Value *for* Money: An Economic Assessment of Investment in Walking and Cycling

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Summary

The trend across the UK and other developed nations is for physical activity levels to decline. This is associated with widespread use of the private car, an increase in sedentary leisure activities and greater mechanisation in the home, workplace and public places. Illness as an outcome of physical inactivity has been conservatively calculated to be £1.08 Billion per annum in direct costs to the NHS alone (2007 prices). Indirect costs have been estimated as £8.2 Billion per annum (2002 prices).

Walking and cycling have been identified as a key means by which people can build physical activity into their lifestyles. Yet the volume of literature on Cost Benefit Analysis of interventions to promote routine walking and cycling has grown in the past decade or so and reveals that the economic justification for investments to facilitate cycling and walking has been undervalued or rarely considered in public policy decision-making.

In contrast to this omission, a consensus exists among experts in many OECD countries that significant public health benefits can be realised through greater use of active transport modes. In England there is evidence of change at the policy level. **Cost Benefit Analysis** is of growing importance. Not least, the Treasury and more recently the Cabinet Office have recognised the costs of physical inactivity (among others) and the need to reflect these by steering transport policy in urban areas to promote cost effective interventions including cycling promotion.

This review assesses the evidence base from both peer reviewed and grey literature both in the UK and beyond. **Almost all of the studies identified (UK and beyond) report economic benefits of walking and cycling interventions which are highly significant, and these average 13:1. For UK interventions only the average figure is higher, at 19:1.** Investment in infrastructure and to facilitate increased activity levels amongst local communities through cycling and walking is likely to be a ‘best buy’ for our health, the NHS at large in terms of cost savings, as well as for the road transport sector.

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Introduction

Physical activity is recognised as an important element of a healthy lifestyle, reducing the risks of ill-health and premature death. For this reason physical activity has been identified as a 'best buy' for public health.[1] The trend across the UK and other developed nations is for physical activity levels to decline. This is associated with widespread use of the private car, an increase in sedentary leisure activities and greater mechanisation in the home, workplace and public places. There is also increasing evidence of the link between adult obesity levels and travel behaviour, one indicator of which is that countries with highest levels of active travel generally have the lowest obesity rates.[2]

In England the Chief Medical Officer has stated that the target of 30 minutes of moderate intensity activity for adults (1 hour for children) in order to promote health, such as brisk walking on at least 5 days per week, will only be achieved by helping people to build activity into their daily lives. His 2004 report on physical activity says,

> "for most people, the easiest and most acceptable forms of physical activity are those that can be incorporated into everyday life. Examples include walking or cycling instead of driving…"[3]

Yet, 67% of adults in Bristol report taking insufficient physical activity to reduce their risk of disease and ill-health.[4] A significant and growing body of evidence links insufficient physical activity to a number of medical problems and premature death (all cause-mortality). The evidence is strongest for chronic diseases, especially:

- cardiovascular disease
- stroke
- cancer (colon, and breast)
- type 2 diabetes
- osteoporosis
- depression.[5]

While this desktop review does not claim to be comprehensive it does claim to reflect the *'direction of travel'* within both peer reviewed and grey literature of the benefits to costs (BCR) which accrue from investments in walking and or cycling – through both infrastructure and general promotion work. Studies have been sought both through on-line searches of transport and health databases and contact with authors across the globe.

Most studies of physical activity have focused on the economic burden of inactivity in general, often addressing a single disease or a few major diseases. These studies tend to concentrate on direct health care costs - those directly associated with health care by the NHS.[6 7] Indirect costs include expenditure not directly attributable to the NHS, such as informal care, inferior physical and mental function, deficient physical and mental well-being, and loss of productivity through sick leave, but receive less attention in physical activity studies.

Illness as an outcome of physical inactivity has been conservatively calculated to be £1.08 Billion per annum in direct costs to the NHS alone (2007 prices).[8] Indirect costs have been estimated as £8.2 Billion per annum (2002 prices).[9]

CBA of active travel interventions

CBA of active travel (walking and cycling) projects is not currently widespread. Nevertheless, a consensus exists among experts in many OECD countries that significant public health benefits can be realised through greater use of active transport modes.[10] In 2009 there is a not inconsiderable volume of data on the CBA of environmental facilities on promoting physical activity in the general population including through walking and cycling.[11] [12] This includes a recent systematic review (16 studies) of economic analyses of transport infrastructure and policies including health effects related to cycling and walking.[13]

A signal as to the growing importance of CBA is that recently the Cabinet Office has considered physical inactivity costs (among others) and the need to reflect these by steering transport policy in urban areas to promote cost effective interventions including cycling promotion.[14]

> "These results suggest that transport policy has the opportunity to contribute to a wider range of objectives. This is supported by emerging evidence on specific schemes eg high benefit cost ratios for cycling interventions." p. 3

Since the start of the 21st century there has been an increasing number of studies addressing cost-benefit analysis (CBA) of walking and cycling. Most of these are focused on infrastructure intervention. Most include calculations for reductions in ill-health and premature death, but not all studies do. These indicate that including health impacts arising from existing and new users could make a major difference to CBA results.[15] Non-UK evidence is in the Appendix.

The UK evidence for BCR of active travel interventions

CBA research for the Department for Transport

CBA research for the Department for Transport suggests the scale of cost-benefit ratio to be substantial ie that the benefits to costs (BCRs) were high. For example, a canal towpath in London was transformed into a high quality route and assessed in terms of levels of walking and cycling commuter use. User counts were conducted pre-project in 2002 and post-project in 2004. Improved route-surface quality and connectivity, in addition to the introduction of the congestion charge, led to considerable increases in usage, resulting in:

- A BCR of 24.5:1
- Savings of £5,487,130 through reduced absenteeism
- Savings of £28,537,854 due to increased physical fitness (based on numbers of preventable deaths)[16]

Links to School: Sustrans

During 2005, Sustrans, the Institute for Transport Studies at Leeds University, and the University of Bolton, produced guidance notes for the economic appraisal of cycling and walking schemes on behalf of the Department for Transport (DfT). The guidance is consistent with the government's New Approach to Transport Appraisal suite of tools, and is intended to form part of the DfT's WebTAG series which advises on methods of economically appraising transport schemes.

DfT's economic appraisal method with the new guidance was applied to three Links to Schools schemes in 2005 (a programme funded by DfT and administered by Sustrans to bidding local authorities).[17]

1) Bootle: This scheme consists of a series of improvements to an existing route close to a number of schools. The improvements include resurfacing, some new construction, road marking, signing and lighting. The grant awarded was £131,000 towards an overall project cost of £231,000. **BCR 29.3:1.**

2) Hartlepool: This scheme involved the construction of a toucan crossing close to a primary and a secondary school, with some more general infrastructure improvements in the immediate vicinity. The grant awarded was £25,174 towards an overall project cost of £50,349. **BCR 32.5:1.**

3) Newhaven: A new shared-use path in an existing grassed verge adjacent to, and set back from, the busy A259 was constructed. The route is some distance from, but forms a link between, two secondary schools. It also links to their communities of Seaford and Newhaven. The grant awarded was £125,000 towards an overall project cost of £300,000. **BCR 14.9:1.**

Research for Cycling England

Research by SQW Consulting for Cycling for England sets out a summary of the monetary values that have been estimated for one new cyclist, cycling regularly for a year.[18] A model was developed with four different scenarios: urban on-road, urban off-road, rural on-road and rural off-road. The values for these scenarios are shown in Table 1. The scenarios suggest that the annual economic benefits range from around £540 to £640 with the greatest economic benefits for cycling generated by urban off-road projects and the least by rural on-road ones. The average benefit per additional cyclist is £590 per year.

While the differences between the scenarios are reasonably significant, it is important to note that the greatest impact that cycling has is on the health benefits of *additional cyclists*. These health benefits are universal. If people can be convinced to cycle, around two-thirds of the economic benefit generated does not depend on the location or type of facility.

The figures in Table 2 provide a simple and straightforward way to assess whether a cycling project is likely to generate a positive return on investment. As a rule of thumb, every £10,000 invested would need to generate at least one extra cyclist, each year, over a 30 year period in order to break even. Where the effect of the intervention is likely to be shorter, the number of extra cyclists will need to be higher.

Table 1 Annual values attributed to each additional cyclist, cycling regularly for one year – the figures assume that 50% of cycle trips replace a car trip

Benefits (annual for each additional cyclist)	**Urban**		**Rural**	
Health Benefits	On Road	Off Road	On Road	Off Road
Value of loss of life	£408.67	£408.67	£408.67	£408.67
NHS Savings	£28.30	£28.30	£28.30	£28.30
Productivity gains	£47.69	£47.69	£47.69	£47.69
Pollution	£34.57	£34.57	£6.49	£6.49
Congestion	£68.64	£68.64	£34.32	£34.32
Ambience	£13.20	£53.60	£13.20	£53.60
Total Benefits	£601.06	£641.46	£538.66	£579.06

Source: SQW

The report included a number of case studies of the economic impact and each case study is outlined in Table 2. The value of the benefits for every one pound invested vary considerably, ranging from 34 pence to over £40. However, this range is understandable given that some of the projects have only very recently been completed. This is particularly true of Priory Vale, Queen Elizabeth Park and Surrey University's Manor Park campus. The average benefit to cost ratio of the five case studies is just under 2:1 excluding the Hull case study which is much higher than the other results. Including this outlier, the average benefit to cost ratio is almost 10:1. It is also worth stressing that these cases were identified independently by the consultants as typical examples.

Table 2 Number of cyclists needed to achieve a benefit to cost ratio of 1:1

Cost of Project	Urban		Rural		Average
	On Road	Off Road	On Road	Off Road	
£10,000	1	1	1	1	1
£25,000	3	3	3	3	3
£100,000	11	10	12	11	11
£250,000	27	25	30	28	27
£500,000	54	50	60	56	55
£750,000	80	75	90	83	82
£1,000,000	107	100	120	111	109
£1,250,000	134	125	149	139	136
£1,500,000	161	151	179	167	164
£1,750,000	187	176	209	195	191
£2,000,000	214	201	239	222	218

Source: SQW

The retrofitting of seven streets in Hull has proved to be extremely successful, combining low costs with a high number of additional cyclists. The implementation of a 20mph speed limit and other measures also contributed to the growth in cycling.

York City Council assessed the value of one of its cycle route scheme using the above data. The Malton Road cycle route scheme cost £600K for infrastructure works and would achieve a benefit to cost ratio of 1:1 if the scheme created an additional 60 cyclists (approximately) for this urban, off-road route. By 2007 there was an average of 439 cyclists, an increase of 178 cyclists, constituting a 68% increase over 10 years.[19]

Most recently (November 2009), using the WHO's HEAT tool, Cycling England researchers estimated the value of the reduction in adult mortality.[20] The HEAT analysis found a maximum annual benefit (once the maximum health benefit had been reached after an estimated five years) of £8.9 million per annum. Taking into account the build up of health benefits in the HEAT tool, the present value of the mean annual benefit of this additional level of cycling is in the region of £4.5 million per year. Over ten years, assuming the new cyclists remained cycling at the current level, this would result in a saving of £45 million.

The Cycle Demonstration Towns programme cost £2.8 million per year of direct Cycling England / Department for Transport grant, matched by funding from the local authorities which averaged £3.4 million per year, for three years. This is a total of £18.7 million, which equates to a net present value of £17.45 million at the start of the project. Thus, for each £1 invested, the value of decreased mortality is £2.59. This figure is for decreased mortality only. Including other benefits would be likely to increase the ratio considerably.

Calculating life years saved
Research in England has also reported cost-benefits in relation to cycling.[21] For 100,000 people, evenly spread between the ages of 20 and 60, taking up regular cycle commuting, would result in 50 fewer deaths per year as an aggregate of health benefits and reduced road traffic casualties among those cyclists. This is equivalent to around 1660 life years. Assuming a value of around £30,000 per life year, this results in a net benefit of just over £50 million from those 100,000 cyclists.

Value for money
Although all schemes with a benefit-cost ratio greater than 1 might be worth pursuing, financial constraints, not least during periods of public finance contraction, mean that it is necessary to prioritise some schemes above others, at least in terms of value for money. The Department for Transport's Webtag Guidance categories value for money (VfM) as per Table 3 below so that schemes over 2 are those most worth pursuing.

Table 3 Value for money

BCR	VfM
Less than 1	Poor
Between 1 and 1.5	Low
Between 1.5 and 2	Medium
Over 2	High

(source Webtag 2.6.4)[22]

Below is a compendium of the BCRs from the above studies. **For these UK projects the average BCR is 19:1.**

Table 4 Compendium of BCRs for UK walking and cycling infrastructure projects

Study	Study focus/location	Benefit to cost?	Comment
DfT, 2005	London	24.5:1	Canal towpath assessed in terms of levels of walking and cycling commuter use
SQW Consulting, 2008	UK	almost 10:1.	Estimated impacts of five cycling infrastructure projects
Cycling England	England	2.59	Increases in cycling associated with Cycling Demonstration Towns - mortality benefits only.
Sustrans	Bootle:.:	29.3:1	Resurfacing, some new construction, road marking, signing and lighting
Sustrans	Hartlepool	32.5:1	Construction of toucan crossing close to primary and secondary school, with some general

			infrastructure improvements in immediate vicinity.
Sustrans	New Haven	14.9:1	New shared-use path in an existing grassed verge adjacent to, and set back from, the busy A259 was constructed
	average	19:1	

Conclusions

Health benefits are a fully recognised component within CBA calculations within transport planning. As with other areas of public policy decision making about interventions to increase physical activity, decisions are likely to be swayed by the economic case as much as by the general congestion reduction, health or environmental benefits. This is particularly accentuated in times of fiscal restraint. Consequently, an evidenced based approach to decision making, as required by Government, is especially important in informing the economic case.

The volume of literature on CBA/BCR of interventions to promote routine walking and cycling has grown in recent years and reveals that the economic justification for investments to facilitate cycling and walking has been undervalued or not even considered in public policy decision-making. Yet, almost all of the studies report economic benefits which are highly significant, with benefit to cost ratios averaging 11.5:1 (UK and non-UK). In addition, the conservative nature of their calculations implies even greater economic benefits are possible than those reported. Nonetheless, even with conservative calculations it is of note that such high benefit to cost ratios are rare in transport planning.

Consequently, environmental and other interventions to facilitate increased population physical activity through cycling and walking is likely to be a ‘best buy’ across areas of public policy ie both public health and the NHS at large in terms of cost savings, and for transport planning. Looking for opportunities for the application of CBA/BCR the Local Transport Plan 3 being drafted by all highway authorities for commencement in April 2011 is a clear target. Additionally, the significant values reported of BCRs should have a significant influence to inform regional and national transport policies.

Appendix 1: Non-UK BCR evidence

CBA (and BCR) calculations of traffic safety measures

CBA calculations of various traffic safety measures using European data show that measures for cyclists and pedestrians result in a more than positive ratio than other travel modes.[23]

- Measures to restrict speed such as those now in use in increasingly more urban areas reduce the average risk of accidents by more than 50%. The ratio between benefits and costs is 9:1
- Separate cycle paths have a positive effect on safety for both motorized vehicles and cyclists and also benefit traffic flow. The ratio is 9:1
- A measure that gives cyclists right of way at traffic junctions by means of an advanced stopping line over the full width of the road also improves safety for cyclists and other traffic and has an even more positive ratio of 12:1.[24]

BCRs for three Norwegian cities

A CBA of walking and cycling tracks in three Norwegian cities reported a series of benefits. [25] These benefits included improved fitness, reductions in health costs, decreased air and noise pollution and reduced parking costs. A range of other factors were included in the calculations including traffic accidents, travel time, insecurity, school bus transport, and medical and welfare costs (the latter being 60% of the total cost). The CBA/BCR included conservative estimates of some benefit components:

- *Traffic accidents* - assumed that the number of traffic accidents resulting in injury would remain unchanged because of the new walking and cycling tracks.
- *Travel time* – assumed that travel times for pedestrians and cyclists remain unchanged
- *Insecurity* - felt by pedestrians and cyclists moving along a road was included at a cost of 2 Norwegian Kroner (NOK) per kilometre. Assuming an average speed of 10–20 km/h the cost of insecurity was about NOK 20–40 per hour for cyclists.
- *School bus transport* - assumed that 50% of children previously using a bus would not need this if walking and cycle track networks were constructed.
- *Less severe diseases and ailments and less short-term absence* – assumed that short-term absence from work would be reduced by 1 percentage point (from 5% to 4%) and that 50% of new pedestrians and cyclists would see improvements in their health.
- *Severe diseases and ailments and long-term absence/disability* - moderate amounts of daily physical activity reduce risk of premature mortality in general.

Risk reductions were related to just four types of severe diseases or ailments - cancer, high blood pressure, type-2 diabetes and musculoskeletal ailments. Estimated costs due to welfare loss for people suffering from these diseases or ailments were included. The welfare loss is estimated to be 60% of the total costs - the same magnitude as for welfare loss for people injured in traffic accidents used in Norwegian CBAs of other road investments.

External costs of road transport included were:

- CO2-emissions, local emissions to air,
- Noise
- Congestion
- infrastructure costs
- *Parking costs* – commute trips by car replaced by walking or cycling were assumed to reduce parking costs for businesses in Trondheim, Hamar and Hokksund by NOK 1165, NOK 560 and NOK 3254 per month, respectively.

A summary of the CBA results are presented in Table 5, demonstrating that investment in walking and cycle networks in the three Norwegian cities (best estimates of future pedestrian and bicycle traffic) appear to be highly cost effective.

Table 5 BCR of investments in walking and cycling track networks in Hokksund, Hamar and Trondheim

	Hokksund	Hamer	Trondheim	TOTAL
TOTAL BENEFIT	153.7m NOK (£133.7m)	309.1m NOK (£268.9m)	3023.3m NOK (£2630.2m)	3486.1m NOK (£3032.9m)
TOTAL COSTS	30.2m NOK (£26.27)	20.1m NOK (£17.5m)	767.4m NOK (£667.6m)	817.7m NOK (£711.4m)
Net benefit/cost ratio	4.09	14.34	2.94	

Unit: Norwegian Kroner (NOK 1 = GB £0.87)

Walking and cycling trails in Nebraska, USA

A US study team analysed walking and cycling trails in Nebraska and reported societal benefits.[26] COBA data were

- The per capita annual cost of using the trails was US$209.28 (£120) (including construction, maintenance, equipment and travel).
- Per capita direct medical benefit of using the trails was $564.41 (£320).
- The cost-benefit ratio was 2.94, meaning that every $1 invested in trails for physical activity led to $2.94 in direct medical benefit (£1.67 for every £1 invested).
- As a result, an active person is calculated to have spent $564 (in 1998 dollars) less on medical care than an inactive person.

The results indicate that building walking and cycling trails is cost beneficial from a public health perspective, assuming the trail can be used for 10 years or more. Equipment and travelling to and from the trails formed the major part of the cost demonstrating the importance of increasing awareness of the health benefits of physical activity.

Danish bicycle promotion
A study of a Danish bicycle promotion scheme, using conservative estimates of health benefits, calculated net benefits of 3.1 billion Euro (£2.108 billion).[27] It was assumed that improving infrastructure and continued marketing activities would bring a 50% increase in cycling, associated with a 30% increase in walking across Denmark over 12 years.

Copenhagen, aiming to be World No. 1 Cycling City
Copenhagen has publicly set out to become the top cycling city in the world. The Danish Ministry of Transport's manual for calculating cost-benefit did not include a method for assessing cycle projects. The City of Copenhagen therefore devised a cycling assessment procedure based on the principles set forth in the manual. From a cost-benefit point of view the investments were particularly sound, giving an equivalent or better rate of return than road construction projects such as the widening of the motorway around Roskilde or a new motorway near Silkeborg.[28]

Cycling figures in hard cash - Denmark
* When a person chooses to cycle this is a clear gain for society of 1.22 Danish Kroner per kilometer cycled.
* Conversely, society suffers a net loss of 0.69 Danish Kroner per kilometre driven by car.
* In cost-benefit terms the health and life expectancy benefits of cycling are seven times greater than the accident costs.
* The cost of a bicycle is 33 øre (0.33 of a Danish Kroner) per cycled kilometre covering purchase price and maintenance. The equivalent cost for a car is 2.20 Danish Kroner per driven kilometre.[29]

Unit: Danish Kroner (DK 1 = GB £0.12)

World Health Organisation - Health Economic Assessment Tool
In 2007 the World Health Organisation published guidance on the economic appraisal of health effects related to walking and cycling and a tool to calculate the costs and benefits resulting from cycling interventions – Health Economic Assessment Tool.[30] This was premised on the fact that in recent years, a few countries have carried out pioneering work in trying to assess the overall costs and benefits of transport infrastructures taking health effects into account, and guidance for carrying out these assessments has been developed. However, important questions remained to be addressed regarding the type and extent of health benefits which can be attained through investments in policies and initiatives which promote more cycling and walking.

Addressing these questions was stated as important in order to:

a) support Member States in their assessments of the health and environmental impacts of alternative transport policy options;
b) promote the use of scientifically robust methodologies to carry out these assessments; and
c) provide a sound basis for advocating investments in sustainable transport options.

Research for New Zealand Government research
More recently the New Zealand Land Authority commissioned a study to value economically the health benefits of active travel modes.[31] A starting point for the study was the WHO HEAT tool. Elements of several methodologies were integrated and applied by the New Zealand researchers to estimate a value per km that could be easily incorporated into the existing economic evaluation methods. Mortality, morbidity and health-sector costs were all included in the total annual benefits that could be realised by an inactive person becoming physically active. These benefits were weighted and distributed across the average physical activity profile of the population to produce scenarios of an annual benefit per person.

For cycling this meant a per kilometre benefit of between $(NZ) 1.77 (£0.80) and $(NZ) 2.51 (£1.10). This is comparable to other calculations of benefit, including that generated using the HEAT tool.

Table 6 Compendium of BCRs for Non-UK walking and cycling infrastructure projects

Study	**Study focus/location**	**Benefit to cost**	**Comment**
PROMISING, 2000 EU Project	Restrict speed in urban areas.	9:1	reduce the average risk of accidents by more than 50%.
PROMISING, 2000 EU Project	Separate cycle paths	9:1	Positive effect on safety for both motorized vehicles and cyclists and also benefit traffic flow
PROMISING, 2000 EU Project	Advanced stop lines for cyclists	12:1	Advanced stopping line over the full width of the road also improves safety for cyclists and other traffic
Norwegian cities 2004 (peer reviewed)	Hokksund	4.09	Cycle network infrastructure
Norwegian cities 2004 (peer reviewed)	Hamer	14.34	Cycle network infrastructure
Norwegian cities 2004 (peer reviewed)	Trondheim	2.94	Cycle network infrastructure
Walking and cycling trails, 2005 (peer reviewed)		2.94	Off-highway cycle pedestrian routes in Nebraska
	Average	7.7:1	

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