VALUE FOR MONEY OF WALKING AND CYCLING INTERVENTIONS: MAKING THE CASE FOR INVESTMENT IN ACTIVE TRAVEL

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1. INTRODUCTION

Understanding the value for money offered by any investment is, in the current economic climate, critical. The process of economic appraisal is required in order to demonstrate the expected economic return on investment. Tools and processes for appraising major transport schemes are well developed, widely applied, and important elements in the decision making process. Although considered to be weak in several areas (the full discussion of which is beyond the scope of the current paper), there is nevertheless a significant body of guidance available for performing such appraisals via the relevant departments of national Governments.

Intuitively, schemes designed specifically to encourage walking and cycling offer good value for money in so much as they are (comparatively) cheap to implement, the benefits from such schemes are many and varied, and they offer low cost solutions to key transport challenges. Although guidance is available on the calculation of value for money of such schemes, examples are few but highly positive.

A study for Bristol City Council and NHS Bristol reviewed a selection of cycling and walking infrastructure projects, such as crossings and paths, across the UK. The average benefit to cost ratio (BCR) across the examples considered was 19:1 (Davis, 2010). Green Alliance gives the example of improvements to a 6km section of the Union Canal towpath in Brent. Sustrans monitoring of increases in cycling and walking on this route shows a BCR of 38.4:1 (Cary et al., 2009). Analysis of the English Cycling Demonstration Towns programme demonstrates that for every £1 invested in town-wide programmes of cycling interventions, the value of decreased mortality is £2.59 (Cavill et al., 2009). When including all forms of benefit in the appraisal, the BCR increases to up to 3.5:1(Department for Transport, 2010a). Recent calculations by Sustrans of the value for money of infrastructure schemes linking schools and communities shows an average BCR of almost 4:1 (Sustrans, 2010). Investment in the London Cycle Network showed a return of approximately 4:1, largely from health, congestion and air quality benefits (Department for Transport and Department of Health, 2010).

A positive return on investment is not limited to infrastructure schemes – a 2008 study of a range of soft measures to reduce car use by enabling behaviour change through Smarter Choices such as workplace travel plans, travel marketing, car sharing and teleworking found a BCR of over 10:1 (Cairns et al., 2008). Appraisal of Sustrans personal travel planning programme shows high economic benefits from reduced congestion, reduced absenteeism and increased physical activity, with a BCR of nearly 8:1. Benefit cost analysis of small scale adult cycle training schemes suggest that returns are of the order of 7:1 (Department for Transport and Department of Health, 2010).

In order to demonstrate the value of some elements of Sustrans work in economic terms, we have adopted an approach based largely on WebTAG guidance (Department for Transport, 2010b) but sufficiently flexible to accommodate the specific requirements of the devolved nations and to make use of our current systems of monitoring and evaluation. In the first instance applied this methodology to infrastructure interventions.

In this paper we provide an overview of the methodologies currently adopted, supported by examples, before going on to describe the practical application of such methods in evaluating the value for money afforded by infrastructure schemes delivered in the Scottish context. We then go on to discuss the potential limitations of such approaches and areas where further development is under active consideration.

2. METHODS

2.1 Overview of available methodology

The benefits afforded by increasing walking and cycling amongst the population are varied. The benefits to health from increased physical activity associated with active travel, and the positive impacts on the environment of switching to more sustainable modes are well known. Benefits are also accrued through providing a more pleasant journey (journey ambience) to those travelling by foot or by bike, whilst a secondary impact of increased physical activity is reduced absenteeism from work. Impacts on accidents should also be considered.

Within the Scottish Transport Appraisal Guidance (STAG), walking and cycling are included within the Physical Fitness sub-criteria of the Environment criterion (Transport Scotland, 2009a). Two benefits related to increased physical activity are explored within the guidance: reduced mortality and reduced absenteeism. Changes in accident rates associated with changes in levels of walking and cycling are valued within the Safety section of the guidance (Transport Scotland, 2009b). The English Department for Transport appraisal guidance, WebTAG, includes a guidance unit dedicated to the economic appraisal of walking and cycling schemes (Department for Transport, 2010b). Health, journey ambience, accident, absenteeism and environmental (including decongestion and carbon) impacts are valued.

In order to begin to value the impact of any intervention, it is necessary to have available information supporting both levels of use of that intervention and the types of journeys being undertaken. In the following examples we rely on data collected through intercept surveys of route users. Such surveys, delivered across the UK by Sustrans' Research and Monitoring Unit, collect information about the journeys being made as well as allowing an estimate of overall route use to be calculated.

In the first instance we focus on benefits to health as included in STAG guidance. We then expand the assessment to include other, further, benefits.

The elements included in the appraisal and the derivation of options for input values are summarised in the following sections. As far as possible, data from surveys performed at the scheme sites are used to inform the calculations.

2.2 Estimation of key input parameters

Estimation of numbers of users benefiting from the intervention

In order to calculate the value of benefits resulting from the implementation of a particular intervention, it is first necessary to estimate the number of users who actually benefit. The total annual estimate of cyclist and pedestrian trips is adjusted for return journeys and frequency of trip to give an estimate of numbers of individuals.

The numbers of users counted travelling in any direction is first converted to a number of trips based on the assumption that 90% of the users counted are making return journeys (so would effectively be counted twice) and the remaining 10% are making a one way journey on the route. The estimated number of trips per week is converted to individuals based on the proportion of those trips reported to be made daily, 2-5 times per week, weekly, fortnightly or monthly.

Estimation of car kilometres replaced

An estimation of the number of car kilometres replaced is required to estimate decongestion, environmental and accident benefits. The number of car kilometres abstracted from the road network is calculated using the percentage of respondents stating that they did not use a car to make any part of their journey and the percentage stating that they could have used a car instead of walking or cycling but chose not to. Default trip length values (2.6 miles for cyclists and 0.7 miles for pedestrians) and car occupancy values (1.63 occupants per car) were applied, sourced from the National Travel Survey (Department for Transport, 2009). The difference between car kilometres abstracted for pre and post intervention surveys is taken to represent the total car kilometres abstracted as a result of the intervention.

Estimation of time and distance travelled on the intervention

The estimation of amenity benefits requires an estimation of distance travelled on the intervention (for pedestrians) and time spent on the intervention (for cyclists). To estimate the distance travelled on the intervention, the total number of trips is multiplied by an average trip distance for the pre and post survey. The difference between these two values is taken as the additional distance travelled on the intervention by new users. To estimate the time spent on the intervention, an average trip time is calculated by dividing the average trip distance by a default speed. This is then multiplied by the total number of trips for the pre and post survey. The difference between these two values is taken as the additional time spent on the intervention by new users.

2.3 Calculating the value of benefits

Calculation of benefits to health

Health benefits accrued to cyclists were estimated using the World Health Organisation's Health Economic Assessment Tool (HEAT) for cycling (World Health Organisation, 2008). The version of the model used in these calculations required as input an estimate of numbers of cyclists and time spent cycling (Cavill et al., 2009). Estimated numbers of cyclists were calculated from annual usage estimates derived from intercept surveys. Estimated time spent cycling per week was set at just over 1 hour (Cavill et al., 2009). Health benefits accrued to pedestrians were estimated using a similar method, as outlined in STAG (Transport Scotland, 2009a).

Calculation of absenteeism benefits

Benefits to employers from reduced absenteeism are calculated in accordance with STAG guidance (Transport Scotland, 2009a). The estimation is based on US studies which found 30 minutes of exercise a day could reduce short term sick leave by between 6% and 32%. The base level of absenteeism assumed is 6.8 days per year, 95% of which is attributed to short term illness. We assume a linear relationship between levels of activity and reduced absenteeism. The value attributed to reduced sick days is based on a daily salary value (£183.82 per day according to STAG guidance).

Calculation of accident disbenefits

The impact of interventions to encourage cycling and walking on accidents can be viewed from two perspectives: increased numbers of cyclists and pedestrians lead to a reduction in car journeys and so a reduction in numbers of accidents involving cars, or increases in numbers of cyclists and pedestrians leads to an increase in the number of accidents involving this groups of users. The latter is the approach adopted by STAG (Transport Scotland, 2009b). However, in the examples included by means of illustration within this paper, we focus on the provision of traffic free facilities, in which case it is defensible, depending on the anticipated levels of cycling and walking generated by an intervention, to either omit accidents entirely from the calculation, or take the first approach noted above.

Calculation of other benefits

In addition to health, absenteeism and accident impacts, ambience and decongestion benefits can also be valued (Department for Transport, 2010b). Ambience benefits reflect the 'pleasantness' of the journey on the intervention as experienced by users. WebTAG attributes a number of values to users of different types of route improvements. In the examples included herein, journey ambience benefit to cyclists is valued at 4.73 p/min (the WebTAG value for an off road segregated cycle path) whilst ambience benefits to pedestrians is valued at 6.6 p/km (the ambience benefit to pedestrians from street lighting, kerb level and pavement evenness). Ambience benefit to new users is valued at half that to existing users.

Decongestion benefit is estimated on the basis of car km replaced. WebTAG provides several options for decongestion valuation, based on road type

(Department for Transport, 2007). In the following examples, the value of the decongestion benefit was calculated using the WebTAG rate for 'other' urban roads (5.2 p/km).

Growth rates

The calculations assume that the period of build up in demand for use of the intervention is the same as the period between the pre and post intervention survey – the rationale for this is that the new users attributed for the purposes of the calculation to the intervention are calculated on the basis of pre and post surveys performed a number of years apart. Initially, no increase in demand is assumed once the post intervention use (based on survey data) has been attained.

Appraisal period

The appraisal period used in the calculation was ten years. This period was based on that used in the Cycling Demonstration Towns work (Department for Transport, 2010a), as suggested by the Department for Transport. A 3.5% discount rate is applied to benefits.

Limitations

At the present time, only a limited number of benefits are sufficiently well understood and evidenced to allow for their valuation and inclusion in estimations of benefit to cost ratios for walking and cycling interventions. Particularly, methods for valuing health benefits are suitable only for use with data pertaining to adult populations, and only include mortality and not morbidity benefits. As such, the following examples should be considered conservative – particularly as these interventions targeted at improving walking and cycling access to schools. Children and young people are anticipated to accrue substantial benefits from such interventions additional to those valued for adults in the following examples.

4. EXAMPLE SCHEMES

4.1 Example scheme 1

Details of scheme

A project was delivered in the Highlands as part of a larger scheme to develop the National Cycle Network and links to the network in the area. The project involved the construction of a 2.0m wide tarmac path with associated drainage and fencing through a park. The section of route surveyed is of direct benefit to pupils travelling to and from a nearby school. The intervention was delivered during 2007. Three intercept surveys were performed with users in the area: in February 2007 before the intervention was delivered, and after work had been completed, in October 2007 and February 2009. In this example data collected in February 2007 and February 2009 is used to inform the economic evaluation. The total cost of the scheme was £190,000.

Estimate of usage

On the basis of counts of users performed before the new route section was constructed, the total annual usage estimate of adult cyclists was estimated to be 2,270. No pedestrians were counted during the pre survey at this site. From data collected in the post survey in February 2009, the annual usage estimate was 15,974 adult cyclists and 3,111 adult pedestrians. It was estimated that 98 more individuals were cycling and 25 more individuals were walking between the pre and post surveys.

Value of benefits

The estimated value of benefits to users of the scheme are summarised in Table 1.

Table 1: Breakdown of user benefits – example scheme 1.

		Value (£, total over ten year appraisal period)		
	Parameter	Cyclists	Pedestrians	Total
STAG benefits	Health	£189,395	£30,875	£220,270
	Absenteeism	£5,884	£1,007	£6,891
	Sub-total	**£195,279**	**£31,882**	**£227,161**
Additional benefits	Decongestion	£2,126	£411	£2,537
	Amenity	£33,329	£498	£33,828
	Total	**£230,734**	**£32,791**	**£263,525**

To calculate the benefit to cost ratio, the total benefit over the ten year appraisal period is divided by the total cost of the scheme. The cost must first be adjusted to market price cost by removing VAT then uplifting by a factor for average indirect tax. The cost of the scheme adjusted in this way is £195,498. The resulting benefit cost ratio is therefore 1.2:1 based only on benefits to health and absenteeism, increasing to 1.3:1 when other benefits are included.

4.2 Example scheme 2

Details of scheme

The aims and objectives of a second scheme delivered in East Lothian were to provide a safer route to and from a local school for pedestrians and cyclists, reduce the number of vehicles trying to access the area close to the school and provide a better route for the wider community to use. The project involved the construction of a traffic-free path leading up to the school. The path runs across one side of an existing grassy field. It is fully surfaced and lighting has been installed.

The intervention was delivered during 2007. Three intercept surveys were performed with users in the areas: in February 2007 before the intervention was delivered, and after work had been completed, in October 2007 and February 2009. In this example data collected in February 2007 and February 2009 is used to inform the economic evaluation. The total cost of the scheme was £72,000.

Estimate of usage

On the basis of counts of users performed before the new route section was constructed, the total annual usage estimate of adult cyclists was estimated to be 201, and the estimated annual usage by adult pedestrians was 32,292. From data collected in the post survey in February 2009, the annual usage estimate was 343 adult cyclists and 127,000 adult pedestrians. It was estimated that 1 more individual was cycling and 771 more individuals were walking between the pre and post surveys. In the pre survey, the annual usage estimate for children was 12,883 cyclists and 97,781 pedestrians. In the post survey, the annual usage estimate for children was 18,225 cyclists and 99,704 pedestrians. Although the number of young people using the route increased following the delivery of the intervention, the benefits to children cannot be valued within the existing framework.

Value of benefits

The estimated value of benefits to users of the scheme are summarised in Table 2. Due to the very small estimated number of additional cyclists, pedestrian benefits only are considered

Table 2: Breakdown of user benefits – example 2

		Value (£, total over ten year appraisal period)
	Parameter	Total (pedestrians only)
STAG benefits	Health	£918,759
	Absenteeism	£30,655
	Sub-total	**£949,414**
Additional benefits	Decongestion	£16,709
	Amenity	£25,509
	Total	**£991,633**

The cost of the scheme adjusted to market price is £74,083. The resulting benefit cost ratio is therefore 12.8:1 based only on benefits to health and absenteeism, increasing to 13.4:1 when other benefits are included.

5. DISCUSSION

The (retrospective) economic appraisal of walking and cycling schemes is not particularly novel research. A number of examples of such exercises exist derived from the STAG guidance. With this exercise, we intended not only to demonstrate a means of interpreting the guidance, but to spell out the shortcomings of STAG (and other appraisal frameworks) in the context of wider transport evaluation issues. These issues are explored in this section of the paper in terms of appropriate responses to the presentation of such evidence, aspirations for development of tools and resources for appraisal, and other possibilities for future economic appraisal work.

5.1 What does this research tell us?

Although current guidance on performing such assessments is diffuse within the STAG technical database, most of the key impacts associated with walking and cycling appraisal are included, namely health, absenteeism and accidents. The examples included above demonstrate how the guidance can be applied, and estimations of the value of schemes based on these benefits generate positive benefit to cost ratios. It is worth noting that these benefits can be further inflated when other benefits associated with journey ambience and decongestion are included.

In the opinion of the authors, the estimates generated using STAG are highly conservative. For example, as noted previously, tools to value benefits to children are poorly developed. Although we speculate that the health benefits accrued to children are likely to be substantial, robust tools to quantify this benefit are lacking. The adoption of a short appraisal period may also underplay the longer term benefits of the interventions considered – major transport schemes are typically appraised over a sixty year period.

So whilst these calculations suggest that investment in walking and cycling infrastructure is money well spent, we perceive that there are inequalities in the way that the case can be made and interpreted for walking and cycling schemes relative to the case for road schemes.

5.2 Critique of conventional approaches to appraisal

Economic evaluation of walking and cycling schemes currently sits within the same framework as major transport schemes. This is itself considered deficient in a number of areas.

Key weaknesses within appraisal systems have been well documented (Buchan, 2008; Buchan, 2009; Cary et al., 2009), and include the treatment of short time savings, physical activity and treatment of smarter choices interventions. (Recent amendments to the WebTAG framework reflect issues raised with the treatment of fuel tax revenues and carbon valuations, and are therefore not discussed in this paper).

The treatment of time savings to users within the appraisal system can lead to their value dominating the benefit to cost ratio. Extremely short time savings multiplied up by many users over a prolonged appraisal period tend to result in large monetary values compared to those of other benefits included within the calculations. A report published in 2006 evaluated several road schemes post completion (Matson et al., 2006). Traffic growth was more rapid than anticipated in the appraisal for the examples evaluated, negating the projected time-saving values.

Interventions which increase levels of physical activity, including schemes that enable people to walk and cycle more, can count improved health and well-being amongst their benefits. A model for valuing the health benefits of cycling is available, and a tool to allow the health benefits of walking to be valued in the same way is currently under development. The range of health benefits that can be valued is, however, limited. Benefits valued for cycling are related to all-cause mortality, rather than morbidity associated with conditions such as coronary heart disease and type II diabetes, and the health benefits to children and young people are not valued within the current system. Although benefits to physical fitness are included to a point, equal emphasis is not given to changes in physical fitness in schemes that reduce levels of physical activity by, for example, encouraging people to drive short distances, or creating an environment that discourages walking and cycling.

Substantial evidence exists in support of the potential for smarter choices interventions, for example, behaviour change programmes, to reduce car use and increase the proportion of journeys made by foot, bike and public transport (Sustrans and Socialdata, 2009). Guidance on how to fully appraise such initiative in the same way as infrastructure measures is not currently available.

Numerous examples exist of literature that makes recommendations for amendments to economic appraisal frameworks. These range from suggestions of different treatment of valuations (Buchan, 2008; Buchan, 2009; Cary et al., 2009) to building in an assessment of policy alignment as a pragmatic response to a perceived need for an approach requiring reduced input (Paths for All Partnership, 2008; Knowles, 2009).

5.3 What other possibilities exist for economic appraisal of walking and cycling interventions in the Scottish context?

Whilst we have focused our initial work in this area on estimating the value for money of infrastructure schemes on a modest scale, this does not represent the limit of the scope of such methods.

In 2010 the Department for Transport published benefit to cost ratios for the Cycling Demonstration Towns (Department for Transport, 2010a), applying WebTAG guidance to a multi-faceted delivery programme including capital and revenue investment across six towns. Such methodology could potentially transferred to the seven Smarter Choices Smarter Places towns.

Sustrans is currently working with Fife Council and the Scottish Government in the delivery of the Make Your Move Kirkcaldy project. Project monitoring will capture detailed information about the experiences of residents before and after the programme through a large-scale travel behaviour survey and, together with cycle count and other data, can support an economic evaluation.

Sustrans is also working with the Scottish Government and a range of other partners to compile data resources that can be used as the basis for appraisal of some schemes in some instances. These include further complex travel behaviour surveys, automatic cycle and pedestrian counters, route user intercept surveys, the Scottish school travel hands-up survey, and other data collection around schools-specific programmes.

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