Journal of Transport & Health 2 (2015) 580–594

Contents lists available at ScienceDirect

Journal of Transport & Health

journal homepage: www.elsevier.com/locate/jth

Engaging communities in changing the environment to promote transport-related walking: Evaluation of route use in the 'Fitter for Walking' project

Emma J. Adams [a,*], Nick Cavill [b]

[a] British Heart Foundation National Centre for Physical Activity and Health, School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, UK
[b] Cavill Associates Ltd., 185A Moss Lane, Bramhall, Stockport, Cheshire SK7 1BA, UK

ARTICLE INFO

Article history:
Received 8 May 2015
Received in revised form
29 July 2015
Accepted 7 September 2015
Available online 9 October 2015

Keywords:
Walking
Transport
Environment
Physical activity
Community engagement

ABSTRACT

Promoting walking for transport may help to increase physical activity levels. Associations between the built environment and walking for transport have been well reported. Engaging communities in making small-scale changes to local routes is one potential low-cost strategy to improve neighbourhood environments. The purpose of this study was to evaluate changes in pedestrian use of local routes following environmental changes made by communities and local authorities (LAs) in the 'Fitter for Walking' (FFW) project, to assess route users' awareness of the environmental improvements which were implemented and to make recommendations for future evaluation.

FFW targeted deprived communities in twelve LA areas in England. Coordinators worked with communities and LA partners to improve local route environments based on identified barriers to walking. Route user counts and intercept surveys were conducted in five FFW case studies at baseline, 12 months and 14–20 months after the project activities had commenced.

A wide range of environmental improvements were undertaken. After 12 months, there was a decrease in pedestrian route use overall (−19.4%) and in four case studies (range −42.1% to −10.4%). However, after 14–20 months, an increase in pedestrian route user overall (14.9%) and in all case studies (range 5.4–58.9%) was observed compared to baseline. Route users' awareness of environmental improvements made to routes varied across case studies and was very low for some of the improvements which had been made.

Engaging communities in making small-scale environmental improvements to key routes in local neighbourhoods may be an effective, low-cost strategy for increasing walking for transport. Increasing the number of people walking on newly improved routes may take a long time and require additional promotional initiatives. Evaluating these types of initiatives is challenging. These factors should be considered by health and transport professionals developing initiatives and by researchers interested in measuring behaviour change.

1. Introduction

The health benefits of participating in regular physical activity have been well reported (Department of Health, 2011; Physical Activity Guidelines Advisory Committee, 2008; US Department of Health and Human Services, 1996). Despite this, 33% of males and 45% of females in England do not meet current physical activity recommendations (Department of Health, 2011; Health and Social Care Information Centre, 2012) resulting in increasing public health, economic and social burden from diseases associated with low levels of physical activity (Allender et al., 2007; Scarborough et al., 2011; Lee et al., 2012). Strategies are therefore urgently needed which effectively increase physical activity levels to improve health and reduce this burden. Walking has been described as near perfect exercise (Morris and Hardman, 1997). It is free, acceptable to most people, requires no special equipment, can be incorporated into everyday life and has been

* Corresponding author. Tel.: +44 1509 226422.
E-mail addresses: E.J.Adams@lboro.ac.uk (E.J. Adams), nick@cavill.net (N. Cavill).

http://dx.doi.org/10.1016/j.jth.2015.09.002

shown to have health benefits (Department of Health, 2011; Hamer and Chida, 2008; Kelly et al., 2014; Lee et al., 2010; Murtagh and Nichols, 2015). When walking is used as a mode of transport, it also has the potential to reduce transport costs, help save money and to improve the environment by reducing traffic, which in turn improves road safety and reduces congestion and pollution (Department of Health, 2011) as well as to improve the wider determinants of health inequalities (Marmot, 2010). Therefore, one strategy that has potential to increase physical activity is to encourage people to walk for short trips within their neighbourhood to local destinations.

The physical environment is identified in ecological models as an important influence on physical activity (Sallis et al., 1998). There is now substantial evidence to support the associations of walking for transport with different attributes of the neighbourhood built environment (Adams et al., 2013; Bauman and Bull, 2007; Owen et al., 2004; Saelens et al., 2003; Saelens and Handy, 2008) and potential health, social, environmental and economic co-benefits of activity-friendly environments have been identified (Sallis et al., 2015). Recommendations have been made for changes to the built and natural environment to ensure local services and facilities are easily accessible on foot (as well as by bicycle and other modes of transport requiring physical activity) and also to support walking by offering convenient, safe and attractive access to workplaces, homes, schools and other public facilities (National Institute for Health and Care Excellence, 2008a). However, a number of barriers exist to making large-scale community-wide changes to the built and natural environment to support walking. These include the high levels of investment which are needed and the relatively slow time it takes to change the urban landscape (Heath et al., 2006).

In the face of cuts in public funding, low-cost approaches to improving the local environment to support walking need to be considered. One such approach is to target specific geographic areas, for example key local routes within a neighbourhood, and to instigate smaller scale changes to the built and natural environment which can also be made relatively quickly. Examples of these changes might include improved lighting, improvements to increase the ease and safety of road crossings, improved continuity of footpaths, traffic calming measures such as speed bumps and improved aesthetics of the route e.g. landscaping (Heath et al., 2006, 2012). Engaging local communities in the process of improving their local neighbourhood environments, including the planning, design and delivery of activities, may help to identify specific local environmental barriers and improvements needed to increase walking levels. Local residents can help by taking action themselves to implement changes to improve the local environment, or where more substantial infrastructural barriers are identified (e.g. lack of lighting and suitable crossing points), can be encouraged to work with local councils to influence improvements.

A few small-scale environmental interventions have shown the potential for increasing walking or overall physical activity (National Institute for Health and Care Excellence, 2008a; Heath et al., 2006). However, to date, these interventions have often been conducted as part of wider whole community projects (Baker et al., 2015) and the impact of changing the environment on walking and physical activity has not been specifically reported, or the interventions have been undertaken without any community involvement in the process. Only one study was identified which specifically assessed the effectiveness of using a community engagement approach to instigate these types of changes to attributes of the environment on local routes (Krieger et al., 2009). Using this approach may be important for making rapid and relevant changes to the local environment to promote walking without the need for high levels of investment. The purpose of this study is to evaluate changes in pedestrian use of local routes following environmental changes made by communities and local authorities in five case study sites in the 'Fitter for Walking' project, to assess route users' awareness of the environmental improvements which were implemented and to outline the challenges of evaluating these types of initiatives and provide recommendations for future evaluation.

1.1. The 'Fitter for Walking' project

The Fitter for Walking (FFW) project was launched in 2008 and completed in early 2012. It was supported by a £1.7 m grant from the Big Lottery Fund's Wellbeing Programme. The project was managed and delivered by Living Streets, a third sector organisation based in the UK, as part of a portfolio of projects being delivered by the Travel Actively Consortium which included leading walking, cycling and health organisations. The main aims of the FFW project were to: (1) improve the local neighbourhood walking environment; (2) increase the number of people walking on a specific route targeted for environmental improvements; and (3) encourage communities and local residents to work together to promote walking.

Twelve local authority (LA) partners from five regions of England were recruited by Living Streets to take part in the project: London (Barking & Dagenham, Redbridge); North East England (Gateshead, Sunderland, Newcastle); North West England (Blackburn with Darwen, Bolton); the West Midlands (Dudley, Sandwell, Wolverhampton); and Yorkshire (Doncaster, Rotherham). The LAs were recruited on the basis of having low levels of reported physical activity based on survey results from Active People Survey 1 (2005–2006) (Sport England, 2005–2006) and being based in an area of high deprivation. Five full-time project coordinators, one based in each region, were recruited to act as a link between the LA partner and local communities to enable environmental improvements to be made.

Project coordinators used targeted and opportunistic approaches to recruit a wide variety of community groups. The project coordinators assisted the registered groups with identifying a particular route or local area of concern to them and residents from across the wider community were consulted to identify barriers to walking on this specified route. In some projects, improvements to the local environment were identified through Living Streets' Community Street Audit methodology (Living Streets). Recommendations for action were then made to communities, LAs and partners and this informed the activities that were delivered locally during the project. Activities were delivered across three areas: (1) local authority-led infrastructural changes e.g. new street lighting, dropped curbs, removal of street furniture such as bollards or railings; (2) community-led environmental changes e.g. bulb planting, street cleaning; and (3) promotional and awareness raising activities e.g. led walks to increase awareness of a newly improved route. A detailed description of the Fitter for Walking project is provided elsewhere (Adams et al., 2012).

Table 1
Case study characteristics.

Case study	Local authority/region	Location	Registered group	Date of first meeting with group	Date of street audit	Route identified for project improvements	Key local destinations	Identified barriers to walking
1	Barking and Dagenham, London	Marks Gate	Marks Gate Older People's Network	November 2008	January 2009	Route through a subway under the A12 Eastern Avenue between Marks Gate and Chadwell Heath	Local high street: shops, supermarket, train station, bus stops, schools	Concerns about the subway and parking issues (cars parking on pavements), particularly for someone pushing a buggy/using a wheelchair.
2	Newcastle, North East	Byker Link	Friends of St Lawrence Park	October 2008	December 2008	The Byker Link route – a traffic free pedestrian and cycle route	St Lawrence Park, the Quayside, local high street, leisure centre	Poor reputation of the area, lack of maintenance of the route and dog fouling.
3	Blackburn, North West	Taylor Street	Taylor Street Residents Group	September 2008	October 2008	Route under the bridge on Taylor Street used as a route to local schools, the church, shops and to town	School, children's centre	Litter, lack of signage, graffiti, poor lighting, fly tipping. Intimidating for walkers
4	Wolverhampton, West Midlands	Weddell Wynd	Weddell Wynd Residents Group	August 2009	August 2009	Weddell Wynd linear path	Shops, sports academy, metro (tram) station, youth centre, fishing pools, canals, open green space	Condition of path, dog fouling, litter and water pooling on path, concerns regarding untethered horses on route
5	Rotherham, Yorkshire	Cliff Hills	Cliff Hills Community Action Group	September 2008	November 2008	Crossing from Addison Road to Laburnum Parade	Shops, bus stop	Unsafe, lack of crossing points, lack of footpaths

Table 2
Project activities and timelines for data collection.

Case study	Project activities			Route user counts/surveys		
	Local authority led improvements	**Community-led improvements**	**Other awareness-raising activities**	**T1**	**T2**	**T3 (count only)**
1	February/March 2010: Creation of a 'walking corridor' including improved crossings, installation of dropped kerbs, removal of street clutter, improved signage, resurfacing and installation of bollard way finding	October 2009/July 2010: Bulb/shrub planting June 2010: Path clean up	November 2010: Art project with a local school to produce a route map Attendance at local events to promote walking (no dates available)	Thursday 28th January 2010 Saturday 30th January 2010	Saturday 29th January 2011 Tuesday 1st February 2011	Thursday 8th September 2011 Saturday 10th September 2011
2	September 2010: Installation of display board at start of route March 2011: Removal of smoking shelter blocking route, new signage on route, site visit to assess flooding issues	March 2009: Community clean-up day April 2011: Bulb planting	Themed walks e.g. nature walks, bat walks, led walks and promotion of the route (no dates available)	Saturday 15th May 2010 Tuesday 18th May 2010	Saturday 14th May 2011 Tuesday 17th May 2011	Thursday 8th September 2011 Saturday 10th September 2011
3	March/April 2009: New lighting, extra bollards to prevent traffic using route, removal of graffiti November 2010: Painting of bridge with anti-graffiti paint July 2011: Footstep and play markings on the pavement under the bridge	Community clean up (no date available)	Themed led walks (no dates available) September 2010: 'Teddy Bear' walk to engage local children	Saturday 17th July 2010 Tuesday 20th July 2010	Saturday 16th July 2011 Tuesday 19th July 2011	Thursday 8th September 2011 Saturday 10th September 2011
4	February 2010: Footway maintenance, removal of encroaching vegetation, removal of high kerb, new litter bin June 2010: Removal of mound of earth to improve sight lines October 2010: New benches	December 2009: Bulb planting	Led walks, wildlife related activities (no dates available)	Saturday 15th May 2010 Tuesday 18th May 2010	Saturday 14th May 2011 Tuesday 17th May 2011	Thursday 8th September 2011 Saturday 10th September 2011
5	January to June 2011: Installation of dropped kerbs crossing points, extension of the path around the green	October/November 2011: Bulb planting with local school and day centre	September 2011: School assembly to promote walking	Saturday 17th July 2010 Tuesday 20th July 2010	Saturday 16th July 2011 Tuesday 19th July 2011	Thursday 8th September 2011 Saturday 10th September 2011

2. Methods

2.1. Study design

A mixed methods approach was used to evaluate the Fitter for Walking project including: (1) pre and post route user counts; (2) pre and post route user intercept surveys; (3) post-only residents' surveys; (4) focus groups/key informant interviews with community groups/members; (5) key informant interviews with representatives from local authorities; and (6) focus groups/key informant interviews with project coordinators. Full details of the methods are described elsewhere (Adams et al., 2012). Ethics approval for all evaluation activities was obtained from Loughborough University Ethical Advisory Committee (Ref: R09-P124).

This paper reports findings from route user counts and route user intercept surveys conducted in five case studies in the Fitter for Walking project (Table 1). A set of criteria was developed to help select the case studies for evaluation from a wide range of community projects which were being undertaken. These included: (1) the project had plans to make substantial environmental improvements; (2) there was some certainty that the planned environmental improvements and project activities would go ahead; and (3) there was a realistic expectation that the project might potentially lead to a detectable change in walking levels, as the environmental improvements proposed were considered likely to improve conditions for walking for transport (e.g. improved safety and accessibility).

2.2. Route user counts and intercept surveys

Manual route user counts were conducted at baseline (T1), 12 months later (T2) and 14–20 months after baseline (T3) (depending on the duration and timelines for the project) for each case study. Route user intercept surveys were conducted at baseline (T1) and 12 months later (T2). The dates on which the counts and surveys took place are outlined in Table 2. The route user counts and intercept surveys were conducted by a professional traffic count agency (CTS Traffic and Transportation, Preston, Lancashire, UK) who provided trained staff to undertake the counts. Counts and surveys were conducted over a 12 h period between 07:00 and 19:00 over two days to include one week day (a Tuesday or Thursday) and one weekend day (a Saturday). Route user counts were taken via direct observation at one or more locations on each route and route users travelling in all directions were counted. All route users over the age of 16 were invited to take part in the route user intercept survey which was adapted from an existing survey provided by Sustrans Research and Monitoring Unit (Sustrans). On the days of the counts and surveys the surveyors noted the weather and any unusual circumstances or activities in the area that may have affected the route user counts or surveys (Appendix A).

2.3. Measures of route use

The number of route users by mode of travel (walking, cycling, jogging, wheelchair users, infants in pushchairs, other modes) was recorded each hour and this was summed to give a total number of route users by mode of travel for each day. In addition, surveyors recorded the gender and estimated the age of route users (minor 0–15; adult 16–59 or older adult 60+). Data were entered into a Microsoft Excel spreadsheet by the sub-contractor and returned to the evaluation team. Route user count data for pedestrians were summed to provide: the total number of route users for a week day, weekend day and overall across both days for each case study. These were then summed to provide overall counts across all case studies. The proportion of change in the number of pedestrian route users between baseline (T1) and each follow-up was computed by deducting the number of route users at baseline from the number of route users at follow-up, dividing by the number of route users at baseline and multiplying by 100. These data were reported overall and for each case study for a week day, weekend day and a total across both days.

2.4. Measures of route user and journey characteristics

The route user intercept survey was used to measure: (1) route user characteristics including sex, age category, employment status and ethnic group; (2) general health of route users assessed via a single question asking 'Overall, how would you rate your general health over the last four weeks?' with the response options 'excellent', 'very good', 'good', 'fair', 'poor' or 'very poor'; (3) physical activity levels of route users assessed using the physical activity single item measure (Milton et al., 2011), those reporting five or more days were recorded as meeting physical activity recommendations; (4) journey characteristics including main mode of travel (walking, cycling, running/jogging, dog walking, wheelchair use, roller skating, horse riding or other), estimated time spent walking during journey (in hours and minutes), use of any modes of transport in addition to walking (car/van, train, bus, taxi, jogging, horse riding), frequency of day and night time route use (more than once a day, daily, several times per week, once a week, once or twice per month, less frequently), and journey purpose (to get home, for personal business, for shopping, for work or in the course of work, to get to school/college, to visit friends or family, for social reasons or entertainment, to get to recreational, sport or leisure facilities or just out for a walk for recreation); (5) perceived change in route use in the last 12 months (more, about the same or less) (at follow-up only); and (6) awareness of any recent improvements made to the route (a list of improvements was provided on the survey but the surveyor did not prompt the respondent with any suggestions). Survey data were entered into a Microsoft Excel spreadsheet by the sub-contractor and returned to the evaluation team.

2.4.1. Analysis of route user intercept survey data

Data from the route user intercept survey were checked for range, logic and plausibility and questions with no response were coded as missing variables. Participant and journey characteristics were summarised using descriptive analysis. Data from baseline and follow-up route user surveys were treated as independent samples (as we did not record whether the same people completed the survey at both time points) and statistical analyses were conducted for key variables. Continuous data were analysed to test for significant differences over time using an independent *t*-test. Where data was not normally distributed, non-parametric tests (Mann-Whitney) were utilised. For categorical data, Chi squared tests were conducted assessing change in proportion between baseline and follow-up. Statistical significance is presented at the 0.05 level. Data were analysed in SPSS Statistics (version 22.0) (IBM SPSS Inc., Armonk, New York).

3. Results

3.1. Case study characteristics and project activities

Table 1 presents an overview of characteristics for each case study. Different types of routes were chosen to be the focus of each local project. A street audit (Living Streets) was conducted in all the case study communities to identify barriers to walking and to make recommendations for improvements to the route environment. A variety of environmental changes were made by the local authority partner, members of the group registered with the project, local community residents and volunteers (Table 2). For example, infrastructural improvements were made to footpaths and crossings, lighting and signage. In addition, the aesthetics of routes was improved by clearing rubbish, dog fouling and graffiti and removing overgrown hedges and other vegetation. In all projects, local communities were involved in helping to clear the routes and in four of the case studies local residents and children planted bulbs to improve the aesthetic appearance of the routes. In several case studies, additional activities were organised, such as local led walks, to increase awareness of the improvements which had been made to the route.

3.2. Characteristics of route users

The age and gender of all route users varied across case studies (Appendix B). In case studies 1 and 3 a larger proportion of route users were minors (< 16 years old). In contrast, in case studies 2 and 4, adult males were the most frequent users. Across all case studies and survey time points, a low proportion of route users were older adults. Route user surveys were completed by 278 (16%) route users at baseline and 315 (30%) route users at follow-up (Table 3). The main reasons for route users not taking part in the survey were: individual refused, individual was in a hurry to get to their destination, communication difficulties or the individual had already completed the survey (at that data collection time point). A breakdown of the main reasons for declining to take part in the survey for each case study and at each data collection time point is provided in Appendix A. The characteristics of respondents who took part in the route user survey at baseline and follow-up overall and for each case study are shown in Table 3. The demographic profile of respondents was not significantly different between baseline and follow-up overall and in three case studies.

3.3. Changes in pedestrian route use

The number of pedestrians using the routes overall and in each case study is shown in Table 4. Between baseline (T1) and the 12 month follow-up (T2), there were decreases in the total number of route users overall (− 19.4%) and across all case studies except case study 2. Decreases in the number of route users on a week day were observed overall (− 3.3%) and in case studies 2–4, and on weekend days overall (− 35.3%) and across all case studies except case study 2. Between baseline (T1) and the 14–20 month follow-up (T3), there was an increase in pedestrian use overall (14.9%) and in all case studies (range 5.4–58.9%). Increases in pedestrian route use on week days were observed in all case studies whereas on a weekend day increases were only observed in case studies 2 and 4.

The characteristics of journeys being undertaken by route users are presented in Table 5. In all case studies walking only was the main mode of transport being used at both baseline and follow-up. The most frequently mentioned other mode of transport being used for the

Table 3
Response rates and characteristics of route user survey respondents at baseline (T1) and follow-up (T2) overall and by case study.

	Overall			Case study 1			Case study 2			Case study 3			Case study 4			Case study 5		
	T1	T2	p*	T1	T2	p*	T1	T2	p*	T1	T2	p*	T1	T2	p*	T1	T2	p*
Response rate (%)	16	30		10	30		39	50		43	40		49	18		24	26	
Number of surveys completed (*n*)	278	315		29	52		38	53		73	51		35	17		90	100	
	%	%		%	%		%	%		%	%		%	%		%	%	
Sex																		
Male	55.2	58.5		58.6	61.2		47.4	77.4	*	60.3	51.0		57.1	58.8		51.7	46.5	
Age																		
16–34	27.6	25.8		24.1	32.7		26.3	30.2	*	35.6	17.6		14.3	17.6		29.5	22.2	
35–54	37.3	43.4		34.4	38.7		36.8	58.5		39.7	56.9		45.7	47.3		30.7	31.4	
55+	35.2	30.8		41.4	28.6		36.9	11.3		24.7	25.5		40	35.3		39.8	46.5	
Ethnic group																		
White	92.8	94.5		72.4	73.5		94.7	100.0		86.3	98.0	*	100.0	100.0		100.0	99.0	
Employment status																		
Employed full-time	36.5	45.0		41.4	36.7		31.6	62.3	*	41.1	47.1		40.0	47.1		30.7	33.0	
Employed part-time	15.0	12.6		13.8	6.1		21.1	5.7		11.0	13.7		20.0	11.8		15.9	17.5	
Retired	24.5	21.7		24.1	26.5		26.3	11.3		15.1	9.8		28.6	29.4		29.5	33.0	
Other	24.0	20.7		20.6	30.5		21.0	20.7		32.8	29.4		11.4	11.7		23.9	16.5	
Health status																		
Excellent/very good	51.6	51.1		44.8	59.2		55.3	62.3	*	48.6	37.3		60.0	88.2		50.0	41.2	
Physical activity[a]																		
Meeting recommendations	39.3	48.5	*	62.1	34.7	*	42.1	62.3		37.0	56.8	*	20.0	17.7		40.0	49.0	

T1: baseline; and T2: follow-up 1 (12 months).

[a] Measured using the single-item physical activity questionnaire (Milton et al., 2011) which assessed the number of days respondents took part in 30 min or more of moderate intensity physical activity in the past week.

* *p*-Value < 0.05.

Table 4
Number of pedestrian route users in total and on week and weekend days overall and by case study.

	Total count					Week day count					Weekend day count				
	T1 *n*	T2 *n*	T3 *n*	ΔT1 to T2[a] %	ΔT1 to T3[a] %	T1 *n*	T2 *n*	T3 *n*	ΔT1 to T2[a] %	ΔT1 to T3[a] %	T1 *n*	T2 *n*	T3 *n*	ΔT1 to T2[a] %	ΔT1 to T3[a] %
Overall	3083	2484	3541	−19.4	14.9	1531	1480	2106	−3.3	37.6	1552	1004	1435	−35.3	−7.5
Case study 1	856	736	964	−14.0	12.6	499	527	636	5.6	27.5	357	209	328	−41.5	−8.1
Case study 2	129	147	205	14.0	58.9	73	60	103	−17.8	41.1	56	87	102	55.4	82.1
Case study 3	621	367	732	−40.9	17.9	318	235	451	−26.1	41.8	303	132	281	−56.4	−7.3
Case study 4	280	162	378	−42.1	35.0	128	81	214	−36.7	67.2	152	81	164	−46.7	7.9
Case study 5	1197	1072	1262	−10.4	5.4	513	577	702	12.5	36.8	684	495	560	−27.6	−18.1

T1: baseline; T2: follow-up 1 (12 months); and T3: follow-up 2 (14-20 months).

[a] Δ: Change.

respondent's journey was by bus. There were significant differences in the modes of transport being used between baseline and follow-up in case studies 1–3. Fewer respondents were using a car in combination with walking at follow-up overall and in most case studies. The amount of time spent walking during respondents' journeys was lower at follow-up overall and in 3 case studies however this was only significantly different in case study 2.

Respondents reported many different purposes for their journeys and this varied across case studies and between baseline and follow-up (Table 5). Overall, the most frequently reported journeys were to get home, for personal business or shopping, to visit friends or family or to get to work. Some respondents also reported being 'out for a walk' rather than having a specific purpose for their journey however this only represented a minority of route users in most case studies. Overall, using the route at least once a week was significantly lower in respondents at follow-up during the day and at night. Weekly use of the route during the day was lower in respondents at follow-up in all case studies with data except case study 3, whereas at night, weekly use of the route was lower in all case studies with data except case study 1. Overall, 18.6% of route users perceived that they had used the specific route more in the last 12 months. This varied across case studies from 5.9% to 22.4% (Table 5). Only a small proportion overall (6.9%) perceived they had used the routes less (range 2.1–12.2% across case studies).

3.4. Awareness of environmental improvements made to routes

The proportion of route users who mentioned specific improvements which had been made along the route is shown for each case study in Table 6. Awareness of improvements varied across the case studies and was very low for some of the improvements which had been made. Additionally, some respondents identified improvements which had not been made as part of the project.

4. Discussion

The Fitter for Walking projects focussed on making changes to access (footpath quality and provision), safety (safe crossings, dropped kerbs, lighting) and aesthetics (cleaning up streets, removing litter and graffiti, cutting back hedges and planting bulbs) on a local route which led to key destinations and had the potential for increasing walking trips. Similar environmental improvements have been reported in other studies (National Institute for Health and Care Excellence, 2008a; Heath et al., 2006; Krieger et al., 2009). Engaging communities in identifying barriers to walking on local routes in their local neighbourhood, and asking them to suggest solutions, was a successful approach for instigating environmental improvements which were undertaken by both the communities themselves and by local authorities. Involving local communities in activities in this way is known to be important for improving health outcomes, particularly in disadvantaged communities (National Institute for Health and Care Excellence, 2008b). However, it has been noted that it can take some time and effort to gain community buy-in (Heath et al., 2006) and this should be taken into consideration when developing these types of interventions. The barriers to walking which were identified varied across the case studies reflecting diverse concerns of the different communities and highlighting the importance of assessing local context and needs. The need to adapt environmental intervention activities to reflect local concerns, specific settings and target populations has also been highlighted previously (National Institute for Health and Care Excellence, 2008a; Heath et al., 2012).

The number of people walking on the routes decreased after 12 months in nearly all case studies and a reduction in use of the routes on a weekly basis both during the day and at night was reported by survey respondents in most case studies. We hypothesise that reductions in pedestrian route use observed at 12 months may be due to ongoing work taking place on the route (for example in case study 5), or that previous works on the route had led some individuals to use alternative routes who had then not returned to using their original route, though we are unable to confirm this 'displacement effect'. Despite this, after 12 months, some route users reported using the route more often than they had done previously. However it is not known whether this was due to the environmental improvements which had taken place. In contrast to the follow-up after 12 months, the number of people walking on the routes increased at the second follow-up (14–20 months after baseline) particularly on week days. This week day increase may have been due to an increase in the number of individuals using the route on the journey to work, however as we do not have survey data for this time point it is not possible to verify this. It has been noted elsewhere that it may take time for environmental interventions to be implemented and even longer for any increases in route use or changes in walking to be observed following improvements to the local environment (Ogilvie et al., 2010). The increases in pedestrian route use observed at the second follow-up across all case studies are therefore encouraging and reinforce the suggestion that a longer timeframe may be needed to observe positive changes in outcome measures.

In our study, use of the routes and journey purpose varied considerably across the different case studies again highlighting differences in local context and potentially reflecting availability of local destinations. Walking for transport is known to be determined by the availability of local

Table 5
Journey characteristics of route users overall and by case study.

	Overall			Case study 1			Case study 2			Case study 3			Case study 4			Case study 5		
	T1	T2	p*	T1	T2	p*	T1	T2	p*	T1	T2	p*	T1	T2	p*	T1	T2	p*
Use of other modes of travel by pedestrian route users																		
Walking only	79.9	80.7		62.1	56.0	*	80.6	92.5	*	84.9	84.3	*	100.0	100.0		71.3	76.8	
Walking + bus	13.1	14.4		20.7	44.0		6.5	0.0		13.7	5.9		0.0	0.0		18.4	17.2	
Walking + train	1.1	1.3		6.9	0.0		0.0	1.9		0.0	5.9		0.0	0.0		1.1	0.0	
Walking + car/van/taxi	5.6	1.9		10.3	0.0		12.9	0.0		1.4	0.0		0.0	0.0		9.2	6.1	
Jogging	0.0	1.6		0.0	0.0		0.0	5.7		0.0	3.9		0.0	0.0		0.0	0.0	
Time spent walking on journey																		
Minutes spent walking (± SD)	24.4 ± 33.3	19.6 ± 21.7		ND	19.0 ± 18.8		50.2 ± 46.1	29.9 ± 25.0	*	23.5 ± 23.9	19.3 ± 11.9		17.5 ± 17.9	21.3 ± 10.3		17.2 ± 32.9	15.0 ± 22.3	
Journey purpose (travelling to)																		
Home	37.0	43.8	*	51.7	53.8		13.2	37.7		28.8	37.3		80.0	41.2	*	33.3	40.0	
Personal business/shopping	25.5	23.5		24.1	21.2		18.4	11.3		13.7	18.7		8.6	0.0		46.6	43.0	
Work	6.1	7.3		13.8	5.7		10.5	9.4		11.0	19.6		0.0	5.9		1.1	3.0	
School/college or escort to school	2.5	1.0		0.0	3.8		0.0	0.0		5.5	0.0		5.7	0.0		1.1	0.0	
Visiting friends/family	12.9	6.7		0.0	3.8		0.0	3.8		34.2	17.6		2.9	0.0		11.1	5.0	
Social/entertainment	0.4	1.3		3.4	3.8		0.0	0.0		0.0	2.0		0.0	0.0		0.0	1.0	
Recreation/sport and leisure facilities	2.5	2.7		0.0	0.0		5.3	1.9		5.5	2.0		0.0	0.0		1.1	5.0	
Out for a walk (no specific destination)	13.3	13.7		6.9	7.7		52.6	35.8		1.4	3.9		2.9	52.9		5.6	1.0	
Frequency of route use																		
% Use route on a daily-weekly basis during the day	94.5	90.4	*	93.1	83.6		92.1	88.7		95.9	98.1		97.0	ND		94.2	94.8	
% Use route on a daily-weekly basis at night	36.6	30.8	*	31.0	34.7		47.3	30.1		23.3	7.9	*	22.8	ND		58.6	41.2	
Perceived change in route use in last 12 months																		
% More		18.6			22.4			15.1			5.9			ND			24.0	
% Same		74.6			65.3			75.5			90.2			ND			74.0	
% Less		6.9			12.2			9.4			3.9			ND			2.1	

T1: baseline; T2: follow-up 1 (12 months); and ND: no data collected for this indicator at this site.

* p-Value < 0.05.

Table 6
Improvements to route and route users' awareness of these improvements at follow up (T2).

	Case study 1		Case study 2		Case study 3		Case study 4		Case study 5	
	Project activity	% Route users aware	Project activity	% Route users aware	Project activity	% Route users aware	Project activity	% Route users aware	Project activity	% Route users aware
Path/pavement improvements (resurfacing or widening)	✓	25.0	✓	9.5	–	0.0	✓	17.7	✓	50.0
Dropped kerbs installed	✓	3.8	–	0.0	–	0.0	–	0.0	✓	16.0
Traffic calming: speed humps/ cushions/20 mph speed limit	–	1.9	–	0.0	–	0.0	–	0.0	✓	6.0
Improved crossings	✓	1.9	–	1.9	–	0.0	–	0.0	✓	3.0
Improved lighting	–	7.7	–	7.5	✓	3.9	–	0.0	–	2.0
Clearer information/signage	✓	1.9	✓	0.0	–	0.0	–	5.9	–	2.2
Clearance of graffiti	–	13.5	–	1.9	✓	60.8	–	5.9	–	0.0
Clearance of rubbish/ glass	✓	11.5	✓	26.4	✓	49.0	–	8.6	–	5.0
Clearance of dog fouling	✓	5.8	✓	13.2	✓	2.0	–	0.0	–	2.0
Removal of overgrown hedges	–	1.9	✓	18.9	–	0.0	✓	29.4	–	1.0
Planting of new bulbs	✓	0.0	✓	0.0	–	0.0	✓	0.0	✓	0.0

T2: follow-up 1 (12 months).
✓: Improvement was undertaken as part of project.
–: Improvement was not undertaken as part of project.

destinations to walk to such as shops, public transport stops, schools, workplaces and leisure facilities (Cerin et al., 2007) therefore focusing future interventions on removing barriers to walking and improving the environment on local routes which lead to frequently accessed destinations is likely to have the most significant effect on increasing walking for short journeys. In particular, the availability of public transport is important as the contribution of walking to overall physical activity levels on journeys which are combined with the use of public transport has been well reported (Djurhuus et al., 2014; Lachapelle et al., 2011; Villanueva et al., 2008; Wener and Evans, 2007). Aside from participants whose mode of transport was 'walking only', the second most commonly reported mode of transport in Fitter for Walking was walking combined with using the bus. This demonstrates the potential importance of public transport availability, such as bus stops, within walking distance of people's homes as a means of incorporating walking into longer journeys which may thus lead to increased overall physical activity levels.

The lack of previous studies using a community engagement approach for changing the local environment to promote walking makes it difficult to make any comparisons of our findings. Although Krieger et al. (2009) used a similar approach to Fitter for Walking, with a combination of environmental improvements and awareness raising activities, different methods and measures were used to assess the impact on walking levels and only members of the walking group were surveyed at baseline and follow-up, rather than overall use of the improved environment by local residents. A previous review of studies which have instigated street-scale environmental improvements reported increased pedestrian counts in the shorter term (less than 12 months) in three studies and in the longer term in one study (National Institute for Health and Care Excellence, 2008a). However, it is again difficult to compare these studies directly with our study due to differences in the way the interventions were implemented and the environmental changes that were made.

Awareness of environmental changes made on routes was relatively low in route users at the 12 month follow-up. Although awareness-raising activities took place in most case studies, additional strategies may be needed to increase the visibility of the improvements which have been made to help reach the wider community. The most effective strategies for doing this warrant further investigation but examples might include distributing maps of the newly improved routes or promotional materials to local residents, holding promotional events on the route or using local newsletters and other community-based events to highlight the improvements. In addition, some route users reported environmental changes that were not recorded as being undertaken as part of the project. It is possible that these changes may have been observed on routes feeding into the main project route and thus were in the wider local area rather than on the route under investigation.

A number of factors may have influenced the different activities that were delivered in the Fitter for Walking projects, the awareness of the improvements made and the impact on walking. These might be related to the local context (the characteristics of the routes selected for intervention activities and their local importance in terms of route to specific destinations); the community group registered with the project (their priorities, their role and influence on the local community, experience and skills of the registered group of working on community activities and with local authorities); the local authorities (priority for the local authority, funding available for improvements, the need for planning permission, capacity to undertake the work and timescales on which work could be undertaken) and the project co-ordinators (the approach taken by the project co-ordinators in engaging with community groups, their relationship with the community group and preferences for delivering certain types of activities). These factors should be taken into consideration in planning and developing any similar projects which aim to use a community engagement approach to improve the local environment to promote walking for transport.

4.1. Strengths

As far as we are aware, this is one of the first studies to report the use and evaluation of a community engagement approach to improving the local environment on key local routes to promote walking for transport. Five case studies from different areas of England are reported which provides some heterogeneity of neighbourhoods. The interventions included both educational and awareness-raising activities as well as environmental changes which together have the potential to influence behaviour through addressing factors affecting multiple levels of the socio-ecological model (Krizek et al., 2009). Other strengths of our study include the use of a consistent evaluation methodology which was replicated across all five case studies, whilst allowing for variations in the project activities that took place to account for local context and concerns in relation to barriers to walking. Trained members of staff were used to undertake route user

counts and intercept surveys and the use of observational methods (route user counts) to assess walking levels is also a strength of our study. Baseline and all follow-up route user counts and intercept survey data were collected in similar seasons (with the exception of case study 1) and this approach may have helped to take into account seasonal variations in travel behaviour. However, the weather varied slightly during data collection and may have affected our findings. In addition, route user count and intercept survey data were collected on the same days of the week at each time point, where possible, in each case study. Any variations in the day of the week day count were due to surveyors' availability. An additional strength of our study was the inclusion of a follow-up route user count which took place 14–20 months after baseline and captured longer term changes in route use.

4.2. Limitations and challenges

We conducted a pragmatic evaluation of the Fitter for Walking project with a limited budget. Evaluating initiatives such as Fitter for Walking is challenging due to researchers having no control over the interventions being delivered, constraints with study design, i.e. identifying suitable control or comparison sites, uncertainty as to whether environmental changes will go ahead (which can affect investment in evaluation activities and the timing of baseline data collection), the time it takes to make environmental changes (which are sometimes delayed and therefore can affect follow-up data collection) and the time it may take for any impact of environmental changes on behaviour. These challenges were observed in our study and have been highlighted previously (Ogilvie et al., 2010). There were also delays in integrating the evaluation activities with project implementation which made undertaking robust data collection problematic. In this project, financial constraints restricted the type of evaluation we could undertake, the number of case studies we could evaluate and the number of route user counts and surveys that we were able to conduct within each case study. It also meant that it was not possible to evaluate control or comparison groups as part of our study.

Although we defined a set of criteria for use in selecting which five projects to invest in for conducting evaluation activities, in practice it became difficult to use these due to delays in establishing communication channels between the evaluation and the project delivery team. This was followed by problems finding suitable case studies where sufficient activities would take place within the time frame of the project and allow for a period of follow-up. It was difficult to collect timely information from project coordinators on which activities were being undertaken, and when, to help inform the evaluation decisions as their priority was on project delivery, which was also time consuming and challenging. These issues were compounded by difficulties in predicting which environmental changes would be made, which was due to uncertainties as to funding availability and the need for planning permission, delays in the planning process and obtaining planning permission, as well as capacity of the local authority works teams and the timescales in which they were able to undertake the work. Ultimately, five of the most substantial projects were evaluated however, in most projects, some activities had taken place before the first route user counts and surveys were conducted. These activities had been carried out either as part of the community engagement activities and maintenance of community involvement during planning delays, or because the local authority was able to act quickly to make environmental changes before any evaluation could be undertaken. In some cases, we therefore did not collect a true baseline measure of route use meaning the results may actually reflect the lower level of impact of this type of intervention.

Assessing changes in walking behaviour is challenging (Krizek et al., 2009). Whilst route user counts and route user intercept surveys are useful for counting pedestrians, assessing use of routes and characteristics of journeys undertaken on those routes, they do not allow for the assessment of individual behaviour change in travel behaviour (or assessment of the resulting increases in overall physical activity or health benefits). In addition, the counts and surveys are limited due to their cross-sectional nature, the short periods of time in which they are conducted and the bias towards those who are already using the route. A high proportion of route users declined to participate in the route user intercept survey and the low response rate may have led to further bias in the sample, particularly to those undertaking specific types of journey (i.e. those who were not in a hurry to get to their destination). Conducting counts and surveys at baseline and then 12 months later means we may also have missed some of the changes in walking that took place immediately after improvements to routes had been completed.

We were unable to identify route users who completed the route user intercept survey at both time points therefore we treated baseline and follow-up survey data as independent samples which limited our assessment of individual behaviour change as noted above. We were also therefore unable to determine which individuals were new route users (and thus had potentially changed the mode of travel they would normally use for a particular journey), and what had made them start to use the routes i.e. was it due to the environmental improvements that had been made as part of the project.

To assess the overall findings we combined the data from the individual case studies directly; homogeneity was assessed by comparison of the results from each study, but no further adjustment was performed. The number of route users in each case study, differences in intervention activities and timing of data collection may have influenced the combined results, however an un-weighted average of individual study changes yields an equivalent result to the combined analysis presented, which supports this approach and the findings obtained.

Finally, it is important to bear in mind that in the case study sites selected for investigation the local authority partners were committed to promoting walking for transport when they agreed to take part in the project and some of the community groups were already considering environmental improvements in their local areas, and thus had taken the first step towards increasing walking. This may reduce the replicability of this approach, especially in areas where there is not an initial enthusiasm to promote walking, or there is a lack of adequate support and funding from local authorities and other partners.

4.3. Recommendations for future evaluation

Based on the learning from the evaluation of the Fitter for Walking project, we suggest that considerable investment is needed to conduct robust evaluation of the impact of environmental changes on pedestrian route use and walking levels. We outline below a number of recommendations and considerations which should be taken into account in future evaluation of these types of projects.

We recommend that a communication strategy is established between the project delivery team and the evaluation team as early as possible and before project activities start. Included in the communication strategy should be a record of planned project activities with potential timelines, as well as activities which have been successfully undertaken during the project along with dates and where appropriate, the number of local residents who participated. The frequency of communication should be agreed and the project delivery team advised to contact the evaluation team if any environmental changes are to take place imminently. Where a large number of

potential case study projects are available for evaluation, but only a limited budget is available for conducting evaluation activities, criteria should be developed which can be used to select case studies for evaluation. Together, these will help to ensure potential case study sites can be identified in a timely manner, baseline data can be collected before project activities commence and a record of which activities were implemented during the project can be maintained to help explain the observed results in route use.

Route user counts and intercept surveys should be undertaken at baseline and at regular intervals (every 3 months) if funding permits to ensure any changes in walking levels are captured. Additional counts and surveys should be considered immediately after infrastructural improvement work has been completed to assess any short-term impact. Provision should also be made for long-term follow-up of route use to allow for delays in environmental changes being undertaken and in influencing behaviour. Alternatively, permanent automatic counters could be installed to allow for ongoing monitoring and counting of pedestrians on specific routes (Krizek et al., 2009). In planning manual route user counts and surveys, checks should be made locally to try and avoid data collection on days when an event is taking place that might influence counts and survey responses (e.g. road works close to the location of the counts, or a local football match that might increase pedestrian use of the route) to obtain a more accurate picture of 'usual use' of the route. Additionally, any unusual circumstances that occur on the days of data collection should be recorded. Surveyors might also be asked to record the current status of the route and to take some photographs as a record of the route environment on the days of the route user counts and surveys to help with data interpretation.

To increase the response rate to the intercept survey, the questionnaire should be as short as possible and individuals should be given the opportunity to complete the survey at another time (e.g. provide a paper copy and return envelope or a postcard with a link to an online survey if the potential respondent is unable or unwilling to stop to talk to a surveyor). The survey content should include some assessment of the reasons for any increase in route use by individuals to determine the factors influencing these changes and whether they were due to the environmental improvements undertaken or other reasons.

A researcher-led walkability audit, for which there are a number of existing instruments available (Active Living Research), of the main route selected for improvements, as well as routes in the surrounding area which feed into the main route, should be undertaken at baseline and at the end of the project to enable some assessment of the wider local context (including key local destinations) to be made and to verify any environmental changes which have been undertaken. This, and a photographic record of the routes at each time point, may help with interpreting the findings from route user counts and surveys.

To help identify the impact of the project on non-route users and the wider community and to assess individual behaviour change, local residents might be recruited and invited to complete a baseline and follow-up survey(s) and/or a travel diary. Additional funding may be needed to put in place appropriate methods and mechanisms to obtain high response rates. An assessment of travel behaviour and physical activity as well as perceptions of the walking environment in the local area and along the specific route should be included in the survey. In addition, using an objective measures of physical activity such as accelerometers in combination with Global Positioning Systems (GPS), Geographic Information Systems (GIS) and other new technologies, such as wearable digital cameras, may help to identify patterns of walking behaviour and to characterise route environments (including available destinations) and route use in local neighbourhoods (Kelly et al., 2011; Oliver et al., 2010). Using GPS and wearable digital cameras may also aid with further investigation of displacement effects to alternative routes while improvements are being made on the intervention route and in the longer-term. However, these approaches may be costly and present their own methodological and analytical challenges.

If possible, a potential comparison group or route should be identified. This might include surveying respondents who live defined distances away from the improved route (and who therefore would be exposed to varying 'doses' of the intervention) such as the approach used in the iConnect study (Ogilvie et al., 2012), or a comparison route matched on key characteristics to the intervention route could be identified (Krizek et al., 2009) and route user counts and intercept surveys conducted on this route in addition to the intervention route.

5. Conclusions

There were a number of challenges in delivering and evaluating the Fitter for Walking project. Despite this, walking appears to have been influenced in the longer-term by very focussed and small-scale environmental improvements undertaken by local authorities and communities. Engaging communities in making these types of environmental improvements to key routes in local neighbourhoods may be an effective, low-cost strategy for increasing walking for transport. Community engagement and the implementation of environmental changes can take a long period of time, but it may take even longer to observe an increase in the number of people walking on newly improved routes. Additional activities may be needed to increase awareness of environmental improvements undertaken and to promote use of the improved routes by the wider community to maximise the impact on walking and these warrant further investigation. Evaluating these types of projects is challenging and it may require significant investment to robustly assess the impact on walking for transport. All these factors should be taken into consideration by public health, transport and urban planning practitioners interested in developing local initiatives such as these and by researchers interested in evaluating these types of initiative and measuring behaviour change.

Acknowledgements

The Fitter for Walking project was managed and delivered by Living Streets as part of a portfolio of projects being delivered by a Consortium of the leading walking, cycling and health organisations in England and funded through the Big Lottery Fund's Wellbeing Programme. The lead author undertook an independent evaluation of the Fitter for Walking project on behalf of Living Streets. The funders had no involvement in writing this paper. The views expressed are those of the authors and do not necessarily reflect those of the study funders. We thank the study participants for taking part in this project.

Table A1
Factors affecting data collection including weather, reasons for declining survey participation and surveyors notes.

	Date	Weather	Main reasons for declining to participate in survey	Surveyors notes
CASE STUDY 1				
T1[a]	Thursday 28th January 2010	Mainly cold and mostly dry with three periods of heavy rain.	Refused (74.8%) In a hurry (18.2%) Communication difficulties (6.6%)	None
	Saturday 30th January 2010	Cold and mostly dry all day.		
T2[a]	Saturday 29th January 2011	Cold and mostly dry all day.	In a hurry (50.0%) Refused (21.3%) Work (10.7%)	29/01/2011 7am-12 noon: There was an accident on the A12 Eastern Avenue and there were no buses running from the two bus stops located either side of the subway.
	Tuesday 1st February 2011	Cold and mostly dry with two periods of damp /overcast weather and one longer period of cold/mostly wet in the afternoon.		
T3[b]	Thursday 8th September 2011	Cold but mostly dry all day apart from one period of heavy rain at 2pm. From 5pm onwards it was warm and dry.	Not applicable (count only)	None
	Saturday 10th September 2011	Warm and dry for most of the day. Became cool but dry from 4.30pm and there was heavy rain from 6-7pm.		
CASE STUDY 2				
T1[a]	Saturday 15th May 2010	Warm and mostly dry all day.	Refused (66.7%) In a hurry (30.0%) Already interviewed at this time point (3.3%)	None
	Tuesday 18th May 2010	Warm and mostly dry all day.		
T2[a]	Saturday 14th May 2011	Cold and mostly dry until 10am, warm for the remainder of the day with some showers between 1-2pm.	Refused (45.3%) Already interviewed at this time point (15.1%) Communication difficulties (13.2%)	None
	Tuesday 17th May 2011	Warm and mostly dry all day.		
T3[b]	Thursday 8th September 2011	Cold and dry until 10am, then warm and dry for the remainder of the day.	Not applicable (count only)	None
	Saturday 10th September 2011	Mainly damp and overcast until 11am, warm for most of the rest of day with some showers between 2.30-3pm and 6.30-7pm.		
CASE STUDY 3				
T1[a]	Saturday 17th July 2010	Mainly wet in the morning with one period of heavy rain and mainly warm and dry in the afternoon.	In a hurry (36.5%) Refused (32.3%) Already interviewed at this time point (25.0%)	None
	Tuesday 20th July 2010	Mixed with periods of warm and dry, damp and wet. In the afternoon there was heavy rain.		
T2[a]	Saturday 16th July 2011	Started damp/overcast followed by heavy rain until 1pm. Remained damp/overcast for the rest of the day.	Refused (27.3%) In a hurry (23.4%) Communication difficulties (20.8%)	None
	Tuesday 19th July 2011	Damp/overcast all day.		
T3[b]	Thursday 8th September 2011	Cold and wet for much of the day with periods of heavy rain. Cold but dry from 5-7pm.	Not applicable (count only)	None
	Saturday 10th September 2011	Cold and wet to start with then damp/overcast until 10am. Warm and dry for the rest of the day with one period of rain at 1pm.		
CASE STUDY 4				
T1[a]	Saturday 15th May 2010	Cold and mostly dry all day.	Already interviewed at this time point (48.6%) Communication difficulties (18.9%) Refused (16.2%)	None
	Tuesday 18th May 2010	Cold and mostly dry all day.		

Table A1 (*continued*)

	Date	Weather	Main reasons for declining to participate in survey	Surveyors notes
T2[a]	Saturday 14th May 2011	Mixed, cold with some rain until 10.30am, damp/overcast until 2pm then warm but wet until 5pm, remaining wet and cold until 7pm.	Refused (42.7%) Communication difficulties (16.0%) Already interviewed at this time point (13.3%)	None
	Tuesday 17th May 2011	Started cold and mostly dry, from 10.00am-3.30pm it was warm and mostly dry, the weather was then mixed with some rain between 6-7pm.		
T3[b]	Thursday 8th September 2011	Damp/overcast to start with, cold and dry until 1400hrs then warm and dry for the rest of the day.	Not applicable (count only)	None
	Saturday 10th September 2011	Warm and dry for most of the day apart from 9-9.30pm when it was warm, but wet and a period of heavy rain at 5.30pm.		
CASE STUDY 5				
T1[a]	Saturday 17th July 2010	Warm and mostly dry until 11am, warm but wet until 3:30pm, then warm and dry until 7pm.	Refused (57.5%) In a hurry (17.9%) Already interviewed at this time point (17.2%)	20/07/10 8.30am-1pm: road re-surfacing work being undertaken. Footpath was open but it was too noisy for interviewing.
	Tuesday 20th July 2010	Warm and mostly dry all day, except for some rain between 1:30pm and 2:30pm.		
T2[a]	Saturday 16th July 2011	Cold and wet to start with, heavy rain from 8:30am to 12:30pm. Wet until 3:30pm then warm and dry until 7pm.	Refused (29.0%) In a hurry (22.4%) Already interviewed at this time point (16.9%)	None
	Tuesday 19th July 2011	Wet until 2:30pm with heavy rain for much of the time, warm and dry from 3:30pm onwards.		
T3[b]	Thursday 8th September 2011	Cold but dry until noon, then warm and dry for the rest of the day.	Not applicable (count only)	None
	Saturday 10th September 2011	Warm and dry for the whole day.		

[a] Route user count and route user intercept survey conducted;
[b] Route user count only

Appendix A

See Table A1.

Table B1
Route user characteristics (all modes) by age and gender at baseline and follow-up for case study sites.

	Case study 1			Case study 2			Case study 3			Case study 4			Case study 5		
	T1 %	T2 %	T3 %	T1 %	T2 %	T3 %	T1 %	T2 %	T3 %	T1 %	T2 %	T3 %	T1 %	T2 %	T3 %
Minor (age 0–15)	49.7	42.7	33.5	20.5	14.6	7.9	40.9	58.2	30.8	26.3	20.8	27.9	27.9	29.0	28.3
Adult male (age 16–59)	24.1	27.3	30.7	56.2	58.9	47.8	35.6	18.9	37.0	48.8	47.4	33.3	29.8	28.7	28.7
Adult female (age 16–59)	22.6	23.0	30.0	20.5	24.8	33.0	19.5	20.8	29.6	22.8	18.8	21.7	28.1	28.6	27.2
Older male (age 60+)	1.5	3.2	3.0	0.4	0.8	9.1	1.7	0.7	2.1	2.2	12.3	13.3	8.0	8.0	9.2
Older female (age 60+)	2.1	3.7	2.8	2.4	0.8	2.2	2.4	1.4	0.6	0.3	0.6	3.8	6.3	5.6	6.6

T1: baseline; T2: follow-up 1 (12 months); and T3: follow-up 2 (14–20 months).

Appendix B

See Table B1.

References

Allender, S., Foster, C., Scarborough, P., Rayner, M., 2007. The burden of physical activity-related ill health in the UK. J. Epidemiol. Commun. Health 61, 344–348.

Adams, E.J., Goodman, A., Sahlqvist, S., Bull, F.C., Ogilvie, D., 2013. iConnect Consortium. Correlates of walking and cycling for transport and recreation: factor structure, reliability and behavioural associations of the perceptions of the environment in the neighbourhood scale (PENS). Int. J. Behav. Nutr. Phys. Act. 10, 87.

Adams, E.J., Goad, M.A., Cavill, N., 2012. Evaluation of Living Streets' Fitter for Walking Project. BHF National Centre for Physical Activity and Health, School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, UK.

Active Living Research. Tools and Measures for Assessing the Physical Environment. ⟨http://activelivingresearch.org/toolsandresources/toolsandmeasures⟩.

Bauman, A.E., Bull, F.C., 2007. Environmental Correlates of Physical Activity and Walking in Adults and Children: A Review of Reviews. National Institute of Clinical and Health Excellence, London.

Baker, P.R.A., Francis, D.P., Soares, J., Weightman, A.L., Foster, C., 2015. Community wide interventions for increasing physical activity. Cochrane Database Syst. Rev., 1.

Cerin, E., Leslie, E., du Toit, L., Owen, N., Frank, L.D., 2007. Destinations that matter: associations with walking for transport. Health Place 13, 713–724.

Department of Health, 2011. Start Active, Stay Active: A Report on Physical Activity from the Four Home Countries' Chief Medical Officers. Department of Health, London, UK.

Djurhuus, S., Hansen, H.S., Aadahl, M., Glumer, C., 2014. The association between access to public transportation and self-reported active commuting. Int. J. Environ. Res. Public Health 11, 12632–12651.

Health and Social Care Information Centre, 2013. Health Survey for England 2012. Health and Social Care Information Centre, Leeds, UK.

Hamer, M., Chida, Y., 2008. Walking and primary prevention: a meta-analysis of prospective cohort studies. Br. J. Sports Med. 42, 238–243.

Heath, G.W., Brownson, R.C., Kruger, J., Miles, R., Powell, K.E., Ramsey, L.T., et al., 2006. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: a systematic review. J. Phys. Act. Health 3, S55–S76.

Heath, G.W., Parra, D.C., Sarmiento, O.L., Andersen, L.B., Owen, N., Goenka, S., et al., 2012. Evidence-based intervention in physical activity: lessons from around the world. Lancet 380, 272–281.

Kelly, P., Kahlmeier, S., Goetschi, T., Orsini, N., Richards, J., Roberts, N., et al., 2014. Systematic review and meta-analysis of reduction in all-cause mortality from walking and cycling and shape of dose response relationship. Int. J. Behav. Nutr. Phys. Act. 11, 132.

Krieger, J., Rabkin, J., Sharify, D., Song, L., 2009. High point walking for health: creating built and social environments that support walking in a public housing community. Am. J. Public Health 99 (Suppl. 3), S593–S599.

Krizek, K.J., Handy, S.L., Forsyth, A., 2009. Explaining changes in walking and bicycling behaviour: challenges for transportation research. Environ. Plan. B—Plan. Des. 36, 725–740.

Kelly, P., Doherty, A., Berry, E., Hodges, S., Batterham, A.M., Foster, C., 2011. Can we use digital life-log images to investigate active and sedentary travel behaviour? Results from a pilot study. Int. J. Behav. Nutr. Phys. Act. 8, 44.

Lee, I.-M., Shiroma, E.J., Lobelo, F., Puska, P., Blair, S.N., Katzmarzyk, P.T., et al., 2012. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. Lancet 380, 219–229.

Lee, L., Watson, M.C., Mulvaney, C.A., Tsai, C., Lo, S., 2010. The effect of walking intervention on blood pressure control: a systematic review. Int. J. Nurs. Stud. 47, 1545–1561.

Living Streets. Community Street Audit. ⟨http://www.livingstreets.org.uk/professionals/working-with-communities/community-street-audits⟩.

Lachapelle, U., Frank, L., Saelens, B.E., Sallis, J.F., Conway, T.L., 2011. Commuting by public transit and physical activity: where you live, where you work, and how you get there. J. Phys. Act. Health 8, S72–S82.

Morris, J.N., Hardman, A.E., 1997. Walking to health. Sports Med. 23, 306–332.

Murtagh, E.M., Nichols, L., Mohammed, M.A., Hoder, R., Nevill, A.M., Murphy, M.H., 2015. The effect of walking on risk factors for cardiovascular disease: an updated systematic review and meta-analysis of randomised control trials. Prev. Med. 72, 34–43.

Marmot, M., 2010. Fair Society, Healthy Lives: The Marmot Review. February 2010, London, UK.

Milton, K., Bull, F.C., Bauman, A., 2011. Reliability and validity testing of a single-item physical activity measure. Br. J. Sports Med., 45.

National Institute for Health and Care Excellence, 2008a. Physical Activity and the Environment. National Institute for Health and Care Excellence, Manchester, UK.

National Institute for Health and Care Excellence, 2008b. Community Engagement. National Institute for Health and Care Excellence, Manchester, UK.

Owen, N., Humpel, N., Leslie, E., Bauman, A., Sallis, J.F., 2004. Understanding environmental influences on walking – review and research agenda. Am. J. Prev. Med. 27, 67–76.

Oliver, M., Badland, H., Mavoa, S., Duncan, M.J., Duncan, S., 2010. Combining GPS, GIS, and accelerometry: methodological issues in the assessment of location and intensity of travel behaviors. J. Phys. Act. Health 7, 102–108.

Ogilvie, D., Giles-Corti, B., Hooper, P., Yang, L., Bull, F., 2010. Methods for researching the physical activity impacts of 'natural experiments' in modifying the built environment. J. Phys. Act. Health 7, S341–S343.

Ogilvie, D., Bull, F., Cooper, A., Rutter, H., Adams, E., Brand, C., et al., 2012. Evaluating the travel, physical activity and carbon impacts of a 'natural experiment' in the provision of new walking and cycling infrastructure: methods for the core module of the iConnect study. Br. Med. J. Open 2, e000694.

Physical Activity Guidelines Advisory Committee, 2008. Physical Activity Guidelines Advisory Committee Report 2008. US Department of Health and Human Services, Washington, DC.

Scarborough, P., Bhatnagar, P., Wickramasinghe, K.K., Allender, S., Foster, C., Rayner, M., 2011. The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK: an update to 2006-07 NHS costs. J. Public Health 33, 527–535.

Saelens, B.E., Sallis, J.F., Frank, L.D., 2003. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. Ann. Behav. Med. 25, 80–91.

Saelens, B.E., Handy, S.L., 2008. Built environment correlates of walking: a review. Med. Sci. Sports Exerc. 40 (Suppl.), S550–S566.
Sallis, J.F., Bauman, A., Pratt, M., 1998. Environmental and policy – interventions to promote physical activity. Am. J. Prev. Med. 15, 379–397.
Sallis, J.F., Spoon, C., Cavill, N., Engelberg, J.K., Gebel, K., Parker, M., et al., 2015. Co-benefits of designing communities for active living: an exploration of literature. Int. J. Behav. Nutr. Phys. Act. 12, 30.
Sport England, 2005–2006. Active People Survey 1 2005–2006. ⟨http://archive.sportengland.org/research/active _people_survey/active_people_survey_1.aspx⟩.
Sustrans. ⟨http://www.sustrans.org.uk⟩.
US Department of Health and Human Services, 1996. Physical Activity and Health: A Report of the Surgeon General. US Department of Health and Human Services, Center for Disease Control and Prevention, Atlanta, GA.
Villanueva, K., Giles-Corti, B., McCormack, G., 2008. Achieving 10,000 steps: a comparison of public transport users and drivers in a university setting. Prev. Med. 47, 338–341.
Wener, R.E., Evans, G.W., 2007. A morning stroll – levels of physical activity in car and mass transit commuting. Environ. Behav. 39, 62–74.