drop out.
[52] Intervention did not have a significant effect: Wide CI intervals that include the null hypothesis and p values greater than 0.05.. Results do not specify extent of change in exposed population. Instead, they show extent of change in those who take up using the intervention without detail on how many begin using the intervention.
[53] The cut off point for sedentary PA was not defined
[54] Serious risk of bias due to selection methods and high levels of drop out.
[55] Results do not specify extent of change in exposed population. Instead, they show extent of change in those who take up using the intervention without detail on how many begin using the intervention.

<table>
<tr><td>1
Brown et al 2016</td><td>Non-randomised uncontrolled study</td><td>Serious[56]</td><td>NA</td><td>No serious</td><td>Serious[57]</td><td>None</td><td>537</td><td>n/a</td><td><u>Change in number of bike trips between baseline and 7-11 month follow-up (intervention group only) (self-reported data):</u>

For those living <800m away from the intervention, there was no significant difference in number bike trips between baseline and follow-up (baseline odds ratio when compared to follow-up 0.86 (95% CI 0.49 to 1.53), p≤0.62).
There was also no significant difference in number of bike trips between near and far groups (odds ratio for far group: 0.69 (95% 0.37 to 1.3), p≤0.25</td><td>LOW</td></tr>
<tr><td colspan="10">Active travel as measured by the change in public transport related physical activity</td></tr>
<tr><td>1
Brown et al 2016</td><td>Non-randomised uncontrolled study</td><td>Serious[58]</td><td>NA</td><td>No serious</td><td>Serious[59]</td><td>None</td><td>537</td><td>n/a</td><td><u>Within person differences average mins of PA per 10 hrs accelerometer wear by year and public transport user group - Point estimates and 95% Cis:</u>

Riders (n) — Change in public transport related PA 2012-2013
<table><tr><th></th><th>Point Estimate</th><th>95% CI</th><th>P Value</th></tr><tr><td>Never Riders (391)</td><td>N/A</td><td>N/A</td><td>N/A</td></tr><tr><td>Continued (51)</td><td>-1.15</td><td>-3.03, -0.74</td><td>0.23</td></tr><tr><td>Former (41)</td><td>-2.34</td><td>-3.56, -1.08</td><td>0.0005</td></tr><tr><td>New (52)</td><td>3.46</td><td>2.20, 4.72</td><td><0.0001</td></tr><tr><td></td><td colspan="3">Public transport versus non-public transport days in 2012</td></tr><tr><td>Public transport days (75)</td><td>8.54</td><td>5.00, 12.08</td><td><0.0001</td></tr></table>Evidence suggests that there were significant changes in public transport related physical activity in all types of riders except for continued riders</td><td>LOW</td></tr>
<tr><td colspan="10">Physical activity in everyday life as measured by non-public transport related walking trips</td></tr>
</table>

[56] Serious risk of bias due to selection methods and high levels of drop out.
[57] Intervention had no significant effect: p value greater than 0.05 – downgraded one level
[58] Serious risk of bias due to selection methods and high levels of drop out.
[59] Results do not specify extent of change in exposed population. Instead, they show extent of change in those who take up using the intervention without detail on how many begin using the intervention.

<table>
<tr>
<td>1
Miller et al 2015</td>
<td>Non-randomised uncontrolled study</td>
<td>Serious[60]</td>
<td>NA</td>
<td>No serious</td>
<td>Very serious[61]</td>
<td>None</td>
<td>537</td>
<td>n/a</td>
<td>Within person differences average mins of PA per 10 hrs accelerometer wear by public transport user group (baseline to 7-11 month follow-up) (intervention only). Point estimates and 95% CIs:

<table>
<tr><td>Riders (n)</td><td colspan="3">Change in non-public transport related PA</td></tr>
<tr><td></td><td>Point Estimate</td><td>95% CI</td><td>P Valu</td></tr>
<tr><td>Never Riders (391)</td><td>1.27</td><td>-0.60, 3.14</td><td>0.20</td></tr>
<tr><td>Continued (51)</td><td>-1.71</td><td>-6.62, 3.20</td><td>0.49</td></tr>
<tr><td>Former (41)</td><td>-3.20</td><td>-9.36, 2.96</td><td>0.30</td></tr>
<tr><td>New (52)</td><td>1.81</td><td>-4.04, 7.66</td><td>0.54</td></tr>
<tr><td></td><td colspan="3">Transit versus non-public transport days in 2012</td></tr>
<tr><td>Public transport days (75)</td><td>8.54</td><td>5.00, 12.08</td><td><0.000</td></tr>
</table>
Evidence suggests that there was no significant change in non-public transport related Physical Activity and significantly more physical activity was carried out on public transport days compared to non-public transport days</td>
<td>VERY LOW</td>
</tr>
<tr><td colspan="11">Public transport use (as a proxy measure of physical activity) as measured by public transport trips, including light rail, bus and/or commuter trip</td></tr>
<tr>
<td>1
Brown et al 2016</td>
<td>Non-randomised uncontrolled study</td>
<td>Serious[62]</td>
<td>NA</td>
<td>No serious</td>
<td>No serious</td>
<td>None</td>
<td>537</td>
<td>n/a</td>
<td>Public transport trips (including light rail, bus, and/or commuter rail trip) (baseline to 12-month follow-up) (intervention only):

For residents living <800m away from the intervention, public transport trips were significantly more likely at one-year follow-up compared to baseline (baseline odds ratio when compared to follow-up 0.61 (95% CI 0.4 to 0.93), p≤0.02).
Residents living <800m away from complete streets intervention were more likely to take public transport trips than those living further away (odds ratio for far group 0.60 (95% 0.37 to 0.97), p≤0.04).</td>
<td>MODERATE</td>
</tr>
<tr><td colspan="11">SUMMARY: see evidence statement 1.6</td></tr>
</table>

21

[60] Serious risk of bias due to selection methods and high levels of drop out.
[61] The p value is greater than 0.05, showing no significant effect of intervention. Results do not specify extent of change in exposed population. Instead, they show extent of change in those who take up using the intervention without detail on how many begin using the intervention
[62] Quality score was (-) indicating high risk of bias – downgraded one level. Main bias is dissimilar baseline characteristics and lack of blinding.

Public transport fare integration

[To note that all studies on public transport fare integration started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Public transport fare Integration and simplification of paying systems										
Public transport use (as a proxy measure of physical activity) measured as change in daily passenger boarding										
1 Sharaby and Shiftan, 2012	Non-randomised uncontrolled study	Very serious[63]	NA	No serious	Serious[64]	None	253,200	NA	Change in numbers of passengers per day (baseline 1 [6 years pre intervention]; baseline 2 [3 years before intervention] follow-up [11 months post-intervention]) (intervention group only) (count data): Baseline 1 / Baseline 2 / Follow-Up Passengers per day: **236,100** / **213,400** / **253,200** Daily passenger boarding increased by 7% between baseline 1 and follow-up, and 19% between baseline 2 and follow-up. Statistical significance not reported.	**VERY LOW**
Public transport use (as a proxy measure of physical activity) measured as daily passenger trips										
1 Sharaby and Shiftan, 2012	Non-randomised uncontrolled study	Very serious[65]	NA	No serious	Serious[66]	None	253,200	NA	Change in daily passenger trips (baseline 1 [6 years pre intervention]; baseline 2 [3 years before intervention] follow-up [11 months post-intervention]) (intervention group only) (count data):	**VERY LOW**

[63] Very serious risk of bias due to lack of adjustments made for demographic characteristics of population between baseline and seven-year follow-up. No consideration of other contextual changes during this period which could have impacted on the outcomes.
[64] No measure of variance reported or p values – downgraded one level
[65] Very serious risk of bias due to lack of adjustments made for demographic characteristics of population between baseline and seven-year follow-up. No consideration of other contextual changes during this period which could have impacted on the outcomes.
[66] No measure of variance reported or p values – downgraded one level

									Baseline 1 / Baseline 2 / Follow-Up Daily passenger trips*: **182,700** / **155,000** / **167,000** **Trips is lower than boarding as there may be multiple boardings per trip, if trip contains >1 leg.* Daily passenger trips decreased by 9% between baseline 1 and follow-up, but increased by 9% between baseline 2 and follow-up.	
SUMMARY: see evidence statement 1.7										

24

Motorway extension

[To note that all studies on motorway extensions started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Motorway Extension										
Changes to Transport measured as travel trips (all, bus, car, walking)										
1 Foley et al 2017	Non-randomised controlled study[67]	Very serious[68]	NA	No serious	Serious[69]	None	Cohort: 127 Cross-Sectional: 304	Cohort: 126 Cross-Sectional: 338	Odds of Intervention individuals traveling, or using bus / car / walking at 2-year follow-up compared with control individuals at 2 year follow-up (self-reported data) (COHORT): All Travel / Bus / Car / Walking Odds Ratio (95% Confidence Interval) Intervention: **2.1 (1.0, 4.2)*** / 1.3 (0.6, 3.0) / 1.4 (0.7, 2.7) / 1.2 (0.6, 2.3) Control: Comparison for intervention * = P<0.05 Results show that intervention participants were significantly more likely to undertake travel trip at follow-up than control participants. However, there were no significant differences between study areas for use of any mode of transport in particular. (REPEAT CROSS-SECTIONAL): All Travel / Bus / Car / Walking Odds Ratio (95% Confidence Interval)	**VERY LOW**

[67] This study also included a cohort analysis i.e. an analysis including only those who responded at both baseline *and* follow-up
[68] Very serious risk of bias due to key demographic characteristics not being adjusted for. Very low response rate indicates potential selection bias. Only one day of data was collected.
[69] Although travel is marginally significant in cohort analysis, confidence intervals cross line of no effect in repeated cross-sectional analysis – downgraded one level

									Intervention: 1.0 (0.5, 1.9) / 1.0 (0.6, 1.8) / 1.1 (0.6, 2.0) / 0.8 (0.5, 1.4) Control: Comparison for intervention There were no statistically significant differences between groups for likelihood of undertaking any mode of travel, or travel as a whole, at follow-up.	
Changes to Transport measured as mins/day spent travelling the previous day (all, bus, car, walking)										
1 Foley et al 2017	Non-randomised controlled study[70]	Very serious[71]	NA	No serious	Serious[72]	None	Cohort: 127 Cross-Sectional: 304	Cohort: 126 Cross-Sectional: 338	Proportional change in minutes spent travelling the previous day for one unit change in exposure to intervention (incidence rate ratio, 95% CI). Intervention vs control. 2-year follow-up. COHORT: All travel / Bus / Car / Walking Incidence Rate Ratio (95% Confidence Interval) Intervention: 0.8 (0.5, 1.1) / 1.0 (0.6, 1.7) / 0.9 (0.6, 1.3) / 0.9 (0.6, 1.4) Control: Comparison for intervention There were no significant differences between intervention and control for time spent travelling in general, or time spent using any mode of transport in particular. Results are mirrored in the repeat cross-sectional analysis.	**VERY LOW**
Change to light physical activity										
1 Ogilvie et al 2017	Non-randomised controlled study	Serious[73]	NA	No serious	Serious[74]	None	59	79	Incidence rate ratio (IRR): 0.9 (95% CI 0.8, 1.0)	**LOW**

[70] This study also included a cohort analysis i.e. an analysis including only those who responded at both baseline *and* follow-up
Very serious risk of bias due to key demographic characteristics not being adjusted for. Very low response rate indicates potential selection bias. Only one day of data was collected
[72] All Confidence Intervals overlap line of no effect – downgraded one level
[73] Serious risk of bias due to potential selection bias, and not adjusting for key demographic variables (health status or ethnicity)
[74] Confidence intervals include line of no effect – downgraded one level

Change to Moderate to Vigorous Physical Activity										
1 Ogilvie et al 2017	Non-randomised controlled study	Serious[75]	NA	No serious	Serious[76]	None	59	79	Incidence rate ratio (IRR): 1.0 (95% CI 0.8, 1.3)	**LOW**
Change to sedentary time										
1 Ogilvie et al 2017	Non-randomised controlled study	Serious[77]	NA	No serious	Serious[78]	None	59	79	Incidence rate ratio (IRR): 12.8 (95% CI -9.5, 35.0)	**LOW**
SUMMARY: see evidence statement 1.8										

[75] Serious risk of bias due to potential selection bias, and not adjusting for key demographic variables (health status or ethnicity)

[76] Confidence intervals cross line of no effect – downgraded one level

[77] Serious risk of bias due to potential selection bias, and not adjusting for key demographic variables (health status or ethnicity)

[78] Confidence intervals cross line of no effect – downgraded one level

Work travel plans [79]

[To note that all studies on work travel plans started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
New express bus route										
Changes to transport as measured by changes in mode of travel to work										
1 Collins and Agarwal 2015	Non-randomised controlled study	Very serious[80]	NA	Serious[81]	No serious[82]	None	656	n/a	Change to proportion of all trips to work made passively / somewhat passively / by public transport / actively / varied by season. Intervention only. Self-reported data. Baseline to 1 year follow-up: Commuter Group[83] — % At 13 Months Post-Intervention — % Change Exclusively Passive (N = ~267) — 40.7 — -0.6 Somewhat Passive (N = ~56) — 8.5 — -0.7 Public transport (N = ~56) — 8.5 — 3.0 (P<0.01) Active (N = ~93) — 14.2 — -0.7 Varies By Season (N = ~185) — 28.2 — -0.9	**VERY LOW**

[79] Work travel plans included one study on new express bus Route to work (bus) with subsidised monthly pass and another study assessing the impact of University Transport Plan increasing parking charges and decreasing parking spaces, meanwhile improving facilities for active commuters

[80] Very serious risk of bias due to high loss to follow-up; baseline data taken after study began; data collection tools not validated; low response rate and high drop-out rate; self-reported data and potential recall bias and no mention of adjusting for potential confounders.

[81] Sample is commuters so not generalizable to whole population

[82] The result of primary interest, public transport use, did increase significantly.

[83] Exclusively passive: drove own vehicle, or carpooled, or got dropped off, Somewhat passive: as above, but who parked off-campus and walked to University, Transit: public transport users, Active: walk or cycled to work, Varies by season: did not employ the same route all year round

									The only noted change was in public transport users, whose increase was statistically significant. Characteristics of people shifting transport mode: There was significantly higher likelihood of 'shifting' modes if participants were female (p=0.036), lower household income (<0.001), did not have a driver's license (<0.001), had a transit pass (p<0.001), and did not have a permit to park at work (<0.001).	
Total physical activity as measured by self-reported survey										
Bristol University Transport Plan[84]										
Active Travel as measured by change in people's usual travel to work mode										
1 Brockman and Fox, 2011	Non-randomised uncontrolled study	Very serious[85]	NA	Serious[86]	No serious	None	2,829	NA	Active Travel as measured by change in people's (self-reported) usual travel to work mode (baseline to 9-year follow-up) (intervention only WALKING: Usual form of transport at baseline (%) 19; Usual form of transport to work at follow-up (%) **30**; Significance of change (P Value) **<0.001** CYCLING: 7; 12; Not significant (P-Value not reported) CAR DRIVING: **50**; **33**; **<0.001** There was a significant increase in percentage of people reporting walking as usual mode of travel to work, and a significant decrease in those reporting driving as usual mode. Percentage of people cycling increased, but not significantly.	**VERY LOW**
Summary: See Evidence Statement 1.9										

[84] **I**ncreasing parking charges and decreasing parking space

[85] Very serious risk of bias due to non-validated data collection tools and a low response rate. No adjusting for confounders.

[86] Sample is commuters and therefore not generalizable to the population of the guideline.

Review 2

Ciclovia/Street closures

[To note that all studies on Ciclovia / street closures started from low in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Street Closures										
Total physical activity as measured by mean daily minutes spent engaging in physical activity at the event										
Torres et al 2016	Non randomised uncontrolled study	Serious[87]	NA	No serious	Serious[88]	none	589	n/a	Participants meeting recommended PA (150 minutes) during street closure event (self-reported) 23.3% of survey respondents met the PA recommendation of doing 150 minutes or more of moderate to vigorous physical activity, during the ASA event. 20.0% met the recommendation in ASA2, and 16.4% in ASA5. The average over the three events was 19.4% . Follow-up period not applicable[89]. Intervention group only.	VERY LOW
Total physical activity as measured by mean daily minutes spent engaging in MVPA										
1 D'Haese et al 2015	Non randomised controlled study	No Serious	NA	No serious	No serious	none	51	71	Moderate and Vigorous Physical Activity (MVPA[90]) differences between intervention and control at follow-up (follow-up in same week as baseline data) (measured by accelerometer) Mean minutes (SD) / Intervention / Control / Time *condition *B* / P Baseline: 26.70(13.51) / 26.91(16.92) / 3.626 Follow up: 35.79(24.93) / 24.32(13.47) / 0.057	LOW

[87] Quality score allocated as (-) indicating high risk of bias, main bias is variation in event location, time and duration – downgraded one level
[88] No measure of variance reported or p values, unable to determine whether or not more or less people achieved recommended MVPA pre intervention – downgraded one level
[89] Data was collected on the same day as each event – follow up not applicable
[90] MVPA not defined as how may METS or counts per minute etc.

									The intervention group showed a significantly greater increase in MVPA than the control group between baseline and follow-up (p = 0.057)[91]. These changes remained significant when measured over the whole day (sedentary p = 0.012; MVPA p = 0.010) This was tested to ensure that intervention groups were not compensating for changes over the rest of the day (results are significant at ≤0.1. "Higher significance levels are used for interaction terms as they have less power"). In intervention children, MVPA during intervention period contributed more to entire day Physical Activity (53.4%) than during normal period (48.6%). No significance stated.	
Total sedentary time as measured by mean minutes of sedentary time per day										
1 D'Haese et al 2015	Non randomised controlled study	No Serious	NA	No serious	Serious[92]	none	54	72	<u>Mean daily minutes of sedentary time / day: differences between intervention and control at follow-up (measured by accelerometer)</u> Mean minutes (SD) / Intervention / Control / X^2 Baseline: 146.30(38.36) / 156.49(41.69) / 3.896 FOLLOW UP: 137.74(35.43) / 164.61(40.10) Change between baseline and final follow-up in intervention (-8.56 [95% CI -22.49, 5.37]) and change between baseline and final follow-up in control (8.12 [95% CI -5.24, 21.48]) were not significantly different (-16.68 [95% CI -35.59, 2.23]) (calculated by reviewers). Intervention vs control. Baseline and follow-up measures collected in the same week.	**VERY LOW**
Total sedentary time as measured by the proportion of people reporting that they would have been sedentary if they had not attended the event										

[92]Confidence intervals spanned the line of no effect (and therefore the MID) – downgraded one level.

1 Torres et al 2016	Non randomised uncontrolled study	Serious[93]	NA	No serious	Serious[94]	none	589	n/a	Proportion of people reporting that they would have been sedentary if they had not attended the event Event 1: 34% Event 2: 49.% Event 5: 54.4% The above indicated participants would have been engaged in a sedentary state at home—indoors, watching TV, or on the computer—if they were not participating at the street closure event ($\chi 2 = 19.84$, $P = 0.001$). Follow-up period not applicable[95]. Intervention group only – no control was used. Interventions over time not intended to show a trend, as settings, time of day, duration etc. varied.	**VERY LOW**
Summary – see evidence statement 2.1										

37

38

[93] Quality score allocated as (-) indicating high risk of bias Main bias is variation in event location, time and duration – downgraded one level.
[94] No measure of variance reported or P values, unable to determine whether or not more or less people achieved recommended MVPA pre intervention – downgraded one level
[95] Data was collected on the same day as event – follow up not applicable

Other Cycle Infrastructure

[To note that all studies on "other cycle infrastructure" started from high in line with the modified GRADE approach].

1.Improvement of cycle infrastructure for active commuting

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Improvement of cycle infrastructure for active commuting										
Active travel as measured by the number of active commuters observed										
1 Hendricks et al 2009	Non randomised uncontrolled study	Very serious[96]	NA	No serious	Serious[97]	none	1853	n/a	Total number of active commuters observed (counted) at one-year follow-up At baseline, 1,028 active commuters were recorded. This increased to 1,853 at follow-up, an increase of 63%. At follow-up, 67% of active commuters were walking, 30% were biking, and 3% were using skateboard / rollerblades / another form of active transport.	**VERY LOW**
Summary- see evidence statement 2.3										

[96] Very serious risk of bias due to unreliable and non-valid data collection methods, and lack of representativeness of the population.
[97] No measure of variance reported or p values, only descriptive statistics provided – downgraded one level

43 2.Cycle demonstration towns[98]

Physical activity in everyday life as measured by the proportion of individuals cycling (various methods)										
2 Sloman et al 2009 Goodman et al 2013a	Non randomised controlled studies	Serious[99]	Not assessable as unit measures are too different for comparison	No serious	Serious[100]	none	>9000	Matched Comparison n = 969,605 Unfunded comparison n = 4,195,540 National Comparison Group n = 10,356,452	<u>Self-reported cycling for at least 30 minutes more than 12 times per month (n=6000) at up to 4-year follow-up</u> Proportion of adult cycle demonstration town (CDT) residents who cycled regularly (≥30 minutes ≥12 times per month) 2006: 2.6% | 2008: 3.5% | %point increase: 0.9% | % increase: 34.6% <u>Automatic cycle counters (n=3000) at up to 4-year follow-up</u> Data from automatic cycle counters shows that cycling levels (6 town average) increased by 27% between baseline and 1-3 year follow-up in the CDT towns, ranging from +6% to +29% <u>Any cycling in a typical week (self-reported) (n =not provided)</u> The proportion of adult residents of the CDTs doing any cycling in a typical week in the previous year rose from 24.3% in 2006 to 27.7% in 2009, an increase of approximately 3.4%-points or 14% <u>Cycling to work (self-reported) – percentage difference at 10 year follow-up compared to baseline (95% CI)</u> In intervention towns, cyclists as a proportion of commuters increased significantly more between baseline and follow up than all three comparison groups, as seen below (ratio of increase (with 95% CI): • Intervention Compared with *Matched Comparison*: Relative intervention effect = 1.09 (1.07, 1.11) • Intervention Compared with *Unfunded Comparison*: Relative intervention effect = 1.18 (1.17, 1.20) • Intervention Compared with *National Comparison*: Relative intervention effect = 1.26 (1.25, 1.28) Cycling increased in all quintiles of deprivation although smaller improvements were seen amongst most deprived areas.	**LOW**

[98] Cycle demonstration town interventions included school travel planning; cycle facilities at schools; pedestrian bridges
[99] Serious risk of bias due to self-reported measures, possible selection bias, unclear similarity of outcome measures and demographic characteristics at baseline.
[100] No measure of variance reported or p values, only descriptive statistics provided – downgraded one level

Total sedentary time as measured by the proportion of respondents classed as inactive										
1 Sloman et al 2009	Non randomised controlled study	Serious[101]	NA	No serious	Serious[102]	none	Not clearly defined	Not clearly defined	<u>The proportion of adult respondents classed as inactive</u> A validated measure was used – EPIC, self-reported 4-level index. Proportions fell from 26.2% at baseline to 23.6at 3 year follow-up, a fall of 2.6%-points or 10%. The proportion of people in medium urban areas who cycled 'less than once a year' or 'never' was stable at 68 or 67% in each year between baseline and follow-up.	**LOW**
Public transport use (as a proxy of physical activity) as measured by the change in proportion of respondents using public transport as their commute										
1 Goodman et al 2013a	Non randomised controlled study	Serious[103]	NA	No serious	Serious[104]	none	1,266,337	Matched Comparison n = 969,605 Unfunded comparison n = 4,195,540 National Comparison Group n = 10,356,452	<u>Public Transport use and driving as commute (self-reported), intervention and control groups. Percentage difference at 10-year follow-up compared with baseline:</u> In intervention towns public transport use increased by 0.32%-points (95% CI 0.24, 0.41), and driving decreased between baseline and follow up -3.01%-points (95% CI -3.13, -2.88). Absolute figures not reported, so % change cannot be calculated. The decrease in driving was significantly greater in the intervention towns than all comparison groups; changes in public transport were similar to comparison groups.	**LOW**
Active travel as measured by the change in proportion of respondents walking as their commute										
1 Goodman et al 2013a	Non randomised study	Serious[105]	NA	No serious	No serious	none	1,266,337	Matched Comparison n = 969,605	<u>Walking as commute (self-reported), intervention and control groups. Percentage difference at 10-year follow-up compared with baseline:</u>	**MODERATE**

[101] Serious risk of bias due to lack of clarity about whether adjustments have taken place and unclear similarity of outcome measures and demographic characteristics at baseline.
[102] No measure of variance reported or p values, only descriptive statistics provided – downgraded one level
[103] Serious risk of bias due to self-reported outcome measures and differences at baseline, although method of analysis should control for some of this.
[104] Increase to public transport is similar (exact figures not provided) in control groups indicating that the intervention was not causative.
[105] Serious risk of bias due to self-reported outcome measures and differences at baseline, although method of analysis should control for some of this.

								Unfunded comparison n = 4,195,540 National Comparison Group n = 10,356,452	In intervention towns, walking increased (1.71% (95% CI 1.62, 1.81) The increase in walking was significantly greater in the intervention towns than all comparison groups.	
Summary – see evidence summary 2.4										

3.Various on-street and off-street bicycle paths and bridge improvements

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
Various on-street and off-street bicycle paths and bridge improvements										
Change in transport as measured by cycling as a proportion of all journeys										
1 Krizek et al 2009	Non randomised controlled study	Very serious[106]	NA	No serious	Serious[107]	none	Unclear	Unclear	Grouped Interventions vs Control: Change in proportion of all journeys which are made by bicycle (between baseline and up to 10-year follow-up) (SD) Intervention area 1: The proportion of all journeys which were made by bicycle increased from 1.563% (baseline) to 1.775% (follow-up), a significant result (authors report that change is greater than 2 standard deviations (SDs) of the baseline proportion). This represents a 13.4% increase. Intervention area 2: The proportion of all journeys which were made by bicycle increased from 1.023% to 1.491%	**VERY LOW**

[106] Very serious risk of bias due to differences in outcome measures at baseline which are not adjusted for. No demographic characteristics reported for baseline.
[107] Though standard deviations are reported actual S.D. figures not provided in some instances- downgraded one level

									(statistically significant). This represents a 45.9% increase. Control groups also increased from 0.510 to 0.627% (statistically significant). <u>Bridges: Change in proportion of all journeys which are made by bicycle from baseline (1990) to follow-up (2000) (SD)</u> Trips crossing the river by bicycle increased significantly (3.021% to 4.604% of all journeys crossing the river, 2SDs). This was in a context of generally increasing bicycle mode share: trips which both originated and terminated east of the river also increased (1.982% to 2.775%, 2SDs), as did those originating and terminating west of the river, although to a lesser extent (2.228% to 2.585%, 1 SD). Unclear whether data is self-reported: a Census Transportation Planning Package containing the data was used by the authors.	
Summary – see evidence statements 2.6										

47

48 4.A new greenway[108] for cyclists

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
A new greenway for cyclists										
Adverse outcome as measured by the number of accidents reported										

[108] Green way defined as an off-street bicycle facility. Traffic free, with pedestrian lanes separated from cycling lanes.

1 Poindexter et al 2007	Non randomised uncontrolled study	Serious[109]	NA	No serious	Serious[110]	none	Unclear	NA	The number of accidents per year (crashes/year) reported at baseline and 1-2 year follow up (data from police-collated information) (no control): Baseline / Follow up No of crashes: 78.33(sd 8.33) / 50(nr) Authors report that this is a significant difference, but no p-value or SD given. When buffer area is stratified by distance from intervention greenway (0.5km categories), this decrease is only significant in 0.0km-0.5km and 0.5km-1.0km categories.	**LOW**
Summary – see evidence statements 2.7										

49

[109] Serious risk of bias due to other changes during the intervention period which could have impacted on the results and were not investigated or reported.
[110] Though standard deviations are reported actual S.D. figures not provided in some instances – downgraded one level

Trails and Paths

[To note that all studies on "Trails and Paths" started from high in line with the modified GRADE approach, with the exception of "trails with new wayfinding signage" which started from low].

5.Extension of the existing Greenway[111]

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	control		
Extension of the existing Greenway										
Physical activity in everyday life as measured by the change in the mean number of days spent in at least 30 minutes of walking/week										
2 West and Shores 2011 West and Shores 2015	Non randomised controlled studies	Very serious[112]	No serious	No serious	Serious[113]	none	225	141	Self-reported change in mean number of past seven days participants did ≥30 mins of walking (follow-up times between 11 months and 1 year) (intervention and control* groups): Both intervention and control groups showed increases in number of days (of the past 7) in which they achieved ≥30 mins of walking. The difference between intervention group increase and control group increase was not significant: (Mean difference in days [95% CI]: -0.19 [-0.68,0.29]). *Control groups lived further from intervention than intervention groups	**VERY LOW**
Total physical activity as measured by the mean number of days spent engaging in moderate or vigorous physical activity										

[111] Authors report that greenways are "open-space corridors reserved for recreational use or environmental preservation that connect urban centres".
[112] Very serious risk of bias due to baseline characteristics and outcome measures not adjusted for in the analysis, and are not tested for significance. Contamination may also have occurred between control and intervention groups.
[113] Although mean number of days walking increased, there is no significant difference between intervention and control

2 West and Shores 2011 West and Shores 2015	Non randomised controlled studies	Very serious[114]	No serious	No serious	Serious[115]	none	230	138	Self-reported change in mean number of past seven days participants engaged in moderate physical activity (follow-up times between 11 months and 1 year) (intervention and control* groups): In one study, both intervention and control group showed small increases over time. In the other study, both intervention and control group showed small decreases over time. The difference between intervention group change and control group change was not significant: (Mean Difference in days is 0.07 [95% CI -0.35,0.50]). *Control groups lived further from intervention than intervention groups	**VERY LOW**
2 West and Shore 2011 West and Shore 2015	Non randomised study	Very serious[116]	No serious	No serious	Serious[117]	none	229	141	Self-reported change in mean number of past seven days participants engaged in vigorous physical activity (follow-up times between 11 months and 1 year) (intervention and control* groups): In one study, both intervention and control group showed small increases over time. In the other study, both intervention and control group showed small decreases over time. The difference between intervention group change and control group change was not significant: Mean difference in days [95% CI]: 0.32 [-0.09, 0.73]). *Control groups lived further from intervention than intervention groups	**VERY LOW**
Summary – see evidence statement 2.8										

6.Improvement to routes[118]

[114] Very serious risk of bias due to baseline characteristics and outcome measures not adjusted for in the analysis, and are not tested for significance. Contamination may also have occurred between control and intervention groups.
[115] Results are not statistically significant – downgraded one level
[116] Very serious risk of bias due to baseline characteristics and outcome measures not adjusted for in the analysis, and are not tested for significance. Contamination may also have occurred between control and intervention groups..
[117] Results are not statistically significant – downgraded one level
[118] For example, infrastructural changes as well as interventions which are out of scope such as bulb planting.

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Improvement to routes										
Physical activity in everyday life as measured by the total number of pedestrians using the route										
Adams and Cavill 2015	Non randomised uncontrolled study	Very serious[119]	NA	No serious	Serious[120]	none	3541	NA	Change in number of pedestrians using the intervention route over whole observation period (manual count data) (baseline to 3-19 month follow-up) (no control): Overall, there was a 14.9% increase of pedestrians using the routes. Increases were seen in all locations: London (856 to 964, 12.6%), Newcastle (129 to 205, 58.9%), Blackburn (621 to 732, 17.9%), Wolverhampton (280 to 378, 35.0%) and Rotherham (1197 to 1262, 5.4%).	**VERY LOW**
See evidence statement 2.9										

7.Bicycle route[121] and off street bicycle facilities

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Bicycle boulevard and off street bicycle facility										

[119] Very serious risk of bias due to short data collection periods; counts were taken at different follow-up times between intervention areas; follow-up counts conducted at different time of year than baseline which could affect results.
[120] Unable to tell whether results are statistically significant as no measures of variance or P-values provided – downgraded one level
[121] These routes are stretches of street with traffic calming to increase cycle safety

<table>
<tr><td colspan="11">Physical activity in everyday life as measured by the total number of bike counts using the route</td></tr>
<tr><td>1

Rissel et al 2015</td><td>Non randomised controlled study</td><td>Serious[122]</td><td>NA</td><td>No serious</td><td>Serious[123]</td><td>none</td><td>1396</td><td>NA</td><td><u>Change in number of bicycles using the route at 4-month follow-up (Count data) (intervention and control):</u>

Intervention areas increased more than control areas, but no significance is reported.
Bike counts increased by 23% (812 cyclists at baseline, and 1001 cyclists at 4-month follow-up) and 97% (201 cyclists at baseline, and 395 cyclists at 4-month follow-up) at the two bike count sites located on the intervention route.
Rest of city (control): The change in rates of cycling between baseline and 4-month follow-up across the whole of the City of Sydney was a 3% increase.
[to note: unable to calculate the percentage point change because the figures reported are numbers and not percentages, unable to determine the initial percent to calculate percentage point change)</td><td>LOW</td></tr>
<tr><td colspan="11">Physical activity in everyday life as measured by the proportion of participants making bike trips</td></tr>
<tr><td>1

Dill et al 2014</td><td>Non randomised controlled study</td><td>Very serious[124]</td><td>NA</td><td>No serious</td><td>Serious[125]</td><td>none</td><td>154</td><td>139</td><td><u>Change in proportion of participants taking a bike trip at 2-12 month follow up compared with baseline (accelerometer data) (intervention and control):</u>

<table><tr><th></th><th>Baseline</th><th>Follow-up</th><th>Significance of change</th></tr><tr><td>Intervention</td><td>61.1%</td><td>58.2%</td><td></td></tr><tr><td>Control</td><td>55.4%</td><td>52.9%</td><td>>0.10</td></tr></table>
No significance difference between groups at follow up

<u>Change in average number of bike trips made per person over study period at 2-12 month follow up compared with baseline (accelerometer data) (intervention and control):</u>

<table><tr><th>BIKE TRIPS (SD)</th><th>Baseline</th><th>Follow-up</th><th>Change (confidence interval)*</th></tr><tr><td>Intervention</td><td>5.6 (4.9)</td><td>4.4 (4.2)</td><td>-1.2 (-2.22, -0.18)</td></tr></table></td><td>VERY LOW</td></tr>
</table>

[122] Quality score allocated as (-) indicating high risk of bias Main bias is incomplete outcome data and low count validity – downgraded one level.
[123] Unable to tell whether results are statistically significant as no measures of variance or P values provided – downgraded one level
[124] Very serious risk of bias due to confounding: intervention group had more positive attitudes towards cycling than control group. Incomplete outcome data.
[125] Compared confidence intervals of difference between intervention over time and control over time. No significant differences between intervention and control group - downgraded one level

									Control | 4.3 (3.8) | 3.5 (3.3) | -0.8 (-1.64, 0.04) Although the installation of a bicycle route was statistically significantly negatively correlated with number of bike trips (p = 0.06)[126], and the intervention group showed a significant decrease, the intervention and control change scores were not statistically significantly different. Therefore the result is not precise. *C**ALCULATED BY REVIEWERS**	
Physical activity in everyday life as measured by the total number of bike trips taken for at least >10minutes										
1 Dill et al 2014	Non randomised controlled study	Very serious[127]	NA	No serious	Serious[128]	none	154	139	<u>Change in proportion of participants taking a bike trip lasting >10 minutes at 2-12 month follow up compared with baseline (accelerometer data) (intervention and control):</u> Baseline | Follow-up | P Intervention | 43.9% | 45.3% Control | 39.7 | 31.4% | >0.10 There was a slight non-significant increase in the intervention group from baseline to follow up. However the actual group mean minutes spent bicycling (of trips >10 minutes) decreased from 103.9 (SD 73.0) to 65.9 (SD 74.7) between baseline and 2-12 month follow-up >10 minutes spent biking was significantly negatively correlated with the installation of the bicycle route (p = 0.00).	**VERY LOW**
Physical activity in everyday life as measured by percentage of participants walking >20 minutes										
1 Dill et al 2014	Non randomised controlled study	Very serious[129]	NA	No serious	Serious[130]	none	154	139	<u>Change in proportion of participants walking for >20 minutes/day at 2-12 month follow up compared with baseline (accelerometer data) (intervention and control):</u> Baseline | Follow-up | P	**VERY LOW**

[126] Significant testing was considered at p<0.1
[127] Very serious risk of bias due to confounding: intervention group had more positive attitudes towards cycling than control group. Incomplete outcome data.
[128] Unable to tell whether the intervention has had a significant effect – downgraded one level
[129] Very serious risk of bias due to differences between the intervention and control environments i.e. intervention group had better pavements which was not the subject under study. Characteristics were not adjusted for and there is a risk of selection bias.
[130] Unable to tell whether the intervention has had a significant effect – downgraded one level

									Intervention 83.5% 75.6% Control 79.3% 74.4% >0.10 Change between groups over time not statistically significant (p ≥0.10). Average minutes walked (of trips >20mins) per day also decreased in both groups (intervention 107.2 [SD 79.1] to 89.4 [SD 66.8], control 92.0 [SD 86.9] to 75.4 [SD 66.5]). Change between groups over time not statistically significant (p = 0.54).	
See evidence statement 2.10										

58

59 8.Trails with new way-finding signage[131]

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
6 trails with new way-finding signage										
Physical Activity in everyday life as measured by the change in the mean number of trail users										
1 Clark et al 2014	Non randomised controlled study	No serious	NA	No serious	Serious[132]	none	Unclear[133]	Unclear	Change in intervention trail usage between baseline and 1-9 month follow-up (intervention and control) (infra-red sensor provided data): Intervention trail usage increased by 35%, and control trails by 31%, both significant increases (p = <0.01).	**VERY LOW**

[131] This intervention also included a marketing campaign which is outside of the scope of this guideline but may have impacted outcomes
[132] Unable to tell whether the intervention had an effect (as the control group also showed increases which were not significantly different). Downgraded one level
[133] At baseline, approximately 6,454 individuals were counted. At follow-up, approximately 8.610 individuals were counted. Not separated by intervention and control.

									There was no significant difference between the intervention and control groups (p = 0.3226) <u>Mid-intervention to 1-9 month follow-up change:</u> Between mid-intervention and 1-9 month follow-up, control trail use did not change significantly (p = 0.69), but intervention trails did decrease significantly (141 mean users per day to 107) (p = <0.01).	
See evidence statement 2.11										

60

61 9.Greenway/Path connecting residential and commercial areas

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
Greenway connecting residential and commercial areas										
Total Physical activity as measured by the change in people counted walking and cycling										
1 Fitzhugh et al 2010	Non randomised controlled study	Very serious[134]	NA	No serious	No serious	none	Not reported	Not reported	<u>Change in people counted undertaking walking or cycling on the intervention route (intervention and control) (baseline to 14 month follow-up) (direct observations):</u> Increase in physical activity counts were significantly higher in the intervention compared to control for total physical activity (from 4.5 to 13.0 counts of PA in intervention; 3.0 to 1.0 count of PA in control; p = 0.001). Intervention change and control change were significantly different for both pedestrian (p = 0.001) and cyclists (p = 0.038) counts.	**LOW**

[134]Very serious risk of bias due to lack of adjusting for characteristics or baseline outcome measures. Data collection duration was short.

Total physical activity as a measured by the change in the proportion of people engaging in moderate and vigorous physical activity										
1 Gustat et al 2012	Non randomised study	Serious[135]	NA	No serious	No serious	Serious[136]	336	356	Change in people counted undertaking moderate or vigorous activity on the intervention route (intervention and control) (baseline to 10 month follow-up) (direct observations): [Note: Intervention neighbourhood split into 2 groups (I1 and I2) – I1 was area of path, I2 was area of playground. I2 is included in the analysis as the authors measure outcomes related to the path for this area as well, and both I1 and I2 are in the same neighbourhood] There were significant differences between the changes over time in the four groups (p = <0.001). Intervention area: A significant increase in the proportion of people engaged in moderate and vigorous activity was noted in I1 between baseline (36.7%) and follow-up (41.0%) (p = <0.001). No significant change in I2. Control areas: A significant decrease was seen in C1 (p = <0.001, no figures provided). No significant change in C2.	**LOW**
Total physical activity as a measured by the change in the proportion of people engaging in vigorous physical activity										
Gustat et al 2012	Non randomised study	Serious[137]	NA	No serious	No serious	Serious[138]	336	356	Change in people counted undertaking vigorous activity on the intervention route (intervention and control) (baseline to 10 month follow-up) (direct observations): [Note: Intervention neighbourhood split into 2 groups (I1 and I2) – I1 was area of path, I2 was area of playground. I2 is included in the analysis as the authors measure outcomes related to the path for this area as well, and both I1 and I2 are in the same neighbourhood]	**LOW**

[135] Data collection method could have resulted in double counting and was unlikely to be representative of general effects of intervention. Assessors were unblended which could have affected the assessment of this outcome which was measured by 'driving around systematically' to observe people doing physical activity.
[136] Data collection times were limited to between 4pm and 6pm which is unlikely to represent the general effect and could introduce bias related to fluctuations throughout the day.
[137] Data collection method could have resulted in double counting and was unlikely to be representative of general effects of intervention. Assessors were unblended which could have affected the assessment of this outcome which was measured by 'driving around systematically' to observe people doing physical activity.
[138] Data collection times were limited to between 4pm and 6pm which is unlikely to represent the general effect and could introduce bias related to fluctuations throughout the day.

									Intervention area: I1 underwent a significant increase in vigorous PA between baseline and 10-month follow-up (10.5% to 12.7%; p = <0.001). I2, C1 and C2 did not undergo significant changes: all decreased slightly but non-significantly	
Physical activity in everyday life as measured by the number of individuals using the path/trail										
1 Gustat et al 2012	Non randomised study	Very serious[139]	NA	No serious	Serious[140]	none	336	356	Change in percentage of people reporting trail use at baseline and 10-month follow-up (intervention and control) (self-reported survey): [Note: Intervention neighbourhood split into 2 groups (I1 and I2) – I1 was area of path, I2 was area of playground. I2 is included in the analysis as the authors measure outcomes related to the path for this area as well, and both I1 and I2 are in the same neighbourhood] Walking trail use increased slightly but non-significantly (from 21.9% to 29.6%). [To note, unclear from reported data whether this is I1 and I2 respondents combined].	**VERY LOW**
Physical activity in everyday life as measured by the percentage of people reporting walking for recreation										
1 Gustat et al 2012	Non randomised study	Very serious[141]	NA	No serious	Serious[142]	none	336	356	Percentage of people reporting walking (for leisure) at baseline and 10-month follow-up (intervention and control) (self-reported survey): [Note: Intervention neighbourhood split into 2 groups (I1 and I2) – I1 was area of path, I2 was area of playground. I2 is included in the analysis as the authors measure outcomes related to the path for this area as well, and both I1 and I2 are in the same neighbourhood] Increases were seen in I1 (60.0% to 65.3%), C1 (61.3% to 70.4%) and C2 (57.7% to 68.9%). I2	**VERY LOW**

[139] Very serious risk of bias due to no adjustments for confounders. Self-reported measure is vulnerable to social desirability bias.
[140] No measure of variance reported – downgraded one level
[141] Very serious risk of bias due to no adjustments for confounders. Self-reported measure is vulnerable to social desirability bias.
[142] No measure of variance reported – downgraded one level

									decreased (63.3% to 61.5%). There was no significant difference in the changes over time between groups (group by time effect; p value not reported).	
Active travel as measured by the number of children engaging in active transport to school										
1 Fitzhugh et al 2010	Non randomised controlled study	Very serious[143]	NA	No serious	Serious[144]	none	Not reported		Change in number of children engaging in active transport to school (intervention and control) (baseline to 14 month follow-up) (Direct observation): There was no significance between intervention and control group change between baseline and follow up (p = 0.2061).	**VERY LOW**
Active travel as measured by the percentage of people reporting walking as transportation										
1 Gustat et al 2012	Non randomised controlled study	Very serious[145]	NA	No serious	Serious[146]	none	336	356	Percentage of people reporting walking (transportation) at baseline and 10-month follow-up (self-reported survey): Increases were seen in both intervention groups (29.3% to 34.8%; and 24.8% to 36.9%). Increases also seen in control groups (31.3% to 40.5%; and 19.8% to 31.1%). No between group comparison.	**VERY LOW**
Summary – see evidence statement 2.12										

10. Connect2 interventions including traffic free bridges and new riverside boardwalks

Quality assessment							No. of participants		Effect	Quality

[143] Very serious risk of bias due to non-valid data collection method, and different outcome measures at baseline between intervention and control groups which were not adjusted.
[144] Unable to tell whether the intervention had a significant effect as no difference between intervention and control – downgraded one level
[145] Very serious risk of bias due to no adjustments for confounders. Self-reported measure is vulnerable to social desirability bias.
[146] Unable to tell whether the intervention had a significant effect as no measure of variance reported – downgraded one level

No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Connect2 interventions (Cardiff, Kenilworth and Southampton) including traffic free bridges and new riverside boardwalks										
Physical activity in everyday life as measured by walking along any of the intervention routes										
1 Goodman et al 2013b	Non randomised uncontrolled study	Serious[147]	NA	Serious[148]	Serious[149]	none	3516	NA	Change in percentage of participants who had used the intervention route for walking (baseline to between 9 and 21 month follow-up) (intervention only) (self-reported): At follow-up, 29% of the total sample (92% of those who had actually used the intervention routes) had used the intervention routes for any kind of walking, rising to 35% at follow-up 2 (91%). The most common category of walking was walking for recreation, at 27% (84%) at follow-up 1, and 32% (85%) at follow-up 2. Walking for education, and walking for business were least popular: <1% at both follow-up 1 and 2 for both categories	**VERY LOW**
Physical activity in everyday life as measured by cycling along any of the intervention routes										
1 Goodman et al 2013b	Non randomised uncontrolled study	Serious[150]	NA	Serious[151]	Serious[152]	none	3516	NA	Change in percentage of participants who had used the intervention route for cycling (baseline to between 9 and 21 month follow-up) (intervention only) (self-reported): At follow-up 1, 13% (39% of those who had actually used the intervention routes) of respondents had used the intervention area for any form of cycling, rising to 16% (43%) at follow-up 2. Significance not stated The most popular form of cycling was recreational, with 12% (37%) using it for this purpose at follow-up 1, and 15% (39%) at follow-up 2. Education and business were again the least popular: <1% at both follow-up 1 and 2 for both categories.	**VERY LOW**

[147] Serious risk of bias due to selection bias and drop-outs.

[148] Indirectness in outcome measure. Use of the route for walking is not a direct proxy for a change in physical activity.

[149] No measure of variance reported – downgraded one level

[150] Serious risk of bias due to selection bias and drop-outs.

[151] Indirectness in outcome measure. Use of the route for walking is not a direct proxy for a change in physical activity.

[152] No measure of variance reported – downgraded one level

Physical activity in everyday life as measured by mean minutes per week spent walking and cycling										
1 Goodman et al 2014	Non randomised uncontrolled study	Serious[153]	NA	No serious	Serious[154]	none	3516	NA	Change in mean minutes per week of walking or cycling on route (baseline to between 9 and 21 month follow-up) (intervention only) (self-reported): Mean minutes per week increased by 4 minutes between baseline and follow-up 1, and 0 minutes between baseline and follow-up 2. No absolute numbers provided). Significance not stated. At one year follow up There was no significant difference between proximity and time spend on walking or cycling 4.6 min/wk per km closer [CI -4.2, 13.4) Total physical activity: 0.9 min/wk per km closer [CI -6.8, 8.5, CI demonstrates no statistical significance) At 2 year follow up Parameter estimates and 95% confidence interval (CI) for change in minutes/week, per kilometre closer to intervention (i.e. individual 1km away will have the following increases in activity compared with someone 2km away, and double the below compared with someone 3km away): Total walking and cycling*: +15.3 min/wk per km closer [CI 6.5, 24.2, p = <0.001]) Total walking and cycling**: +9.2 min/wk per km closer [CI 0.6, 17.9, CI demonstrates statistical significance]) *After adjusting for demographic, socioeconomic, and health characteristics, and walking and cycling time at baseline. ** Same as above, also excluding 65 outliers (those whose change score was ≥600 min/wk).	**LOW**
Total physical activity as measured by mean minutes per week spent on moderate or vigorous physical activity along any of the intervention routes										

[153] Serious risk of bias due to selection bias and drop-outs.
[154] No measure of variance reported – downgraded one level

1 Goodman et al 2014	Non randomised uncontrolled study	Serious[155]	NA	No serious	Serious[156]	none	3516	NA	Change in mean minutes per week spent in moderate or vigorous physical activity on routes (baseline to between 9 and 21 month follow-up) (intervention only) (self-reported): Moderate to vigorous intensity physical activity (MVPA) declined by 24 mins/week at 21 months follow up. Significance not reported There was no significant difference between proximity and time spend on total physical activity - 0.9 min/wk per km closer (CI -6.8, 8.5) Authors note that there were no significant changes at year 2 in forms of MVPA outside of walking and cycling (adjusted effect is 0.1min/wk, CI -6.2, 6.5), showing no evidence that gains in walking and cycling are offset by reductions in other forms of activity.	**LOW**
Physical activity in everyday life as measured by the proportion of respondents reporting use of the Connect2 routes										
1 Sahlqvist et al	Non randomised uncontrolled study	Serious[157]	NA	Serious[158]	Serious[159]	none	3516	NA	Use as measured by a face to face interview no follow (1 year follow up) Cardiff: 2011 48%, 2012 52% Kenilworth: 2011 28%, 2012 37% Southampton: 2011 19%, 2012 22% The most common type of use (both within walking and within cycling) at all locations is recreation (higher than social/leisure, shopping, work and education combined).	**VERY LOW**
Summary – See evidence statement 2.13										

64

65

[155] Serious risk of bias due to self-reported outcome.
[156] No measure of variance reported – downgraded one level
[157] Serious risk of bias due to self-reported measure and social desirability bias.
[158] Indirectness in outcome measure. Use of the route for walking is not a direct proxy for a change in physical activity.
[159] No measure of variance reported – downgraded one level

On-Street Cycle Lanes

[To note that all studies on on-street cycle lanes started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
On-street Cycle Lanes										
Physical Activity in Everyday Life as measured by change in cyclists counted on streets										
4 Bjornskau et al 2012 Hunter et al 2009 Parker et al 2011 Parker et al 2013	4 non-randomised studies[160]	Very serious[161]	No serious	No serious	No serious	None	Can't be calculated [162]	Can't be calculated [163]	Change in cyclists counted on the street (baseline to 3-11 month various follow-up) (Intervention only, or intervention vs control) INTERVENTION GROUPS / Mean number per day at baseline (SD) / Mean number per day at follow-up (SD) / Percentage change (%) / Significance of change (P-Value) Bjornskau: NR / NR / +50 / NR Hunter: 9.06 / 10.49 / +17 / <0.0001 Parker 2011: 90.9 (21.7) / 142.5 (18.5) / +56.8 / <0.0001 Parker 2013: 79.2 (30.5) / 257.1 (50.9) / +224.6 / <0.000 NR = not reported SD = standard deviation. Confidence intervals not calculated as participant numbers in Parker studies are unclear. Intervention streets saw significant increases in number of cyclists counted per day (three of the four studies – the fourth did not report significance). The two control groups (see evidence tables) both saw decreases – these were significant for the one study which reported	**LOW**

[160] 2 controlled and 2 uncontrolled studies
[161] Very serious risk of bias due to lack of information on matching control groups (Bjornskau). Rising price of gas could have contributed to outcome but not controlled for. One study performed counts in multiple seasons but included summer in follow-up but not baseline (Hunter)
[162] The number of participants cannot be calculated. Approximate trips (not participants) calculated by reviewers as >18,000 (Bjornskau did not report any figures so is not included)
[163] Participants cannot be calculated. Approximate trips (not participants) calculated by reviewers as >1,000 (for two studies with control groups: Parker 2011, Parker 2013).

									significance (-33.1%, p = <0.000).No further data on the second study control group.	

68

Adverse outcomes as measured by percentage change in cyclists riding with traffic (as opposed to in the wrong direction)										
2 Parker et al 2011 Parker et al 2013	2 non-randomised studies[164]	Very serious[165]	No serious	No serious	No serious	None	5,209	1,088[166]	Change in percentage of cyclists riding with traffic (baseline to 3-6 month follow-up) (intervention only, or intervention vs control)[167] Parker 2011 Intervention: With traffic (baseline) (%) 73.3; With traffic (follow-up) (%) 81.8; Change (%-point) +8.5; % change +11.6; Significance of change (P-Value) <0.001 Parker 2013 Intervention: With traffic (baseline) (%) 92.8; With traffic (follow-up) (%) 95.6; Change (%-point) +2.8; % change +3.0 %; Significance of change (P-Value) <0.003 Parker 2013 control: With traffic (baseline) (%) 96.6; With traffic (follow-up) (%) 93.5; Change (%-point) -3.1; % change -3.2%; Significance of change (P-Value) 0.002 The percentage of cyclists cycling with rather than against traffic increased significantly between baseline and follow-up, while the percentage in control streets decreased significantly.	**LOW**
Adverse outcomes as measured by percentage change in cyclists riding on the pavements										

[164] 1 controlled study, 1 uncontrolled study
[165] Very serious risk of bias due to confounding different outcome measures at baseline in Parker 2013. Control group may not be matched.
[166] From one study only (second study uncontrolled)
[167] This outcome measures counts rather than participants: one individual may have appeared multiple times

<table>
<tr>
<td>3
Bjornskau et al 2012
Parker et al 2011
Parker et al 2013</td>
<td>3 non-randomised studies[168]</td>
<td>Very serious[169]</td>
<td>No serious</td>
<td>No serious</td>
<td>Serious[170]</td>
<td>None</td>
<td>5,209[171]</td>
<td>1,088[172]</td>
<td>
<u>Change in percentage of cyclists riding on the pavement (baseline to 3-6 month follow-up) (intervention only, or intervention vs control</u>
<table>
<tr><th></th><th>Cyclists riding on the pavement (baseline) (%)</th><th>Cyclists riding on the pavement (follow-up) (%)</th><th>Change (%-point)</th><th>% change</th><th>Significance of change (P-Value)</th></tr>
<tr><td>Bjornskau intervention*</td><td>47, 22</td><td>23, 5</td><td>-24, -17</td><td>-51, -22.7</td><td>NR</td></tr>
<tr><td>Parker 2011 Intervention</td><td>24.6</td><td>24.4</td><td>-0.2</td><td>-1.0</td><td>0.90</td></tr>
<tr><td>Parker 2013 Intervention</td><td>93</td><td>93</td><td>0</td><td>0</td><td>0.81</td></tr>
<tr><td>Parker 2013 control</td><td>0.5</td><td>2.2</td><td>+1.7</td><td>+340</td><td><0.000</td></tr>
</table>
*2 intervention sites which cannot be averaged are presented here
NR = not reported

Proportion of cyclists riding on the pavement did not significantly decrease in intervention groups between baseline and follow-up for two of the studies, and in the third no significance is given for the decrease. Proportion of cyclists riding on the pavement significantly increased in the control group between baseline and follow-up
</td>
<td>VERY LOW</td>
</tr>
</table>

[168] 2 controlled studies, 1 uncontrolled study

[169] Very serious risk of bias due to lack of information on matching control groups (Bjornskau). Rising price of gas could have contributed to outcome but not controlled for. Different outcome measures at baseline in Parker 2013.

[170] P-values are either not reported or are not significant for most studies – downgraded one level

[171] Bjornskau did not include the no of participants therefore total is from 2 / 3 studies

[172] Bjornskau did not include the no of participants therefore total is from 2 / 3 studies

Summary – See evidence statement 2.15

69

Safe Routes to School Interventions[173]

[To note that all studies on Safe Routes to School started from high in line with the modified GRADE approach].

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Safe Routes to Schools (SRTS) Programmes										
Active Travel as measured by change in active commute to school (ACS) between baseline and various follow-up periods										
2 Hoelscher et al 2016 Stewart et al 2014	Non-randomised studies[174]	Very serious[175]	No serious	No serious	Serious[176]	None	23 schools and 45 projects[177]	34 schools[178]	Change in rates of active commuting to school between baseline and various follow-up periods (intervention only, or intervention vs control). (self-reported) Stewart reports that the intervention group (no control) had significantly increased rates of ACS between baseline and 1-4 month follow-up. Hoelscher reports that the increase in percentage of children actively commuting between baseline and 3-year follow-up was significantly higher in intervention than control for morning observations (p=0.024), but not for whole-day (p=0.078).	**VERY LOW**
Active Travel as measured by change in Walking to School										
2	Non-randomised	Very serious[179]	No serious	No serious	Serious[180]	None	2 schools and 33 projects[181]	NA[182]	Change in rates of walking to school between baseline and various follow-up periods (intervention only) (self-reported)	**VERY LOW**

[173] Safe Routes to School interventions include improved pavements and crossings, speed reduction, traffic signals, car drop off zones etc.)
[174] 1 uncontrolled, 1 controlled
[175] Very serious risk of bias due to selection bias. Additionally, data collection undertaken by unblended individuals at schools, leading to potential detection bias.
[176] Insufficient data provided in results to verify significance of changes.
[177] 45 projects may each contain one or more schools. Exact number of schools and therefore individuals is unknown.
[178] Exact number of participants unknown.
[179] Very serious risk of bias due to selection bias, poor outcome data collection (Orenstein); varied methods of data collection; data collection by unblinded individuals at the schools in one study: detection bias (hoelscher).
[180] No measure of variance or significance reported for some results – downgraded one level
[181] Projects may each contain one or more schools. Exact number of schools and therefore individuals is unknown.
[182] Both studies uncontrolled

<table>
<tr><td>Orenstein et al 2007
Stewart et al 2014</td><td>uncontrolled studies</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Stewart reports that the intervention group (no control) had significantly increased rates of walking to school between baseline and 1-4 month follow-up (9.0% to 11.7%; p = <0.0001).

Orenstein reports increases in incidence of walking to school of between 48.5% and 304.5% between baseline and follow-up (follow-up time not defined) in two intervention schools. Significance not reported</td><td></td></tr>
<tr><td colspan="11">Active Travel as measured by change in Cycling to School</td></tr>
<tr><td>2
Orenstein et al 2007
Stewart et al 2014</td><td>Non-randomised studies[183]</td><td>Very serious[184]</td><td>No serious</td><td>No serious</td><td>Serious[185]</td><td>None</td><td>Unknown [186]</td><td>Unclear[187]</td><td><u>Change in rates of cycling to school between baseline and various follow-up periods (intervention only):(self-reported)</u>

Stewart reports that the intervention group (no control) had significantly increased rates of cycling to school between baseline and 1-4 month follow-up (1.6% to 2.4%; p = 0.011)

Orenstein reports increases in incidence of cycling to school of between 0 and 160% between baseline and follow-up (follow-up time not defined) in two intervention schools. Significance not reported.</td><td>VERY LOW</td></tr>
<tr><td colspan="11">Active Travel as measured by change in general or previous week cycling to school</td></tr>
<tr><td>1
Ostergaard et al 2015</td><td>Non-randomised controlled study</td><td>Very serious[188]</td><td>NA</td><td>No serious</td><td>Serious[189]</td><td>None</td><td>13 schools (1,296 children)</td><td>12 schools (1,105 children)</td><td><u>Change in general or previous week cycling to school (baseline to 1-year follow-up) (intervention vs control): (self-reported)</u>

<table>
<tr><th>COMMUTING TO SCHOOL BY CYCLING</th><th>Beta-coefficient*</th><th>95% Confidence Interval</th><th>P-Value</th></tr>
<tr><td>Cycling as a general method</td><td>-0.02</td><td>-0.10, 0.05</td><td>0.485</td></tr>
<tr><td>Cycling as previous week method</td><td>0.15</td><td>-0.25, 0.54</td><td>0.463</td></tr>
</table>
* negative figures reflect a decrease, positive numbers reflect an increase</td><td>VERY LOW</td></tr>
</table>

[183] 1 uncontrolled, 1 controlled
[184]Very serious risk of bias due to selection bias; poor outcome data collection (Orenstein); varied methods of data collection;
[185] No measure of variance or significance reported for some results – downgraded one level
[186] Number of participants unknown: Orenstein 2 schools; Stewart 33 projects.
[187] One study uncontrolled, so no participants in control group. The second study does not give numbers of participants in control group.
[188] Very serious risk of bias due to likelihood of recall and social desirability bias; self-selection of intervention schools; schools not matched and although some factors controlled for; not specific which.
[189] Unable to tell whether intervention had an effect as P values greater than 0.05– downgraded one level

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>There was no significant difference between changes in the control group and changes in the intervention group between baseline and 1-year follow-up for either measure</td><td></td></tr>
<tr><td colspan="11">Total Physical Activity as measured by number of days with 30 minutes or more of daily outdoor physical activity</td></tr>
<tr><td>1
Hoelscher et al 2016</td><td>Non-randomised controlled study</td><td>Very serious[190]</td><td>NA</td><td>No serious</td><td>Serious[191]</td><td>None</td><td>Unknown[192]</td><td>Unknown[193]</td><td><u>Change in self-reported number of days with ≥30mins/day of outdoor physical activity (baseline to 3-year follow-up) (intervention only):</u>
<table><tr><th></th><th>Mean days at baseline (SD)</th><th>Mean days at follow-up (SD)</th><th>P-Value</th></tr><tr><td>Intervention schools</td><td>4.2 (2.4)</td><td>4.4 (2.3)</td><td>0.162</td></tr><tr><td>Control schools</td><td>4.2 (2.5)</td><td>2.5 (2.2)</td><td>0.000</td></tr></table>SD = standard deviation

Students from control schools reported a significant decrease in number of days with 30 min or more of daily outdoor physical activity at follow-up. Intervention schools did not have a statistically significant change.</td><td>VERY LOW</td></tr>
<tr><td colspan="11">Physical Activity in Everyday Life as measured by change in time spent in leisure time physical activity (LTPA)</td></tr>
<tr><td>1
Ostergaard et al 2015</td><td>Non-randomised controlled study</td><td>Very serious[194]</td><td>NA</td><td>No serious</td><td>Serious[195]</td><td>None</td><td>13 schools (1,296 children)</td><td>12 schools (1,105 children)</td><td><u>Change in self-reported time spent in leisure time physical activity (LTPA) (baseline to 1-year follow-up) (Intervention vs control):</u>
<table><tr><th></th><th>Beta-coefficient*</th><th>95% Confidence Interval</th><th>P-Value</th></tr><tr><td>Change in LTPA</td><td>-0.09</td><td>-0.21, 0.03</td><td>0.124</td></tr></table>* negative figures reflect a decrease, positive numbers reflect an increase</td><td>VERY LOW</td></tr>
</table>

[190] Very serious risk of bias due to data collection undertaken by unblinded individuals at the schools resulting in potential detection bias.
[191] Unable to tell whether intervention had a significant effect in relation to control group – downgraded one level
[192] Number of participants unknown: 23 schools.
[193] Number of participants unknown: 34 schools.
[194] Very serious risk of bias due to likelihood of recall bias and social desirability bias in data collection, self-selection of intervention schools, schools not matched and although some factors controlled for; not specific which.
[195] Intervention had no significant effect in relation to control group (P values greater than 0.05) – downgraded one level

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>There was no significant difference between changes in the control group and changes in the intervention group between baseline and 1-year post-baseline follow-up.</td><td></td></tr>
<tr><td colspan="11">Adverse effects as measured by change in percentage of children aged 5-18 sustaining a traffic related injury between various follow-up periods (intervention vs control)</td></tr>
<tr><td>2
Orenstein et al 2007
Ostergaard et al 2015</td><td>Non-randomised controlled studies</td><td>Very serious[196]</td><td>No serious</td><td>No serious</td><td>Serious[197]</td><td>None</td><td>13 schools (1,296 children)[198]</td><td>12 schools (1,105 children)[199]</td><td>Change in incidence of children sustaining traffic injury (baseline to various follow-up periods) (intervention vs control) (self-reported data):
<table><tr><th>STUDY 1</th><th>Baseline (I) (%)</th><th>Baseline (C) (%)</th><th>P-value</th><th>Follow-up (I) (%)</th><th>Follow-up (C) (%)</th><th>P-value</th></tr><tr><td>Traffic injuries (all)</td><td>23.8</td><td>23.3</td><td>0.878</td><td>24.1</td><td>23.6</td><td>0.812</td></tr><tr><td>Traffic injuries (severe)</td><td>3.0</td><td>3.5</td><td>0.556</td><td>4.2</td><td>3.6</td><td>0.521</td></tr></table>I = Intervention, C = Control

Results show that there was no significant difference in incidence of any type of traffic injury between intervention and control groups at baseline, or between intervention and control groups at 1-year post-baseline follow-up.

<table><tr><th>STUDY 2</th><th>Change between baseline and follow-up (%)</th><th>95% Confidence Interval</th></tr><tr><td>Control</td><td>-15</td><td>NR</td></tr><tr><td>Intervention</td><td>-13</td><td>-2, 23</td></tr></table>Results show that there was no significant decrease in injuries in the intervention group between baseline and 7-year follow-up</td><td>VERY LOW</td></tr>
<tr><td colspan="11">Summary – See evidence statement 2.17</td></tr>
</table>

72

[196] Very serious risk of bias due to selection bias; poor outcome data collection (Orenstein); varied methods of data collection; self-selection of intervention schools, schools not matched and although some factors controlled for; not specific which.
[197] P values greater than 0.05 or 95% CI overlaps 0, showing no significant effect of intervention – downgraded one level
[198] Orenstein does not report figures, so this is from 1 / 2 studies only.
[199] Orenstein does not report figures, so this is from 1 / 2 studies only.

Review 3

Parks

[To note, all studies reporting on upgrading parks and changing the microenvironment started from low in line with the modified GRADE approach. Interventions on new parks started from high.]

11. Upgrading park facilities

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
Upgrading park facilities(includes lighting, facilities, paths, greenery, gyms, landscaping, improved safety)										
Total physical activity as measured by moderate to vigorous physical activity										
5 Bohn-Goldbaum et al 2013 Veitch et al 2012 Paton-Lopez et al 2014	Non-randomised studies[200]	Serious[201]	Not assessable as measures too different to combine	No serious	Serious[202]	None	1892[203]	NA	Mean number of children engaged in MVPA per 2-hour observation period (SD) 4 month follow up Bohn-Goldbaum 2013 Children Pre: Intervention park a 1.17 (2.21); Control park b 2.86 (3.95) Post: Intervention park a 0.67 (1.18); Control park b 1.98 (3.03) Confidence interval cannot be calculated as number of participants not reported. The authors report there was significant differences between intervention parks and control parks at both time points. The mean number of children engaging in MVPA decreased at follow up in both groups Rate of activity among youth observed in park Paton-Lopez et al 2014	**VERY LOW**

[200] Controlled studies – Bohn-Goldbaum et al, Veitch et al, Slater et al and Tester and Baker et al; Uncontrolled Studies – Paton Lopez et al

[201] Quality score for all studies allocated as (-) indicating high risk of bias – downgraded one level. Main bias is dissimilar outcome measures at baseline and contamination

[202] The Mean number of children engaging in MVPA reduced at follow up for the intervention group but p values or measures of variance were not included, the control group also observed a decrease and the groups were significantly different at baseline unable to determine effect of the intervention (Bohn-Goldbaum study) and no measures of variance (Paton-Lopez study) – downgraded one level

[203] Only 2/4 studies reported the number of participants

Slater et al 2016

Tester and Baker 2009

Children (3-11) n=370	Pre intervention	Post intervention
Moderate physical activity	53%	54%
Vigorous physical activity	11%	22%

Half of all activities observed among children (3-11years) were moderately active during both time periods. No p values or confidence intervals provided.

Adolescents* n=157	Pre intervention	Post intervention
Moderate physical activity	54%	60%
Vigorous physical activity	11%	21.9%

*adolescents cut-off ages were not provided

The authors report that the results were not statistically significant – possibly due too few observations. No p values or confidence intervals provided.

Park-Based moderate to vigorous physical activity MVPA 12 month follow up Slater et al 2016 (direct observations)

Confidence interval cannot be calculated as number of participants not reported. Model 1 included control variables only and Model 2 also examined the effects of overall neighbourhood crime count, presence of park programs and park maintenance

Covariate	Model 1 (Coefficient, SE)	Model 2 (Coefficient, SE)
Group	0.079 (0.121)	-0.005 (0.126)
Time	0.262 (0.069) (P<0.05)	0.306 (0.071)(p<0.05)
Group + time	**0.174 (0.088)(p<0.05)**	**0.199(0.089) (p<0.05)**

The results of Model 1 (0.17, P<0.05) and Model 2 (0.199, p<0.05) showed a significant increase in the number of people engaging in MVPA when comparing baseline with the 12 month follow-up.

Mean number of males and females per observation for moderate and vigorous physical activity (Tester and Baker 2009)

	Baseline (2006)	Follow-up (2007)	P value (2-tailed) Males/females
Park A			
Moderate	1.64	7.8	<0.001/<0.001
Vigorous	1.04	2.5	0.04/0.05
Park B			
Moderate	3.22	14.22	<0.001/<0.001

									Vigorous 0.65 4.18 <0.0001/0.03 Park C(control) Moderate 1.95 4.57 0.01/0.2 Vigorous 1.45 1.48 0.83/0.53 There were significant increase in the mean number of males and females observed engaging in either moderate or vigorous PA or a significant increase only for moderate PA in males in the control group. There was no between group comparison. Number of people observed walking (moderate PA) (intervention and control) Veitch et al 2012: Intervention: baseline 155, 3-month follow-up 195, 8 month follow-up 369. Control: baseline 75, 3-month follow-up 92, 8 month follow-up 51. The results show there was a statistically significant increase in the number of people observed walking in the intervention park over time compared to the control park. There was a significant interaction between park and time for counts of people walking F(2, 154) = 11.70, p = 0.0005. Number of people observed being vigorously active (intervention and control) Veitch et al 2012: Intervention: baseline 38, 3-month follow-up 137, 8 month follow-up 257. Control: baseline 5, 3-month follow-up 1, 8 month follow-up 0. The results show there was statistically significant increase in the number of people observed engaging in vigorous physical activity in the intervention park over time compared to the control park. There was a significant interaction between park and time for counts of people being vigorously active F(2, 154) = 4.98, p = 0.008.	
Total physical activity as measured by % change in MET-hours expended in park										
1 Cohen et al 2015	Non-randomised controlled study	Serious[204]	NA	No serious	No serious	None	Unclear[205]	Unclear	MET hours expended in park at 3 years follow up (intervention and control) based on direct observations Intervention parks / Control parks *=P<0.001 % change.. | Renovations complete Beta (SE) | Under construction Beta (SE) | No renovations Beta (SE) met-hours expended in park | 254.8 (70.1)* | 28.2 (25.3) | -53.1 (11.1)* Confidence interval cannot be calculated as number of participants not clear. The results show that there was a 250% increase in energy expended in the intervention parks compared to the baseline (p<0.001).	**VERY LOW**

[204] Quality score allocated as (-) indicating high risk of bias – downgraded one level. Main bias is contamination, selective outcome reporting.
[205] Authors did not provide number of participants split by intervention/control groups just baseline and follow up

<table>
<tr><td colspan="11">Total physical activity as measured by the proportion of individuals self-reporting meeting the recommended physical activity</td></tr>
<tr><td>1
Gidlow et al 2010</td><td>Non-randomised uncontrolled studies</td><td>Serious[206]</td><td>NA</td><td>No serious</td><td>Serious[207]</td><td>None</td><td>170</td><td>NA</td><td><u>The proportion of individuals self-reporting physical activity (meeting the recommended 30 mins of moderate PA per day) 12 months follow up (self-reported)</u>

<table>
<tr><th></th><th>BASELINE (N=50)</th><th>FOLLOW-UP (N=120)</th><th></th></tr>
<tr><td></td><td>%</td><td>%</td><td></td></tr>
<tr><td>Meet PA recommendations</td><td></td><td></td><td></td></tr>
<tr><td>yes</td><td>60.8%</td><td>62.2%</td><td>ns</td></tr>
<tr><td>no</td><td>39.2%</td><td>37.8%</td><td></td></tr>
</table>

The authors did not report on the actual p values for significant differences between the baseline and follow up. There was no significant differences between the number of days reported in engaging in at least 30 minutes of moderate physical activity and consequently there was no significant differences between baseline and followup in the proportion of respondents meeting the PA recommendations</td><td rowspan="2">VERY LOW</td></tr>
<tr><td>1

Bohn-Goldbaum 2013</td><td>Non-randomised studies</td><td>Serious risk of bias[208]</td><td>NA</td><td>Serious[209]</td><td>Serious[210]</td><td>None</td><td>140</td><td>NA</td><td><u>Total physical activity as measured by the proportion of children meeting a parental proxy questionnaire at 4 months follow up (self-reported)</u>

Sufficient physical activity was defined as attaining the recommended 60 minutes of at least moderate intensity physical activity daily. There were no significant differences between the reported physical activity in May and September.

<table>
<tr><th>Physical activity</th><th>Total % (n=58)</th><th>May % (n=34)</th><th>September % (n=24)</th><th>Chi-square (value)</th></tr>
<tr><td>Sufficient activity</td><td>55.2 (32)</td><td>58.8 (20)</td><td>50.0 (12)</td><td>0.44(0.51)</td></tr>
<tr><td>Insufficient activity</td><td>44.8 (26)</td><td>41.2(14)</td><td>50.0 (12)</td><td></td></tr>
</table>
</td></tr>
</table>

[206] Quality score for all studies allocated as (-) indicating high risk of bias – downgraded one level. Main bias is results based on self-reported accounts.
[207] The intervention did not has a significant effect – downgraded one level
[208] Quality score allocated as (-) indicating high risk of bias – downgraded one level. Main bias is results based on self-reported accounts
[209] The authors used the reported measures of parents visiting the park to determine the sufficiency of physical activity carried out by the children – serious indirectness as proxy measure – downgraded one level
[210] No significant differences between the 2 time points –downgraded one level

<table>
<tr><td colspan="11">Physical activity in everyday life as measured by park use</td></tr>
<tr>
<td>6
Bohn-Goldbaum 2013

Cohen et al 2009
Cohen et al 2015

Slater et al 2016

Tester and Baker 2009

Veitch et al 2012</td>
<td>Non-randomised controlled studies</td>
<td>serious[211]</td>
<td>Not assessable as unit measures are too different to combine</td>
<td>No serious</td>
<td>Serious</td>
<td>None</td>
<td>Unclear</td>
<td>unclear[212]</td>
<td>
<u>Parental park use (%(n)) from survey (intervention park only) (Bohn-Goldbaum et al 2013)</u>

More than half of the parents visited the intervention park at least once per week. There was no significant difference in park visit frequencies between May (57.7%) and September (61.3%, p=0.47).Significantly lower proportion of survey respondents from September had visited the playground before the renovation (49.2%) than those from May (66.7%, P = 0.04)

<table>
<tr><th></th><th>Total (n=140)</th><th>May (n=75)</th><th>September (n=65)</th><th>Chi-square (P value)</th></tr>
<tr><td colspan="5">Playground visit frequency %(n)</td></tr>
<tr><td>At least once per week</td><td>59.4 (79)</td><td>57.7 (41)</td><td>61.3 (38)</td><td>1.51 (0.47)</td></tr>
<tr><td>1-2 per fortnight or less</td><td>27.1 (36)</td><td>31.0 (22)</td><td>22.6 (14)</td><td></td></tr>
<tr><td>First time</td><td>13.5 (18)</td><td>11.3 (8)</td><td>16.1 (10)</td><td></td></tr>
<tr><td colspan="5">Visited playground before renovation %(n)</td></tr>
<tr><td>Yes</td><td>58.6 (82)</td><td>66.7 (50)</td><td>49.2 (32)</td><td>4.36 (0.04)</td></tr>
<tr><td>No</td><td>41.4 (58)</td><td>33.3 (25)</td><td>50.8 (33)</td><td></td></tr>
</table>

<u>Overall park use at 3-5 years follow up (based on direct park observations) Cohen et al 2009</u>

The authors reported that overall park use (control and intervention) declined in all age groups bar ‘teens’ from baseline to follow up (14682 individuals used the 10 parks at follow up compared to 19579 at baseline). Impact on control and intervention parks separately not reported.

<u>Change in total park use at 3 years park use (Direct Observations) Cohen et al 2015</u>
<table>
<tr><th></th><th colspan="2">Intervention parks</th><th>Control parks</th></tr>
<tr><th>*=P<0.001
% change…</th><th>Renovations complete Beta (SE)</th><th>Under construction Beta (SE)</th><th>No renovations Beta (SE)</th></tr>
<tr><td>Total park use</td><td>233.1(55.9)*</td><td>30.4(21.9)</td><td>-48.6(10.3)*</td></tr>
<tr><td>Children in park</td><td>434.0 (112.7*</td><td>58.8 (33.5)*</td><td>−7.4 (23.1)</td></tr>
</table>
</td>
<td>VERY LOW</td>
</tr>
</table>

[211] All six studies with an allocated QA score of (-) indicating high risk of bias with some results based on self-reported accounts – downgraded one level
[212] Total of intervention and control groups unclear as a proportion of the 6 studies did not provide number of participants

Teens in park	−51.1 (10.4)*	-7.3(19.7)	0.3 (24.7)
Adults in park	169.6 (39.9)	29.8 (19.2)	-53.7 (8.2)*
Seniors in park	25.4 (18.0)	-8.8(13.1)	-10.7(15.1)

Confidence intervals cannot be calculated as number of participants observed not reported. The results from the Cohen 2015 study show there was a 230% increase in park use in the intervention parks compared to the baseline ($p<0.001$). Significant increases were observed in children and adults at the renovated parks and a non-significant increase in the seniors age group (age cut offs not included). There was a significant 48% decrease in total park use in the control park at follow up compared to the baseline.
The authors did not compare intervention park and control park

Park usage at 1 year follow up (based on direct observations Slater et al 2016
Model 1 included control variables only and Model 2 also examined the effects of overall neighbourhood crime count, presence of park programs and park maintenance

Covariate	**Model 1 (Coefficient, SE)**	**Model 2 (Coefficient, SE)**
Group	0.201(0.09) (p<0.05)	0.056(0.096)
Time	0.031 (0.049)	0.097 (0.052) (p<0.1)
Group + time	**0.174 (0.062) (p<0.05)**	**0.211 (0.063) (p<0.05)**
Park maintenance scale		-0.072(0.014)(p<0.05)
Neighbourhood crime count (log)		0.359(0.104) (p<0.05)
Park has programmes		0.159(0.199)

Confidence intervals cannot be calculated as number of participants not reported. The results shows there was a statistically significant increase in park utilisation over time in intervention parks compared to control parks in both model 1 and 2. The results show that the only factor significantly associated with increased park use was low neighbourhood crime count (beta=0.359, $p<0.05$).

Park use (1 year follow up) (direct observations) Taster and Baker 2009
There was a significant increase in the total number of visitors in observations on the intervention Park A ($p=0.00$) and B ($p=0.00$), but not for the control park ($p=0.36$)In the intervention parks the results show that there was significant increase in the number of children, adults and seniors visiting the parks at baseline and at follow-up. The teens' group was the only group whose visits decreased in the intervention parks, but increased in the control

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>park. There were no significant changes in the control parks from baseline to follow-up apart from the male teens whose park visits significantly increased.

The authors did not compare the intervention parks with the control park

<table><tr><th>Intervention park A</th><th>Baseline (2006)</th><th>Follow-up (2007)</th><th>P value (2-tailed) males/females</th></tr><tr><td>Children</td><td>0.09</td><td>3.55</td><td>0.001/<0.001</td></tr><tr><td>Teens</td><td>0.64</td><td>1.67</td><td>0.813/0.0.008</td></tr><tr><td>Adults</td><td>4.07</td><td>18.95</td><td><0.001/<0.001</td></tr><tr><td>Seniors</td><td>0</td><td>0.18</td><td>0.003/0.16</td></tr><tr><td>Intervention park B</td><td></td><td></td><td></td></tr><tr><td>Children</td><td>0.42</td><td>4.35</td><td>0.006/0.003</td></tr><tr><td>Teens</td><td>1.37</td><td>1.71</td><td>0.931/0.116</td></tr><tr><td>Adults</td><td>2.69</td><td>22.76</td><td><0.001/<0.001</td></tr><tr><td>Seniors</td><td>0.4</td><td>3.38</td><td><0.001/<0.001</td></tr><tr><td>Control park</td><td></td><td></td><td></td></tr><tr><td>Children</td><td>0.27</td><td>0.61</td><td>0.257/0.042</td></tr><tr><td>Teens</td><td>1.32</td><td>4.09</td><td>0.00/0.27</td></tr><tr><td>Adults</td><td>6.97</td><td>5.71</td><td>0.37/0.478</td></tr><tr><td>Seniors</td><td>0.07</td><td>0.04</td><td>0.475/-</td></tr></table>
<u>Total number of users (Intervention and control) Veitch et al 2012:</u>
Intervention: baseline 235, 3-month follow-up 582, 8 month follow-up 985.
Control: baseline 83, 3-month follow-up 114, 8 month follow-up 51.
The results show that there was a statistically significant increase in park use for the refurbished park over time compared to the control park. There was a significant interaction between park and time for total counts of park users, F(2, 154) = 14.99, p = 0.0005</td><td></td></tr>
<tr><td colspan="10">Sedentary behaviour</td></tr>
<tr><td>2

Tester and Baker 2009

Veitch et al 2012</td><td>Non-randomised controlled studies</td><td>serious[213]</td><td>Not assessable as measures too different to combine</td><td>No serious</td><td>Serious[214]</td><td>None</td><td>2614</td><td>597</td><td><u>Mean number of males and females per observation (sedentary)</u>
<table><tr><th></th><th>Baseline (2006)</th><th>Follow-up (2007)</th><th>P value (2-tailed) Males/females</th></tr><tr><td>Intervention park A</td><td></td><td></td><td></td></tr><tr><td>Sedentary</td><td>2.13</td><td>14.01</td><td><0.001/<0.001</td></tr><tr><td>Intervention park B</td><td></td><td></td><td></td></tr><tr><td>Sedentary</td><td>0.84</td><td>13.95</td><td><0.001/<0.001</td></tr><tr><td>Park Control)</td><td></td><td></td><td></td></tr></table></td><td></td></tr>
</table>

[213] Quality score for all studies allocated as (-) indicating high risk of bias – downgraded one level. Main bias is some results based on self-reported accounts and contamination
[214] Some studies did not provide measures of variance included – downgraded one level

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>
Sedentary | 5.24 | 4.39 | 0.4/0.65

There were significantly more people observed being sedentary in the intervention parks at follow up, however in the two intervention parks combined, there were 1681 physically active visitors in the follow-up week, compared to a total of 360 at baseline. There were statistically significant increases among males and females who were observed at each respective PA level in the intervention parks. The majority of visitors where however sedentary. Sedentary visitors increased 5+ fold

<u>Number of people observed lying/sitting (intervention and control) Veitch et al 2012:</u>
Intervention: baseline 6, 3-month follow-up 119, 8 month follow-up 61.
Control: baseline 0, 3-month follow-up 4, 8 month follow-up 0.
Significance of interaction between park and time not reported

<u>Park-Based Sedentary behaviour</u>
<table>
<tr><th><u>Covariate</u></th><th>Model 1 (Coefficient, SE)</th><th>Model 2 (Coefficient, SE)</th></tr>
<tr><td>Group</td><td>0.409(0.119) (p<0.05)</td><td>0.264(0.123) (p<0.05)</td></tr>
<tr><td>Time</td><td>-0.194(0.068) (p<0.05)</td><td>-0.112(0.071)</td></tr>
<tr><td>Group + time</td><td>0.139(0.089)</td><td>0.173(0.089 (p<0.054)</td></tr>
<tr><td>Park maintenance scale</td><td></td><td>-0.090(0.019)(p<0.05)</td></tr>
<tr><td>Neighbourhood crime count log</td><td></td><td>0.316(0.119) (p<0.05)</td></tr>
<tr><td>Park has programmes</td><td></td><td>0.124(0.222)</td></tr>
</table>
Confidence intervals cannot be calculated as number of participants not reported. The results show that intervention parks had significantly more people engaging in sedentary behaviour as well as a significant decrease in observed sedentary behaviour over time in the control group (beta = -0.19, p<0.05). The results also show that while provision of programmes did not influence sedentary behaviour, decreased park maintenance and increased neighbourhood crime were both associated with an increase in sedentary behaviour p<0.05.
</td><td></td></tr>
<tr><td colspan="11">Perceived state of the park (safety, maintenance etc)</td></tr>
<tr><td>3

Cohen et al 2009</td><td>Non-randomised controlled studies</td><td>serious[215]</td><td>Not assessable as units too different to combine</td><td>No serious</td><td>Serious[216]</td><td>None</td><td>Unclear</td><td>Unclear</td><td><u>Perceptions of park safety (self-reported- survey responses) 3-5 years follow up, Cohen et al 2009 (intervention and control park)</u>
Perceptions of park safety from baseline to follow-up improved among intervention park users and neighbourhood residents; while it decreased for the control parks. This was a significant change (p=0.007) ; however, it was not correlated with observed park use or self-reported exercise</td><td>VERY LOW</td></tr>
</table>

[215] Quality score for all studies allocated as (-) indicating high risk of bias – downgraded one level. Main bias is self-reported accounts, contamination, and selection bias.
[216] Some studies did not provide measures of variance included – downgraded one level

<table>
<tr><td>Cohen et al 2015

Gidlow et al 2010</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td><u>Survey Perceptions of safety (self-reported) 3 years follow up Cohen et al 2015 (intervention park only)</u>
Park renovations were associated with a significantly increased perception of park safety by park users (Beta estimate 1.43, p<0.01) and local residents (Beta estimate 0.42, p<0.01).

<u>Baseline and follow-up perceptions of the intervention park (self-reported) Gidlow et al 2010</u>

There were no significant changes in perception of the intervention park (design and appearance, ease of getting around and maintenance) between baseline and follow up.
The authors did not seek any perceptions regarding the design and appearance, ease of getting around the park and maintenance of the control parks.</td><td></td></tr>
<tr><td colspan="10">Total physical activity potential predictors determined by a multivariate model</td></tr>
<tr><td>1

Quigg et al 2011</td><td>Non-randomised studies</td><td>No serious</td><td>NA</td><td>No serious</td><td>No Serious</td><td>None</td><td>77</td><td>79</td><td><u>Total physical activity potential predictors determined by a multivariate model (intervention and control parks)</u>
<table>
<tr><th>Variables</th><th>Intervention ratio of geometric means(95% ci)</th><th>P value</th><th>Control ratio of geometric means (95% ci)</th><th>P value</th></tr>
<tr><td>Exposure to playground (community of residence) intervention compared to control</td><td>0.90 (0.69-1.16)</td><td>0.417</td><td>1.11(0.85,1.44)</td><td>0.456</td></tr>
<tr><td>BMI overall (per 1 z score unit increase)</td><td>0.96 (0.87, 1.06)</td><td>0.388</td><td></td><td></td></tr>
<tr><td>BMI (control group)</td><td></td><td></td><td>1.19(1.06,1.34)</td><td>0.005</td></tr>
<tr><td>BMI (intervention group)</td><td></td><td></td><td>0.94(0.83,1.06)</td><td>0.300</td></tr>
<tr><td>Interaction: community by BMI z score</td><td></td><td></td><td></td><td>0.006</td></tr>
<tr><td>Interaction sex & ethnicity</td><td></td><td></td><td></td><td>0.019</td></tr>
<tr><td>Participant age (per 1 year increase)</td><td>0.92(0.87, 0.97)</td><td>0.004</td><td>0.90(0.85,0.94)</td><td><0.001</td></tr>
</table></td><td>LOW</td></tr>
</table>

									Non-school day (ref school day)	0.72(0.63, 0.81)	<0.001	0.72(0.63,0.82)	<0.001	
									Usually walking to school (ref: car or mixed)	1.18 (1.01, 1.39)	0.038	1.16(1.00,1.35)	0.046	
									There authors did not report on the mean total daily physical activity as measured by the accelerometer at baseline and follow-up but used in multivariate models to identify potential predictors of physical activity. The multivariate model found no evidence that participants in the intervention community had a statistically significant difference in their mean total daily physical activity (TDPA), compared to those living in the control community. The results show that living close to a playground (even after renovations) does not have a significant effect on total daily physical activity. There was evidence of statistically significant associations in the final model between follow-up physical activity and participant baseline age, school day, usual mode of travel to school, gender, and ethnicity.				
Summary - See evidence statement 3.1														

78

79 ## 12. New Parks

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
New parks										
Physical Activity in Everyday Life as measured by adults' frequency of park visits										

1 Cohen et al, 2014	Non-randomised controlled study	Very serious[217]	NA	No serious	No serious	Serious[218]	432	NA	Physical Activity in Everyday Life as measured by adults' self-reported frequency of park visits (intervention only) (baseline to 2 year post-baseline follow-up) At follow up the percentage reporting visiting any park more than once per week tripled, (increased by 22.8 percentage points from 11.1% to 33.9%) a statistically significant change from baseline (p<0.0001).	**VERY LOW**
Physical Activity in Everyday Life as measured by average number of monthly visits										
1 King et al 2015	Non-randomised uncontrolled study	Serious [219]	NA	Serious[220]	No serious	None	4525	NA	Physical Activity in Everyday Life as measured by average number of monthly visits (intervention only) (baseline to 2-year post-baseline follow-up The average monthly visits significantly increased by 362% at 2 year follow up.(from 180 to 651, p=0.02) When looking at the proportions of those who visited there was a significant increase in the proportion of teenagers visiting the park at follow up and a decrease in the proportion of children.	**LOW**
Physical Activity in Everyday Life as measured by proportion of adults exercising in the park										
1 Cohen et al, 2014	Non-randomised controlled study	Very serious[221]	NA	No serious	No serious	Serious[222]	432	NA	Physical Activity in Everyday Life as measured by proportion of adults self-reporting exercising in the park (intervention only) (baseline to 2 year post-baseline follow-up) The proportion of people exercising in the park significantly increased by 4.8 percentage points (from 9.6% at baseline to 14.4% at follow up, p<0.0395)	**VERY LOW**
Physical Activity in Everyday Life as measured by proportion of adults self-reporting engaging in leisure-time exercise										
1 Cohen et al, 2014	Non-randomised studies	Very serious[223]	NA	No serious	No serious	Serious[224]	432	NA	Physical Activity in Everyday Life as measured by proportion of adults self-reporting engaging in leisure-time exercise (intervention only) (baseline to 2 year post-baseline follow-up) The proportion of people engaging in leisure time significantly increase by 9.9 percentage points (from 25.8% at baseline to 35.7% at follow up) (p<0.0025)	**VERY LOW**

[217] Very serious risk of bias due to dissimilar characteristics at baseline; and control and intervention groups measured at different times of the year. Data is self-reported which could introduce bias.
[218] Serious due to reporting bias as the study does not report control results.
[219] Serious risk of bias due to a lack of control meaning the change cannot be attributed to the intervention. Selection bias also likely.
[220] Serious indirectness due to measures only taken in and around the intervention park. Measures of park use do not measure change in physical activity overall.
[221] Very serious risk of bias due to dissimilar characteristics at baseline; control and intervention measured at different times of the year. Self-reported data could introduce bias.
[222] Serious due to reporting bias as the study does not report control results.
[223] Very serious risk of bias due to dissimilar characteristics at baseline; control and intervention measured at different times of the year. Self-reported data could introduce bias.
[224] Serious due to reporting bias as the study does not report control results.

Total Physical Activity as measured by energy expenditure levels										
1 King et al 2015	Non-randomised studies	Serious [225]	NA	Serious[226]	No serious	None	432	NA	Total Physical Activity as measured by energy expenditure levels (intervention only) (baseline to 2-year post-baseline follow-up) Pre- and post- comparisons between the non-park and park zones indicated a 38% decrease in energy expended in streets, alleys and parking lots and a 3-fold increase in energy expended within the park boundaries post-construction (P = 0.002).	**LOW**
Total Physical Activity as measured by change in proportion of people undertaking moderate and vigorous activity in the park										
1 King et al 2015	Non-randomised studies	Serious [227]	NA	Serious[228]	No serious	None	4525	NA	Total Physical Activity as measured by change in proportion of people undertaking moderate activity or vigorous activity in the park (intervention only) (baseline to 2-year post-baseline follow-up**) 2010 - 2012** There was a significant increase in the proportion of individuals observed as engaging in vigorous physical activity from baseline (18.6%) to follow up (25.2%) an increase of 6.6 percentage points (p=0.04), however the proportion of individuals observed as engaging in moderate physical activity decreased from 43.4% to 40.8% at follow up, a decrease of 2.6 percentage points (p=0.007)	**LOW**
Sedentary behaviour										
1 King et al 2015	Non-randomised studies	Serious [229]	NA	Serious[230]	Serious[231]	None	4525	NA	The proportion of adults observed being sedentary decreased at follow up by 4 percentage points, no measures if variance provided.	**VERY LOW**
Summary - See evidence statement 3.3										

80

[225] Serious risk of bias due to a lack of control meaning the change cannot be attributed to the intervention. Selection bias also likely.
[226] Serious indirectness due to measures only taken in and around the intervention park. Measures of park use do not measure change in physical activity overall.
[227] Serious risk of bias due to a lack of control meaning the change cannot be attributed to the intervention. Selection bias also likely.
[228] Serious indirectness due to measures only taken in and around the intervention park. Measures of park use do not measure change in physical activity overall.
[229] Serious risk of bias due to a lack of control meaning the change cannot be attributed to the intervention. Selection bias also likely.
[230] Serious indirectness due to measures only taken in and around the intervention park. Measures of park use do not measure change in physical activity overall.
[231] Serious imprecision due to no measures of variance reported

81 13. Changing micro-environment

<table>
<tr><th colspan="7">Quality assessment</th><th colspan="2">No. of participants</th><th rowspan="2">Effect</th><th rowspan="2">Quality</th></tr>
<tr><th>No of studies</th><th>Design</th><th>Risk of bias</th><th>In-consistency</th><th>In-directness</th><th>Imprecision</th><th>Other considerations</th><th>Intervention</th><th>Control</th></tr>
<tr><td colspan="11">Movement of seats and picnic tables in a park</td></tr>
<tr><td colspan="11">Total physical activity as measured by METS expended by park visitors during intervention time</td></tr>
<tr><td>1 Roemmich et al 2014</td><td>Non-randomised studies</td><td>serious[232]</td><td>NA</td><td>No serious</td><td>No Serious</td><td>None</td><td>484</td><td>NA</td><td>
<table>
<tr><th>Condition</th><th>Adults</th><th></th><th>Children</th><th></th></tr>
<tr><td></td><td>N</td><td>Mets</td><td>N</td><td>Mets</td></tr>
<tr><td colspan="5">summer 2012 (mean, ±standard error)</td></tr>
<tr><td>Seating near ($a_{1)}$</td><td>79</td><td>1.8±0.1</td><td>91</td><td>3.1±0.2</td></tr>
<tr><td>Seating far (b)</td><td>22</td><td>2.0±0.2</td><td>27</td><td>3.8±0.4</td></tr>
<tr><td>Seating near (a_2)</td><td>55</td><td>1.4±0.1</td><td>57</td><td>3.1±0.3</td></tr>
</table>
A1 – tables nearer to the playground, B – tables further away from the playground, A2 – tables nearer to the playground again.

Reviewers have calculated that:
• For adults, METS expended is significantly higher in b when compared with A_1 (mean difference 0.20, 95% CI 0.11, 0.29), and also when compared with $\mathbf{A_2}$ (mean difference 0.60, 95% CI 0.51, 0.69).
For children, METS expended is significantly higher in b when compared with A_1 (mean difference 0.70, 95% CI 0.54, 0.86), and also when compared with $\mathbf{A_2}$ (mean difference 0.70, 95% CI 0.53, 0.87).Children were more intensely active than adults (p=0.0001)
METS Intensities were greater when seating was not accessible (B) than when seating was accessible (A1, A2) p<0.02).</td><td>VERY LOW</td></tr>
<tr><td colspan="11">Total Physical Activity as measured by odds of adults engaging in MVPA</td></tr>
</table>

[232] Quality score allocated as (-) indicating high risk of bias – downgraded one level. Main bias is presence of selection bias and confounders.

1 Roemmich et al 2014	Non-randomised uncontrolled studies	Serious[233]	NA	No serious	No Serious	None	484	NA	Total Physical Activity as measured by odds of adults engaging in MVPA (intervention only) (unclear follow-up period) The odds of adults engaging in MVPA were at least 4.1 times significantly higher when the picnic tables s were moved away from the playground compared to when the tables were closer (p=0.03), the results remained consistent when the study was repeated at a later date.	**VERY LOW**
Total sedentary time as measured by odds of adults standing rather than sitting during intervention										
1 Roemmich et al 2014	Non-randomised uncontrolled studies	Serious[234]	NA	No serious	No Serious	None	484	NA	The odds of adults standing rather sitting were greater when the tables were further away from the playground compared to when the tables were nearer to the playground (OR – 9.4, 95% CI 2.5, 35.2, p value <0.0001) and the odds remained significantly great when the tables were moved back to the playground again (4.7, 95% CI 1.3,17.2; p value <0.02)	**VERY LOW**
Summary - See evidence statement 3.5										

82

[233] Quality score allocated as (-) indicating high risk of bias – downgraded one level. Main bias is presence of selection bias and confounders
[234] Quality score allocated as (-) indicating high risk of bias – downgraded one level. Main bias is presence of selection bias and confounders

83 Effectiveness of neighbourhood interventions

84 [To note, all studies reporting on neighbourhood interventions, except for DIY-streets, started from high in line with the modified GRADE approach.]

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Moving to a new neighbourhood complying with Livable Neighbourhoods Guidelines (LNG) vs moving to conventional neighbourhood										
Active Travel as measured by change in transportation-related walking (transport walking)										
1[235] Christian et al 2013 Knuiman et al 2014	Non-randomised controlled studies[236]	Serious[237]	NA	No serious	Serious[238]	None	299[239]	528	Mean minutes of transport walking per week (baseline is prior to move)(intervention only, or intervention vs control) (baseline to 1-, 3-, and 7-year post-baseline follow-up) CHRISTIAN ET AL 2013 — Baseline mean mins (SD) — 1-year follow-up mean mins (SD) — 3-year follow-up mean mins (SD) Intervention — 25.2 (55.33) — 15.2 (66.64) — 25.6 (70.90) Control — 28.1 (55.15) — 19.6 (50.55) — 25.7 (71.23) SD = standard deviation (calculated by reviewers) Change between baseline and final follow-up in intervention (-0.40 [95% CI -10.59, 9.79]) and change between baseline and final follow-up in control (2.4 [95% CI -5.28, 10.08]) were not significantly different (2.80 [95% CI -8.22, 13.93]) (calculated by reviewers). Prevalence of walking trips KNUIMAN ET AL 2014 — Baseline — 1-year follow-up — 3-year follow-up — 7-year follow-up	LOW

[235] One study but two publications

[236] One publication splits data into intervention and control group, the other uses all data combined

[237] Serious risk of bias due to self-selection of the intervention group. Some demographic factors are adjusted for in the analysis but unknown actors could cause bias.

[238] Confidence intervals spanned the line of no effect (and therefore the MID) – downgraded one level.

[239] One publication (Christian et al 2013) split participants into intervention (n=299) and control (n=528). The other publication (Knuiman et al 2014) treated all participants as intervention (n=1047)

									Percentage making a transport walking trip in a week (%): 37 / 28 / 29 / 36 Mean number of transport walking trips made per week: 1.4 / 1.1 / 1.1 / 1.4 Over time, proportion of participants making a walking trip and mean number of walking trips made increase to baseline levels.	
Active Travel as measured by association between transport walking and public transport access, and number of possible destinations										
1 Knuiman et al 2014	Non-randomised uncontrolled study	Serious[240]	NA	No serious	No serious	None	1,047	NA	<u>Active Travel as measured by association between transport walking and public transport access, and number of possible destinations (intervention only) (baseline to 1-, 3-, and 7-year post-baseline follow-up)</u> Perceived (self-reported) and objective (GPS-identified) access to bus stops and railway stations are significantly associated with transport walking. Perceived number of types of destinations in the neighbourhood is more strongly associated with transport walking than objective measures of number of destinations present (both are significant when comparing presence of 8+ destinations with 0-3 destinations). <u>Objective measures of public transport access and number of possible destinations in neighbourhood</u> 15-29 bus stops within 1600metres (compared with 0-14): Association with objective walkability (OR, 95% CI)* 1.63 (1.34, 1.98) ≥30 bus stops within 1600metres (compared with 0-14): 1.75 (1.39, 2.19) Railway station present within 1,600 metres of home: 1.34 (1.00, 1.81) 4-7 types of destinations present (compared with 0-3): 1.03 (0.87, 1.22)	MODERATE

[240] Serious risk of bias due to large drop out between baseline and follow up (almost 70%). Although some factors are adjusted for in the analysis, unknown factors could cause bias.

									8-15 types of destinations present (compared with 0-3): 1.29 (1.02, 1.64) Perceived measures of public transport access and number of possible destinations in neighbourhood Perceived access to bus stops (within 15-minute walk from home): 1.35 (1.10, 1.66) Perceived access to railway stations (within 15-minute walk from home): 1.44 (1.13, 1.85) 3-6 types of destinations present (compared with 0-2): 2.07 (1.76, 2.43) 7-11 types of destinations present (compared with 0-2): 2.32 (1.95, 2.77)	
Active Travel as measured by association between transport walking and walkability										
1 Knuiman et al 2014	Non-randomised uncontrolled study	Serious[241]	NA	No serious indirectness	No serious	None	1,047	NA	Active Travel as measured by association between transport walking and walkability (intervention only) (baseline to 1-, 3-, and 7-year post-baseline follow-up) Connectivity z-score: 1.05 (0.99, 1.11); **1.09 (1.03, 1.15)** Residential density z-score: 1.04 (0.94, 1.15); 1.02 (0.92, 1.14) Land-use mix z-score: **1.16 (1.08, 1.25)**; **1.21 (1.12, 1.30)** *Odds Ratio, 95% confidence interval Objective (but not perceived) connectivity is significantly associated with transport walking. Neither perceived nor objective residential density mix is significantly associated with transport walking. Perceived and objective land-use mix is significantly associated with transport walking.	MODERATE
Physical Activity in Everyday Life as measured by changes to time spent walking for recreation										
1	Non-randomised	Serious[242]	NA	No serious	Serious[243]	None	299	528	Mean minutes of recreational walking per week (baseline is prior to move) (intervention vs control) (baseline and 1- or 3-year follow-up)	LOW

[241] Serious risk of bias due to large drop out between baseline and follow up (almost 70%). Although some factors are adjusted for in the analysis, unknown factors could cause bias.

[242] Serious risk of bias due to self-selection of the intervention group. Some demographic factors are adjusted for in the analysis but unknown actors could cause bias.

[243] Confidence intervals spanned the line of no effect (and therefore the MID) – downgraded one level.

Christian et al 2013	controlled study								<table><tr><th></th><th>Baseline mean mins (SD)</th><th>1-year follow-up mean mins (SD)</th><th>3-year follow-up mean mins (SD)</th></tr><tr><td>Intervention</td><td>65.9 (98.56)</td><td>85.4 (107.21)</td><td>95.1 (157.35)</td></tr><tr><td>Control</td><td>77.3 (96.51)</td><td>91.4 (108.0)</td><td>86.2 (149.36)</td></tr></table> SD = standard deviation (calculated by reviewers) Change between baseline and final follow-up in intervention (29.20 [95% CI 8.15, 50.25]) and change between baseline and final follow-up in control (8.9 [95% CI -2.74, 20.54]) were not significantly different (20.30 [95% CI -3.67, 44.27]) (calculated by reviewers).	
Physical Activity in Everyday Life as measured by travel mode to physical activity locations										
1 Dunton et al 2012	Non-randomised controlled study	Serious[244]	NA	No serious	Serious[245]	None	46	48	Physical Activity in Everyday Life as measured by travel mode to physical activity locations (children aged 9 – 13) (baseline to 6-12 month follow-up) (intervention vs control) There was no difference between intervention and control changes over time (Group x time effect) for travel mode (walking or bicycling vs motorised transit) to place of physical activity (Adj. Wald F 0.46, p = 0.633).	LOW
Total Physical Activity as measured by change in time spent in MVPA per day										
1 Dunton et al 2012	Non-randomised controlled study	Serious[246]	NA	No serious	Serious[247]	None	46	48	Total Physical Activity as measured by change in time spent in MVPA per day (children aged 9 – 13) (baseline to 6-12 month follow-up) (intervention vs control) <table><tr><th></th><th>Baseline mean mins/day</th><th>Follow-up mean mins/day</th><th>Change in mins/day</th></tr><tr><td>Intervention</td><td>32.75</td><td>42.78</td><td>10.03</td></tr><tr><td>Control</td><td>34.23</td><td>38.40</td><td>4.17</td></tr></table>	LOW

[244] Serious risk of bias due to results only adjusting for sex, age and annual household income. Self-selection likely to have occurred to move to these neighbourhoods and not controlled for.

[245] No difference in change in control and change in intervention – downgraded one level

[246] Serious risk of bias due to results only adjusting for sex, age and annual household income. Self-selection likely to have occurred to move to these neighbourhoods and not controlled for.

[247] No significant difference in effect in control and effect in intervention – downgraded one level

									There was not a statistically significant difference between the change in intervention group and the change in control group (F Wald 0.44; p = 0.51)	
Summary: See Evidence Statement 3.6										

85
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87

Quality assessment							**No. of participants**		**Effect**	**Quality**
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
DIY-Streets (increasing safety and improving appearance of streets through planters, parking space provision and layout, and some traffic control methods)										
Physical Activity in Everyday Life as measured by self-reported activity levels (65+ years old)										
1 Ward Thompson et al 2014	Non-randomised controlled study	Serious[248]	NA	No serious	No serious	None	56[249]	40[250]	Physical Activity in Everyday Life as measured by self-reported activity levels (65+ years old) (baseline to 2-year follow-up) (intervention vs control) Cross-sectional: Self-reported frequency of summer outdoor activities significantly declined in the intervention group (p = 0.02) at 2 year follow-up. No significant differences for the comparison group (significance not reported). Longitudinal: Self-reported levels of outdoor activity in summer: did not increase significantly in either intervention or comparison groups (significance not reported). Participants in the intervention group perceived that they were more active at follow-up than baseline, significantly more so than those in the comparison group (p=0.04).	VERY LOW
Perceptions as measured by perceptions of safety and quality of facilities (65+ years old)										

[248] Quality score was (-) indicating high risk of bias – downgraded one
[249] This is for cross-sectional data. 20 intervention participants for longitudinal analysis
[250] This is for cross-sectional data. 16 control participants for longitudinal analysis

1 Ward Thompson et al 2014	Non-randomised controlled study	Serious[251]	NA	No serious	No serious	None	56[252]	40[253]	Perceptions as measured by perceptions of safety and quality of facilities (65+ years old) (baseline to 2-year follow-up) (intervention vs control) Cross-sectional: In the intervention group, perceptions that "most of the streets and paths in my neighbourhood are safe to walk after dark" increased significantly (p=0.04). There was a significantly negative change in perceptions relating to "good outdoor facilities, including garden and parking, at home" (p=0.02). The comparison group saw no significant change over time. Longitudinal: Responses to the statement 'it is easy for me to walk on my street' showed an increase in the intervention group, a change that was significant compared with the comparison group (p=0.03).	VERY LOW
SUMMARY: See Evidence Statement 3.7										

88

[251] Quality score was (-) indicating high risk of bias – downgraded one

[252] This is for cross-sectional data. 20 intervention participants for longitudinal analysis

[253] This is for cross-sectional data. 16 control participants for longitudinal analysis

Multicomponent

[To note, all studies reporting on multicomponent interventions started from high in line with the modified GRADE approach, apart from Active England woodland projects which started from low.]

Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Active living by design-Creation of city-level bike and pedestrian coordinator positions supporting implementation of environmental changes (crosswalks, park renovations etc), and extension of a walking path connecting intervention town with a city										
Total Physical Activity as measured by proportion of participants meeting either moderate or vigorous physical activity guidelines										
1 Chomitz et al 2012	Non-randomised controlled study	Very serious[254]	NA	No serious	No serious	None	484	NA	Total Physical Activity as measured by proportion of participants meeting either moderate physical activity (MPA) or vigorous physical activity (VPA) guidelines (baseline to 3-5 year post-baseline follow-up) (intervention only) The intervention is associated with significant increases in proportion of participants meeting MPA and/or VPA guidelines between baseline and 3-5 year follow-up in adults, from 40% at baseline to 62% at follow up, adjusted odds ratio 2.36 (95% CI 2.29,2.43) and high school students from 52% at baseline to 62% at follow up, adjusted odds ratio 1.61(1.34,1.92) but not in middle-school students who had a non-significant decrease	**LOW**
SUMMARY – See evidence statement 3.9										

[254] Very serious risk of bias due to possible selection bias of the intervention area. High levels of drop outs. Some adjustments made but not clear what characteristics were adjusted.

94

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
Implementation of "The District Approach": Improving green space through: redevelopment of existing parks; creation of public parks, natural playgrounds, community gardens, fishponds and public allotments.										
Physical Activity in Everyday Life as measured by proportion walking at least one a week										
1 Droomers et al 2016	Non-randomised controlled study	Serious [255]	NA	No serious	Serious[256]	None	1018	1918[257] 3344[258] 46,885[259] 229[260]	<u>Prevalence of respondents self-reporting leisure walking at least once/week:</u> Intervention and control groups, (baseline to 3.5 year post intervention implementation follow-up) Group x Time effect: When comparing intervention to each of the control groups, the difference in trend was not significant for 3 of the control groups. Only significant result was for a comparison with non-green neighbourhood control: -0.36 (95% CI -0.67, -0.05), indicating that the non-green neighbourhoods had significantly more positive change than intervention. Actual prevalence data not reported, only regression coefficients.	LOW
Physical Activity in Everyday Life as measured by proportion making ≥1 leisure cycle trip/ week										

[255] Serious risk of bias due to high levels of baseline differences for outcome measures, only partially compensated for by statistical analysis. It is not clear whether baseline demographic characteristics are similar. Partially compensated for by multiple controls.
[256] There was no significant difference between the change in the intervention group and three out of the four control groups.
[257] Narrow control: 1,918
[258] Broad control 3,344
[259] Netherlands Control: 46,885
[260] 12 non-green District Approach neighbourhoods Control: 229

1 Droomers et al 2016	Non-randomised controlled study	Serious [261]	NA	No serious	Serious[262]	None	1018	1918[263] 3344[264] 46,885[265] 229[266]	<u>Prevalence of respondents self-reporting cycling for leisure at least once/week</u> Intervention and control groups, (baseline to 3.5 year post intervention implementation follow-up) Group x Time effect: There was no significant change in any of the groups when considering the prevalence of leisure cycling for at least once/week. The intervention group had a regression coefficient of -0.08 (95% CI -0.20, 0.04). The coefficient is very small suggesting the intervention had no effect on the prevalence of self-reported cycling. Actual prevalence data not reported, only regression coefficients.	LOW
Physical Activity in Everyday Life as measured by proportion engaging in leisure sports at least once/week										
1 Droomers et al 2016	Non-randomised study	Serious [267]	NA	No serious	Serious[268]	None	1018	1918[269] 3344[270] 46,885[271] 229[272]	<u>Prevalence of respondents reporting engaging in sports for leisure at least once/</u> Group x Time effect:. There were no significant time, or group x time effects in any of the groups. The intervention group had a regression coefficient of -0.10 (95% CI -0.23,0.02), The small coefficient suggests the intervention had no effect on the prevalence of respondents reporting engaging in leisure sport for at least once/week. Actual prevalence data not reported, only regression coefficients	LOW
SUMMARY – See evidence statement 3.10										

[261] Serious risk of bias due to high levels of baseline differences for outcome measures, only partially compensated for by statistical analysis. It is not clear whether baseline demographic characteristics are similar. Partially compensated for by multiple controls.
[262] There was no significant difference between the change in the intervention group and any of the control groups.
[263] Narrow control: 1,918
[264] Broad control 3,344
[265] Netherlands Control: 46,885
[266] 12 non-green District Approach neighbourhoods Control: 229
[267] Serious risk of bias due to high levels of baseline differences for outcome measures, only partially compensated for by statistical analysis. It is not clear whether baseline demographic characteristics are similar. Partially compensated for by multiple controls.
[268] There was no significant difference between the change in the intervention group and any of the control groups.
[269] Narrow control: 1,918
[270] Broad control 3,344
[271] Netherlands Control: 46,885
[272] 12 non-green District Approach neighbourhoods Control: 229

95
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Quality assessment							No. of participants		Effect	Quality
No of studies	Design	Risk of bias	In-consistency	In-directness	Imprecision	Other considerations	Intervention	Control		
Smarter Choices, Smarter Places (SCSP) programme: introducing new bus services and shelters, ticketing improvements, promotional activity										
Total physical activity as measured by the proportion of participants meeting moderate physical activity (MPA) guidelines										
1 Norwood et al 2014	Non-randomised controlled study	Very serious[273]	NA	No serious	No serious	None	7226	2316	Proportion of participants meeting moderate physical activity (MPA) guidelines (intervention vs control; baseline vs 3-year follow-up): 3-year follow-up: The proportion of participants meeting MPA guidelines was significantly greater in the intervention compared to control at 3 year follow up (p = <0.01; intervention = 30.8%; control = 24.9%). Change over time: Percentage of people meeting MPA guidelines was reduced in both groups between baseline and follow-up but this was greater in the control compared to the intervention (absolute reduction of 14.9% reduction in control vs. 3.4% reduction in intervention). Regression analysis, controlling for age, ownership of a car, employment status, health status, age, ethnicity, education level suggests that the likelihood of PA participation is significantly higher in the intervention areas relative to the control areas at 3 year follow up (p = <0.001, regression coefficient for area by year is 0.39.)	LOW
Total physical activity as measured by the proportion of participants who were active at all										

[273] Very serious risk of bias due to different data collection methods used at follow up (face to face rather than by written survey as at baseline) potentially resulting in social desirability bias. Groups considerably different at baseline although many factors adjusted for.

1 Norwood et al 2014	Non-randomised controlled study	Very serious[274]	NA	No serious	Serious[275]	None	7226	2316	<u>Proportion of participants who were active at all (intervention vs control; baseline vs 3-year follow-up):</u> 3-year follow-up: The proportion of participants who were active at all was not significantly different between control and intervention areas (P value not reported; intervention = 69.9%; control = 70.1%). Change over time: Proportions of participants who were active at all reduced in both groups between baseline and follow-up but this was greater in the control compared with the intervention (absolute reduction of 9.2% vs 0.7%).	VERY LOW
SUMMARY- See evidence statement 3.11										

97

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[274] Very serious risk of bias due to different data collection methods used at follow up (face to face rather than by written survey as at baseline) potentially resulting in social desirability bias. Groups considerably different at baseline although many factors adjusted for.

[275] No significant difference between intervention and control group at follow up

99

Quality assessment							No. of participants		Effect	Quality
No of studies	**Design**	**Risk of bias**	**In-consistency**	**In-directness**	**Imprecision**	**Other considerations**	**Intervention**	**Control**		
Active England woodland projects (new play areas, visitor's centre, cycle tracks, walking trails, shower facilities, butterfly trail, climbing wall, promotional groups and events)										
Physical activity in everyday life as measured by the change in frequency of visits										
1 O'Brien and Morris 2009	Non-randomised uncontrolled study	No serious	NA	No serious	Serious[276]	None	1467	NA	Change in frequency of visits (as % of all visitors) (follow up unclear – differed from each site) (1-3 years and 4-5 years) Total visitor numbers increased by between 47% and 2,143% between baseline and follow-up. Before / After Every day 7.3 / 2.2 4-6 / week 6.7 / 3 1-3 / week 19 / 19 1-3 / month 22.3 / 27.6 4-6 / year 9 / 19.2 1-3 / year 19.7 / 18.8 Less often 15.9 / 10.1 Those visiting every day or 4-6 times per week declined as a proportion of all visitors. Those visiting 1-3 times per month and 4-6 times per year saw the greatest increase as a proportion of all visitors. Average visit time reportedly increased from 1.74 (standard error 0.04) to 2.33 (standard error 0.04).	**Very low**

[276]No measures of variance reported – downgraded one level

1 O'Brien and Morris 2009	Non-randomised uncontrolled study	No serious	NA	No serious	Serious[277]	None	1467	NA	Sub group analysis In all three sites combined, there was no significant change in number of visitors with blue badges (actual numbers not given), however there was a decrease in proportion of visitors reporting having a long term illness (13.9% at baseline, 7.2% at follow-up; p = <0.001; actual numbers not reported). Black and Minority Ethnic (BME) individuals as a proportion of all visitors increased from 1.7% at baseline to 5.2% at follow up (p = <0.001).	
Total Physical activity as measured by proportion of visitors taking ≥5 days exercise/week										
1 O'Brien and Morris 2009	Non-randomised uncontrolled study	Serious[278]	NA	No serious	No serious	None	1467	NA	Total Physical activity as measured by proportion of visitors taking ≥5 days exercise/week follow up unclear – differed from each site (1-3 years and 4-5 years) Proportion of visitors taking ≥5 days exercise/week declined from 55.9% to 36.1% between baseline and follow-up (*p* = <0.001).	**Very Low**
Changes to perceived barriers to accessing forests for physical activity										
1 O'Brien and Morris 2009	Non-randomised uncontrolled study	Serious[279]	NA	No serious indirectness	Serious[280]	None	1467	NA	Changes to perceived barriers to accessing forests for physical activity follow up unclear – differed from each site (1-3 years and 4-5 years) [To note – Actual numbers and statistical significance not reported. NICE team derived this information from a bar chart with no number labels]. The largest changes in perceived barriers occurred in: lack of facilities, antisocial behaviour and lack of information (where there was a decrease in perceived barrier from baseline to follow-up). Compared with baseline, respondents were more likely to perceive weather as a barrier and have a preference for other countryside areas	**Very Low**

[277]No measures of variance reported – downgraded one level
[278] Quality score allocated as (-) indicating high risk of bias – downgraded one level. Main bias is presence of selection bias and poor data collection methods
[279] Quality score allocated as (-) indicating high risk of bias – downgraded one level. Main bias is presence of selection bias and poor data collection methods
[280] No measures of variance reported – downgraded one level

SUMMARY – See evidence statement 3.12	

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