Appendix A - Closure of Network Rail crossings – implications for walking and cycling
Findings of the Literature Review

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Introduction

A literature/evidence review of walking and cycling for leisure and the barriers/enablers, was undertaken by Hinchingbrooke Library Service in October/November 2016
Specifically focusing on:

1. Is there any evidence to support the hypothesis that people are more likely to walk and or cycle if the leisure route is a circular route rather than a linier "there and back again" type route.
2. Is there any evidence that changing/breaking a circular route will lead to a reduction in people walking the route or part thereof
3. Is there any evidence as to the preference for leisure routes i.e. do people prefer walks on farm track type rights of way compared to footpaths on roads.

15 papers were found of which 8 were selected for review (the other papers were abstracts only or not available through OpenAthens[1] and therefore were excluded). The summary of these papers below was undertaken by Iain Green (Senior Public Health Manager - Environment and Planning, Cambridgeshire County Council).

The evidence suggests that there seems to be well documented research about the barriers/enablers of walking/cycling in terms of active/utilitarian travel but little on recreational/leisure aspects of the former. The safety of pedestrians near level crossings is well documented but there appears to be nothing in terms of how this may influence walking patterns etc. There is some evidence on linear/circular routes but which type is chosen depends on personal preference which doesn't seem to be particularly well researched.

The evidence can be group into the following themes:

- The terrain
- Attractiveness of the route
- Walking and cycling for utilitarian purposes
- Human behaviour and other factors

Terrain

The terrain of a walking route is perceived as a barrier only when very steep, and then only in the uphill direction [1] [2]. This may need to be taken into account when a diversion route takes the path uphill, for example up onto a road to avoid/cope with bridges and under passes over or under the railway track.

Short walkable distances to a destination can encourage utilitarian walking [3] [4] there is little evidence on distance and recreational walking [4]. When several choices to reach a destination were available, the shorter distance was preferred for transportation walking.

[1] OpenAthens allows access a range of quality information online. Users can access Healthcare Databases Advanced Search(HDAS) and nationally purchased content.

Vast open spaces for walking such as wide paths and pavements and large open land covered with grass encourage walking, while a lack of such spaces, such as narrow pavements can discouraged it [3] [5].

Attractiveness

The evidence suggests that pedestrians are sensitive to the attributes of the walking network, such as intersection crossing aids, parts of the street and building face environment along urban routes. People walking are willing to go out of their way to use more attractive facilities, but their tolerance for detours is limited, more so than for cyclists. Elements of the built environment can enhance or detract from a potential route. Both the street and adjacent walking environment correlate with route attractiveness [1] [5] [2] [4] [6].

Natural elements such as trees and plants are pleasant and encourage walking while the absence of trees discourages walking [3].

Noise pollution caused by traffic or construction discouraged walking. Traffic noise disturbs the contemplations of walkers, while an atmosphere of calm and quiet in the environment made it possible to think while walking. The green elements can reduce the discouraging influence of noise pollution [3].

Walking for recreation is associated with supportive infrastructure; and cycling for transport is associated only with street connectivity. There is limited evidence of any associations between environmental attributes and cycling for recreation [7] [8] [6].

Recreational walking was associated with presence, proximity, and quality of recreational destinations and route aesthetic. Both walking for recreation and walking for utilitarian purposes were found unrelated to route safety and traffic in most studies [5] [2] [6].

Attributes associated with walking for exercise were different from those associated with walking to get to and from places [9].

Utilitarian walking and Cycling

When walking for utilitarian purposes, walkers do not choose their path at random but chose to maximize the utility of the route [1].

There is consistent evidence that better access to relevant neighbourhood destinations (e.g., local stores, services, transit stops) can be conducive to adults' utilitarian walking. Some evidence also suggests that availability of pavements and well-connected streets can facilitate utilitarian walking [5] [6].

Adults' utilitarian walking is associated with the presence and proximity of retail and service destinations. It is also associated with functional aspects of routes (pavements and street connectivity) [5].

Human behaviour and other factors

Walkers in groups (more than one walker) may prefer more direct routes than solo walkers, there is no significant differences in route preferences for female pedestrians [1] [10] [2].

Providing an encouraging environment for walking can encourage many people to increase their physical activity, including those of low economic status, which needs to be taken into account for closures in the Fenland area [3].

Improper conduct by drivers and the high speed of cars and bicycles are reasons of the sense of inadequate safety [2], these are emphasized in walking with children in low income areas [3].

Recreational walkers tend to respond to surveys indicating they prefer circular routes as opposed to linear routes. This may be due a number of factors but the evidence suggests there are a number of intertwined psychological and physical reasons based around the idea of the futility of the return trip, including a desire not to see the same scenery twice. Another is to do with the perceived accessibility of linear routes and in particular how to get back to your starting point if you don't want to walk [11].

Physical environment contributed significantly to explain the probability of walking. However, different attributes of environment were related to transportation versus recreation walking, suggesting the need for multiple and targeted interventions to effectively support walking [12] [2].

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[4] B. E. Saelens and S. L. Handy, "Built Environment Correlates of Walking: A Review," *Medicine & Science in Sports & Exercise,* vol. 40, no. 7, pp. S550-S566, 2010.

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[10] M. Johnson, L. Blank, R. Jones, H. Buckley Woods and N. Payne, “Synthesis of evidence relating to barriers and facilitators to implementing interventions that promote cycling and walking, and to carrying out cycling and walking for recreational and travel purposes.,” The University of Sheffield - School of Health and Related Research (ScHARR), Sheffield, 2012.

[11] V. Sixsmith, “Making Linear Walks more Attractive to Recreational Users,” *Countryside Recreation,* vol. 12, no. 2, pp. 11- 13, 2004.

[12] C. Lee and A. Vernez Moudon, “Correlates of Walking for Transportation or Recreation Purposes,” *Journal of Physical Activity and Health,* vol. 3, no. 1, pp. S77-S98, 2006.

Appendix B - Cycling/Walking and Mental Health - Evidence Review

This evidence review seeks to address the following question:

- What is the evidence on the benefits/detriments of walking and or cycling on mental health

Headline findings

The published evidence reviewed supports the premise that walking and cycling can have positive effects on mental wellbeing. There is stronger evidence that physical activity positively affects mental health and therefore a conclusion could be drawn that walking and cycling (as forms of physical activity) will also have positive effects on mental health. The main finding from the published guidance is that there are other factors which need to be included in any programme of walking and cycling to increase its effectiveness.

Potential Implications of crossing closures

- The diverted walks/rides need to be easy to find and navigate and should be accompanied with relevant support literature e.g. maps, information on places of interest, places to rest/relax along the route e.g. cafes, pubs etc.
- The routes chosen should be as conducive to walking and cycling i.e. address traffic safety issues and should make the best use of open green space.

A summary of the evidence is given below and is structured into the following areas: NICE guidance, Cochrane Reviews, Published Papers, and Grey Literature such as best practice notes, reports etc.

NICE Guidance/Briefings

NICE guidance PH 41 Walking and cycling: local measures to promote walking and cycling as forms of travel or recreation [2] suggests increasing how much someone walks or cycles may increase their overall level of physical activity, leading to associated health benefits including promoting mental wellbeing.

Increasing walking or cycling can also help Increase the number of people of all ages who are out on the streets, making public spaces seem more welcoming and providing opportunities for social interaction. The specific NICE recommendations relevant to Cycling and Mental Health for local action are contained in Table 1 below:

[2] Walking and cycling: local measures to promote walking and cycling as forms of travel or recreation, November 2012 NICE public health guidance 41.

Recommendation	Who should implement guidance	What is the local action(s)

5 - Cycling Programmes	• Public sector leads
	• Organisations with an interest in cycling
	• Public health practitioners
	• Public transport operators
		• Implement town-wide programmes to promote cycling for both transport and recreational purposes. Programmes could include:
		  • provision of information, including maps and route signing
		  • fun rides, recreational and sponsored group rides
		  • use of leisure routes on and off roads

6 – Walking (community-wide programmes)	• Public Sector Leads
	• Clinical commissioning groups
	• Organisations with an interest in walking
		• Ensure all programmes offer a variety of routes, paces and distances at different times of the day (including evenings and on different days of the week or at the weekend). Programmes could include:
		  • community-wide events, such as mass participation walking groups
		  • walks led by suitably trained walk leaders
		  • Ensure walking routes are integrated with accessible public transport links to support longer journeys.
		  • Signage should give details of the distance and/or walking time, in both directions, between public transport facilities and key destinations.
		  • Provide information tailored for individuals who want to go walking without joining a group or club.
		  • Develop and implement a publicity strategy to let the local community know about the walking routes and events and how accessible they are.

7 - Walking (individual support)	• Public Sector Leads
	• Clinical commissioning groups
	• Organisations with an interest in walking
		• Ensure individual support is available for anyone who is walking on their own, walking informally with others in a group, or participating in local walking programmes.
		• Ensure additional, one-to-one support is offered … this could be provided face-to-face, via the telephone or by using print-based materials, email, the Internet or text messaging.
		• Provide general information including:
		  • maps, signs and other details about walking routes
		  • how to visit places of interest on foot (such as shops, educational or recreational facilities)

		• Details on surface quality and accessibility.
Recommendation 10 (NHS):	• Clinical commissioning groups • National commissioning board • Primary and secondary healthcare professionals	• Incorporate information on walking and cycling into all physical activity advice given by health professionals • Ensure people who express an interest in walking or cycling as a way of being more physically active are given information about appropriate national and local initiatives.

Table 1: NICE PH 41 Recommendations

The Guidance in PH41 is limited in terms of direct guidance on cycling and mental health although the guidance acknowledges the relationship between increasing levels of physical activity through walking and cycling leading to associated health benefits which includes *"promoting mental wellbeing"*. It should also be noted that interventions on their own may not increase levels of cycling and walking without taking into account other factors such environmental factors, and therefore interventions should be seen as part of wider strategy to increase walking and cycling.

The **NICE local government briefing on Walking and cycling**[3] confirms that being inactive is a major health risk, and around 65% of men and 75% of women in England do not achieve the level of physical activity recommended by the Chief Medical Officer (at least 150 minutes of moderate intensity activity a week.

Inactivity is associated with an increased risk of many diseases and conditions, and being active can also help maintain mental wellbeing. Physical activity doesn't need to be vigorous to promote health, moderate activity such as brisk walking or cycling is effective. Walking and cycling can fit into daily life to provide regular exercise as well as being a predictable and cheap form of transport for short trips.

A wide-ranging programme of initiatives, involving all local authority departments, will help local communities to walk and cycle more. Initiatives should address the main barriers to walking or cycling as well as offering ways in which people can start walking or cycling. Among the key actions are:

- ensuring there is a network of paths for walking and cycling between places locally
- including practical support, information about options (including public transport links to support longer journeys), routes, cycle parking and individual support

3 NICE local government briefings - Walking and cycling, 23 January 2013 http://publications.nice.org.uk/lgb8

Cochrane Reviews

Whist there are no specific Cochrane review on the effect of walking and cycling on mental health there is a systematic review looking at the effects of travel planning on health. As part of the systematic review "Organisational travel plans for improving health"[4] the links between "health" and cycling and/or walking contained in the papers have been reviewed. Only one paper measured health outcomes directly. Mutrie 2002[5], a workplace intervention in people contemplating or preparing for active transport. It found significantly greater improvements in SF-36 scores for the intervention group compared with the control group, for the sub scales of mental health, vitality and general health. Changes in the five other SF-36 sub scales (physical function, role limitations due to physical health, bodily pain, social function, and role limitations due to emotional health) were not significant.

Published Journals and Articles

A literature review for articles containing the terms "cycling" and "mental health" was undertaken, the search was not restricted by date, language or publication status, the

following electronic databases were used:

- MEDLINE
- EMBASE
- CINAHL
- PSYCINFO
- AMED
- BNI
- Health Business Elite
- HMIC
- Cochrane Database of Systematic Reviews

In addition other resources were searched including "grey" literature, including relevant conference proceedings, published guidance and internet sources.

The Dr J Kennard[6] suggests that Lifestyle, psychotropic medication, and inadequate physical health care all contribute to the poor physical health of people with mental illness. Exercise is increasingly proclaimed as a cost effective, natural and highly accessible activity that has both preventative and curative properties when related to mood states, although the literature associating physical activity to mental health outcomes remains somewhat mixed with both positive and negative effects being reported. Despite this, the body of evidence points towards moderate exercise as a viable intervention for the treatment of anxiety, depression and the elevation of mood.

[4] Hosking J, Macmillan A, Connor J, Bullen C, Ameratunga S. Organisational travel plans for improving health. Cochrane Database of Systematic Reviews 2010, Issue 3. Art. No.: CD005575. DOI: 10.1002/14651858.CD005575.pub3.

[5] Mutrie N, Carney C, Blamey A, Crawford F, Aitcheson T, Whitelaw A. "Walk in to Work Out": a randomised controlled trial of a self help intervention to promote active commuting. Journal of Epidemiology and Community Health 2002; 56:407–12.

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D.K. Humphreys et al[7]. looked at the associations between active commuting and physical activity and mental health. The results show an association was observed between physical wellbeing (PCS-8) score and time spent in active commuting after adjustment for other physical activity but no such relationship was found for mental wellbeing. The conclusion is that greater time spent actively commuting is associated with higher levels of physical wellbeing. It should be noted that this paper did not examine the associations between recreational walking and cycling and physical and mental health.

Emma J Adams et al.[8] examined the correlates of walking and cycling for transport and recreation and concluded that:

- walking for transport was associated with supportive infrastructure, availability of local amenities and general environment quality
- walking for recreation was associated with supportive infrastructure
- cycling for transport was associated only with street connectivity.
- There was limited evidence of any associations between environmental attributes and cycling for recreation

This research didn't explore the links between mental health and cycling/walking but looked at the environments conducive to these activities and hence it is relevant as it concluded that walking for recreation was associated with a supportive infrastructure i.e. traffic safety, environmental quality etc.

James Jarrett et al[9]. researched the cost savings to the NHS of increased active travel in urban areas, they concluded that increased walking and cycling in urban areas could have positive effects on many health outcomes. An increase in walking and cycling could lead to a reduction in the prevalence in seven diseases (Type 2 diabetes, dementia, cerebrovascular disease, breast cancer, colorectal cancer, depression, and ischaemic heart disease) associated with physical inactivity. Over 20 years would lead to savings of roughly UK£17 billion to the health service in England and Wales (2010 prices) after adjustment for an increased risk of road traffic injuries. The largest reduction in the number of cases was for depression, followed by ischaemic heart disease, type 2 diabetes, and dementia.

[7] Humphreys DK et al. Associations between active commuting and physical and mental wellbeing, Preventive Medicine 57 (2013) 135–139

[8] Adams et al. 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), International Journal of Behavioral Nutrition and Physical Activity 2013, 10:87 Page 10 of 15 http://www.ijbnpa.org/content/10/1/87

[9] Jarrett J, Woodcock J, Griffiths UK, Chalabi Z, Edwards P, Roberts I, Haines A, Effect of increasing active travel in urban England and Wales on costs to the National Health Service, The Lancet, Vol 379 June 9, 2012 www.thelancet.com

Although not specific to the UK and therefore may not be generalizable to the UK, research carried out in Japan by Masanori Ohta et al.[10] concludes that leisure time exercise and walking or cycling during commuting may be associated with better mental health in men (there was no association for women). The study assessed mental health status using a general health questionnaire and compared this to levels of physical activity undertaken either as leisure or community by walking or cycle.

Although the Bikebus project is an intervention for those with low level mental health, there is research on exercise and severe mental health. A systematic review and meta-analysis of randomised controlled trials comparing the effect of exercise interventions on individuals with serious mental illness by Robert Pearsall et al[11] concluded that exercise therapies can lead to a modest increase in levels of exercise activity but overall there was no noticeable change for symptoms of mental health, body mass index, and body weight. It should be acknowledged that this systematic review was looking at severe mental illness and exercise therapies, rather than cycling and walking for leisure as an intervention and the outcome was to promote exercise take up rather than improving mental health through exercise.

A study in Australia by Erin Devine[12] reported that a pilot cycling program appeared to have a positive impact with improvements in service users' mental and physical health. The study is not robust and no objective measures were taken. The findings are based on staff members reported improvements in the mental health of participants and self reported improvements from those attending and therefore the findings should be taken with caution, also the participants were drawn from existing services users with diagnosed mental health illness.

In 2007 MIND[13] published a report looking at the benefits of "ecotherapy" i.e. using the outdoors as a setting for mental health interventions. The study looked at self reported improvements/decline in mental health of people attending various out door activities including cycling and walking. The report concluded that ecotherapy is emerging as a clinically valid treatment option for mental distress, green exercise has particular benefits for people experiencing mental distress. It directly benefits mental health (lowering stress and boosting self-esteem), improves physical health (lowering blood pressure and helping to tackle obesity), provides a source of meaning and purpose, helps to develop skills and form social connections.

[10] Ohta M, Mizoue T, Mishima N, Ikeda M Effect of the physical Activities in Leisure Time and Commuting to Work on Mental Health, Journal of Occupational Health 2007: 49: 46-52
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[13] MIND Ecotherapy The green agenda for mental health www.mind.org.uk

The report also compared indoor walks to outdoor walks, the main findings are shown in Table 2 below and conclude that outdoors walks show a greater increase in self reported improvement in self-esteem, depression and tension compared to indoor walks.

Mental Health Issue	Outdoor v's Indoor	Improvement %	No Change %	Got Worse %
Self - Esteem	Outdoor	90	5	5
	Indoor	17	39	44
Depression	Outdoor	71	23	6
	Indoor	45	33	22
Tension	Outdoor	71	29	0
	Indoor	28	22	50

Table 2: Percentage of people who experienced improvements, following the outdoor and indoor walks

Other Evidence (Best Practice, Government Reports etc.)

The Glasgow Centre for Population health produced a briefing paper[14] on the built environment and health and found that proximity to an adequate quantity of high-quality greenspace has been found to have a protective effect on health and that recent studies on the health-promoting effects of urban greenspace identified the need to provide opportunities for sports, unstructured activities (e.g. trees for children to climb) and passive pursuits (e.g. places to connect with nature and enjoy the view) to take place.

In 2010 the Department of Health and the GO South West[15] produced a report on the cost benefits of investing in walking and cycling, the main conclusions are that the volume of literature on Cost Benefit Analysis of interventions to promote routine walking and cycling reveals that the economic justification for investments to facilitate cycling and walking had previously been under-rated. Walking and cycling are the principal means by which physical activity can be built into lifestyles to reduce the risk of developing 20 conditions and diseases; including mental health problems.

[14] Glasgow Centre for Population Health, Briefing Paper 11 concept series, The Built Environment and Health: an evidence review. November 2013 www.gcph.co.uk
[15] Davis Dr A, Value *for* Money: An Economic Assessment of Investment in Walking and Cycling Department of Health and the Government Office for the South West March 2010

The MIND[16] guide to physical activity gives a general overview of the links between physical activity and mental health. It doesn't specifically examine cycling or walking but advises that physical activity can boost mental wellbeing and change a person's outlook on life, and that physical activity can help people with anxiety and depression.

The Mental Health Foundation[17] surveyed GP's to gain an understanding of the knowledge and willingness to prescribe exercise as a form of treatment for mental illness, the report found a general lack of knowledge amongst GP's as to both the value of exercise for mental illness and a lack of knowledge of locally available schemes. The report only focused on exercise referral programmes rather than general exercise such as walking or cycling for recreation.

THE Local Government Unit[18] produced a report and guidance on walking as means of increasing physical activity drawing from other research it states:

- "The Chief Medical Officer indicates that it [walking] can be as effective as psychotherapy or medication in the treatment of clinical depression"
- Walking can improve self-esteem and relieve symptoms of depression and anxiety[19]. The report looked at led walking programmes and suggests walk led programmes need to be included in a suite of interventions. The relevant recommendation from the report is that local commissioners should invest in promoting walking, recognising its strong business case as a cost-effective preventative health measure. In addition it suggests that a comprehensive approach to led-walks should be developed, targeted at groups and communities with health needs, high levels of obesity and who are likely to face health inequalities or social exclusion.

[16] Grant T (MIND), The Mind guide to physical activity, Mind 2004 www.mind.org.uk
[17] Mental Health Foundation, Up and Running Exercise therapy and the treatment of mild or moderate depression in primary care, Mental Health Foundation 2005
[18] Heron C and Bradshaw G (Local Government Information Unit) Walk This Way Recognising Value In Active Health Prevention, LGiU 2010 Centre for Local Sustainability LGiU
[19] Mobily, KE, Rubenstein LM, Lemke JH, O'Hara MW, and Wallace RB. Walking and depression in a cohort of older adults: the Iowa 65+ rural health study. J. Aging Physiol. Activ. 4:119-135, 1996

Appendix C - Summary of the evidence of open/green space and health

This document is a high level summary using the commonly used/referenced papers/reports and guidance which have assessed the links between open/green space and health. It is therefore not a definitive review but a reasonable summary of the evidence.

There are some key concepts which factor in the evidence of the links between Health and Open Space, these concepts are:

- Defining what is green space
- What is accessible green space

Both these need to be considered when discussing the value of accessible open/green space.

What is "green space"?

A broad range of open space may be of public value and included in green space assessments of need and provision. Definitions of green space vary and overlap and include the terms: public spaces, urban spaces, open spaces and green spaces are these terms are often used interchangeably within the literature.

The Department for Communities and Local Government[i] published a consultation paper in 2010 on planning policy and shaping healthy environments. Within this paper the government defined a wide range of green spaces.

- parks and gardens – including urban parks, country parks and formal gardens
- natural and semi-natural urban green spaces – including woodlands, urban forestry, grasslands, common land, wetlands, areas of open and running water, wastelands, derelict open land and rock areas
- green corridors – including canal and river banks, cycle ways and rights of way
- outdoors sports facilities (with natural or artificial surfaces, either publicly or privately owned) – including tennis courts, bowling greens, sport pitches, athletics tracks, playing fields and other outdoor spoors areas
- amenity green space – including informal recreation spaces, green space in and around housing, domestic gardens and town or village greens
- provision for children and teenagers – including play areas, adventure playgrounds, skate parks, basketball courts and other informal areas
- allotments, community gardens, city (urban) farms and land used for permaculture
- cemeteries and churchyards
- accessible countryside in urban fringe areas
- civic spaces, including civic and market squares
- landscape around buildings – including street trees

What is Accessible Open/Green Space?

There are no national standards on what constitutes accessible open space; however some Local Authorities have set standards through the local plan process, for example:
The Bristol's Parks and Green Space Strategy[ii] has set a distance standard which aims to safeguard and encourage an accessible network of green spaces. The standard is based on local research which identified the distance Bristol residents felt they could reasonably walk

to access green space which coincided with the layout of Bristol's green spaces to ensure the standards were credible.
The distances included:

- distance to the nearest green space – 400m/nine minutes' walk
- children's play space – 450m/10 minutes' walk
- formal green space – 600m/15 minutes' walk
- informal green space – 550m/13 minutes' walk
- natural green space – 700m/18 minutes' walk

Natural England has developed an **Accessible Natural Greenspace Standard (ANGSt)**[iii] which provides local authorities with a detailed guide as to what constitutes accessible green space. The standard recommends the distance people should live from certain types of green spaces and also recommends the size of the green spaces in conjunction with distance to homes. It recommends all people should have accessible natural green space of:

- at least two hectares in size, no more than 300m (five minutes' walk) from home
- at least one accessible 20 hectare site within 2km of home
- one accessible 100 hectare site within 5km of home
- one accessible 500 hectare site within 10km of home

The standard also recommends a minimum of one hectare of statutory local nature reserves per thousand people.

The Fields in Trust organisation has developed a benchmark[iv] for accessible outdoor sport and play, which recommends that:

- playing pitches should be available within 1.2km of all dwellings in major residential areas
- athletics tracks equipped with floodlighting should be within 30 minutes' drive (45 minutes in rural areas) of local residents (per 250,000)
- community tennis courts should be located within 20 minutes' travel time (walking in urban areas, by car in rural areas)
- bowling greens should be located within 20 minutes' travel time (walking in urban areas, by car in rural areas)
- local areas for play and informal recreation should be within 100m walking distance
- local equipped areas of play and informal recreation should be within 400m walking distance
- neighbourhood equipped areas for play and informal recreation should be within 1km walking distance
- size of playing space:
    - designated equipped playing space (0.25 hectares per thousand people)
    - informal playing space (0.55 hectares per thousand people)
    - children's playing space (0.80 hectares per thousand people)

The Public Health Outcomes Framework (PHOF) includes an indicator on the use of outdoor space for health or exercise reasons, which provides an important incentive for local authorities to ensure good quality, accessible open spaces in local areas.

What is the evidence of the links between Health and Open Space

Proximity to plentiful, good quality green space has an important influence on the health of local populations[v] [vi] [vii] [viii], and accessible, good quality green space is linked to better and more frequent use of green spaces[ix] [x] [xi].

Evidence collated by the Kings Fund concluded that:

- every 10 per cent increase in exposure to green space translates into a reduction of five years in age in terms of expected health problems (Groenewegen et al 2003)[xii]
- Green space has been linked with reduced levels of obesity in children and young people in America (Liu et al 2007)[xiii]. There is also strong evidence that access to open spaces and sports facilities is associated with higher levels of physical activity (Coombes et al 2010[xiv]; Lee and Maheswaran 2010)[xv] and reductions in a number of long-term conditions such as heart disease, cancer, and musculoskeletal conditions (Department of Health 2012)[xvi].
- The proportion of green and open space is linked to self-reported levels of health and mental health (Barton and Pretty 2010)[xvii] for all ages and socio-economic groups (Maas et al 2006)[xviii] through improving companionship, sense of identity and belonging (Pinder et al 2009)[xix] and happiness (White 2013)[xx].
- Living in areas with green spaces is associated with significantly less income-related health inequality, weakening the effect of deprivation on health (Mitchell and Popham 2008)[xxi]. In greener areas, all-cause mortality rates are only 43% higher for deprived groups compared to 93% higher in less green areas.
- However, people from more deprived areas have less access; children in deprived areas are nine times less likely to have access to green space and places to play (National Children's Bureau 2013)[xxii].

The evidence on the cost effectiveness of providing open space is mixed, there are studies which look at uptake and use of open space and therefore links have been drawn to possible reductions in obesity and improved mental health.

Let's Make Scotland More Active, the Physical Activity Task Force (PATF) conducted a study focusing on Scottish data for coronary heart disease, colon cancer and stroke. The study proposed goal of reducing the level of inactive Scots by 1% each year for the next 5 years and the economic benefits associated with the number of life years saved due to preventing these deaths was estimated to be £85.2 million.

An evaluation of the Walking for Health project carried out in 2009 gave an illustrative cost–benefit analysis and estimated that it would deliver 2,817 quality adjusted life years (QALYs) at a cost of £4,008.98 per QALY. Based on life-costs averted, it was estimated that this would make a saving to the NHS of around £81m. There was no evaluation of the different QALY impact of the programme on different parts of the population and therefore it is not possible to summarise the potential impact on health inequalities.
There is evidence however, that access to green space is associated with a range of better health outcomes and income-related inequality in health is less pronounced where people have access to green space. However, access to green space is unequally distributed across England, which in turn contributes to health inequalities, i.e. the most affluent 20% of wards in England have five times the amount of green space than the most deprived 10% of wards. Furthermore, people who live in the most deprived communities are ten times less likely to live in the greenest areas than people who live in the least deprived communities.

Health and Play Space
Regular participation in physical activity among children and young people is vital for healthy growth and development. Less than a third of boys (32%) and a quarter of girls (24%) aged 2 – 15 achieve the minimum physical activity levels needed for good health in England (Start Active, Stay Active)

Biodiversity
There is little evidence on the links between Health and Biodiversity, however the concepts are around "health depending upon ecosystem products and services" (such as availability of fresh water, food and fuel sources) which are requisite for good human health and productive livelihoods. Biodiversity loss can have significant direct human health impacts if ecosystem services are no longer adequate to meet social needs. Indirectly, changes in ecosystem services affect livelihoods, income, local migration and, on occasion, may even cause political conflict.

Relevant NICE Guidance on open/green space
Promoting physical activity, active play and sport for pre-school and school-age children and young people in family, pre-school, school and community settings (PH17)
This guidance is for all those who are involved in promoting physical activity among children and young people, including parents and carers.
The NICE recommendations give advice on:

- how to promote the benefits of physical activity and encourage participation
- high level strategic planning
- the importance of consultation with children and young people and how to set about it
- planning and providing spaces, facilities and opportunities
- training people to run programmes and activities
- how to promote physically active travel such as cycling and walking.

One of the barriers identified to children and young people undertaking physical activity include environmental, economic and social factors and perceptions about safety and accessibility. Weather conditions, and C&YP perceptions of what type of conditions make it suitable to be outside.

Inequalities exists for those with disabilities and the guidance recommends that if children with disabilities are encouraged to communicate their preferences, changes can be made to the physical environment, activities and the attitudes of others to help them to participate. Practitioners can encourage and nurture positive peer interaction through play and other physical activity opportunities.

Physical activity and the environment (PH8)
This guidance offers the first evidence-based recommendations on how to improve the physical environment to encourage physical activity. The seven recommendations cover strategy, policy and plans, transport, public open spaces, buildings and schools. They include:

- Ensure planning applications for new developments always prioritise the need for people (including those whose mobility is impaired) to be physically active as a routine part of their daily life.

- Ensure pedestrians, cyclists and users of other modes of transport that involve physical activity are given the highest priority when developing or maintaining streets and roads.
- Plan and provide a comprehensive network of routes for walking, cycling and using other modes of transport involving physical activity.
- Ensure public open spaces and public paths can be reached on foot, by bicycle and using other modes of transport involving physical activity.

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