CYCLING AND HEALTH

A Briefing Paper for the Regional Cycling Development Team

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Written by:

Nick Cavill
Independent consultant
and health promotion advisor to the Regional Cycling Development Team

Dr Adrian Davis
Independent consultant on transport and health

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Renu Bindra
Steve Essex
Mayer Hillman
Marcus Jones
Richard Keatinge
Larry Martindale
Susie Morrow
Marie Newton
Lindley Owen
Harry Rutter
Daniel Seddon
Ken Spence
Chloe Underwood

Nick Cavill. Nick@cavill.net
Adrian Davis. adrian.davis@phonecoop.coop

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INTRODUCTION

This paper aims to provide a comprehensive briefing on the links between cycling and health. It is intended primarily as a background paper for the Regional Cycling Development Team, to help team members in two main areas of activity:

- Making the case to local authorities and others on the strong evidence that exists on the health benefits of cycling and that the benefits are substantive when set against the risks

- Working with the NHS to promote cycling - to NHS facilities and through broader public health activities

The paper begins by describing the strong evidence that underlines the importance of physical activity and exercise to public health, before exploring the evidence for the specific health effects of cycling. The risks of cycling – both direct and indirect are set out, followed by a section looking at the wider benefits of cycling. Finally, the new structure of the NHS is explained, together with a description of the main policies of interest.

The paper makes a number of recommendations for action by the English Regions Cycling Development Team, based on evidence of best practice, where available. .

The paper provides the basis for a summary leaflet to be published by the NCS Board in 2003. This can be used for broader distribution to underline the strong health case for increasing levels of cycling in the UK.

1. CYCLING AND HEALTH - A BRIEF HISTORY

In the post war period up to the mid 1990s, the road transport sector collaborated little with health professionals beyond the involvement of environmental health officers in the monitoring of air and noise pollution, and the health service's focus on traffic casualties. Transport was something of a hidden health issue.[1] There was little information to encourage professionals from either transport or health disciplines to consider other possible effects on health. Cycling levels were in a long-term decline, down from 24 billion kilometres % in 1949 to just 4.4 billion kilometres by 1994,[2] and were inversely mirrored by steeply rising car use. Transport policy was heavily focused on increasing road network capacity for motorists, which became known as 'predict and provide' – predicting the road space necessary for rising use of motor vehicles, and providing it.

By the mid 1990s there were some specific examples of intersectoral collaboration on transport and health issues beyond the traditional areas of concern such as traffic injuries and pollution, [3] [4] but these were rare. At a policy level a notable example of collaboration is to be found in England in the growing acceptance of the value of walking and cycling in meeting access needs while providing regular, moderate aerobic physical activity necessary to provide health gains.[5] In 1996 two reports showed a hint of policy convergence: the launch of the National Cycling Strategy in 1996[6] set targets for quadrupling the number of journeys made by cycle by 2012 (from a 1996 baseline). In the same year the Department of Health issued the outcome of a consultation on physical activity, *A Strategy Statement on Physical Activity*. This placed the emphasis on physical activity as part of the routine of daily life and specifically identified cycling (and walking) as a means of achieving suggested physical activity levels. The rationale for this *Strategy Statement* was the need to address heart disease and stroke, and the sharp rise in overweight and obesity in the population.[7] This convergence of policies offered opportunities for inter-sectoral collaboration at both the national and local level in order to achieve some specific transport and health policy objectives. The evidence base for the health benefits of cycling was previously made in a 1992 report published by the British Medical Association (BMA).[8]

The 1998 Integrated Transport White Paper *A New Deal for Transport: Better for Everyone* made significant references to health and began by acknowledging that:

> "The way we travel is making us a less healthy nation[9]".

It noted that coronary heart disease is the biggest killer of adults, a problem exacerbated by low levels of walking and cycling and an over-reliance on motorised transport. Five overarching objectives of transport policy were set out.

These were to:

- improve safety
- promote accessibility
- contribute to an efficient economy
- promote integration
- protect the environment.

The White Paper introduced the concept of Local Transport Plans (LTPs). LTPs are 5-year plans setting out a strategy for transport for an area, and should contain five key elements:

- Objectives consistent with the five overarching objectives for transport as set out in the White Paper.
- an analysis of the problems and opportunities.
- a long-term strategy to tackle the problems and deliver the Plan objectives.
- They should be costed and affordable.
- A set of targets and performance indicators and other outputs .

Guidance to local authorities from the Department for Transport on the development of Local Transport Plans includes a section on 'Working In Partnership', which addresses the range of partners with whom local authorities have to work with in putting together their LTPs. The guidance states that Health Improvement Programmes (as named at that time) are the formal mechanism for recording how health and local authorities and their partner organisations plan to take forward the objectives of the Government's health strategy for England set out in *Saving Lives: Our Healthier Nation*. The Health Act 1999[10] gave health authorities a statutory requirement to produce HImPS, and made it a requirement that local authorities were involved in their production. The Act also allowed joint funding of schemes between health and local authorities. Page 38 gives full details of the HImP process.

Health professionals interested in promoting physical activity have also embraced the concept of joint working with transport professionals, with an increasing focus on environmental interventions[11 12] through improvements to local environments so that they are perceivably attractive and safe, and in particular can meet everyday travel needs.[13] The importance of cycling as a means to achieve greater sustainability and improvements to public health from transport was recognised in the Charter on Transport, Environment and Health adopted by Member States of the European Region of the WHO in 1999 at the 3rd Ministerial Conference on Environment and Health.[14] More recently concerns about health, particularly the trend of rising levels of obesity in the population have led to calls for greater efforts at collaborative action between transport and health staff.[15]

2. THE IMPORTANCE OF PHYSICAL ACTIVITY FOR PUBLIC HEALTH

> "There are major opportunities for achieving large health gains for the European population by increasing levels of routine physical activity. Walking and cycling as means of daily transport can be a most effective strategy to achieve these gains."[16]

Physical activity is the broad term used to describe 'any force exerted by skeletal muscle that results in energy expenditure above resting level'[17]. Thus 'physical activity' includes any form of human movement including walking, cycling (as sport or transport), play, active hobbies, recreation, or manual occupations, as well as structured exercise or sport.

In recent years, participation in physical activity has declined in the UK, in common with most westernised countries[45.] There are far fewer manual jobs than there were, fewer journeys are taken by bike or on foot, and the physically active elements of housework, shopping and other activities has diminished. The change in lifestyle has been particularly dramatic for children, with outdoor play often being replaced by the TV or computer games, and an increase in the proportion of young people being driven to school and elsewhere[18]. This decline in routine physical activity has had a negative effect on public health. This section will present the evidence for the health benefits of a physically active lifestyle, and describe the importance of physical activity for improving public health.

Health Benefits of physical activity

There is now an extremely strong body of research to support the links between regular physical activity and good health. The first study on this subject in the 1950s found that bus conductors (who tended to be physically active) had far lower rates of heart disease than bus drivers (who were more sedentary), despite similar backgrounds[19]. Since then numerous other studies have reported similar observations, which were reviewed in a landmark report by the US Surgeon General[20]. This presented the following table of health benefits of physical activity (Table 1) which will be described in more detail.

Table 1. The benefits of regular physical activity[16]

Regular physical activity improves health in the following ways:

- Reduces the risk of dying prematurely
- Reduces the risk of dying prematurely from heart disease
- Reduces the risk of developing diabetes
- Reduces the risk of developing high blood pressure
- Helps reduce blood pressure in people who already have high blood pressure
- Reduces the risk of developing colon cancer
- Reduces feelings of depression and anxiety
- Helps control weight
- Helps build and maintain healthy bones, muscles and joints
- Helps older adults become stronger and better able to move about without falling
- Promotes psychological well-being

All-cause mortality

Regular physical activity reduces the risk of all cause mortality – meaning that being active reduces the overall risk of dying prematurely from any cause. Many studies show that the likelihood of death is lowest among those who are most physically active, and the greatest benefit from increasing physical activity comes to those who are least active to start with. A recent review of 44 studies showed that higher levels of physical activity (or fitness) are associated with reduced risk of all-cause mortality for women and men. There is an inverse dose-response relationship, meaning that as the level of physical activity increases, the risk of all-cause mortality decreases[21]

This reduced risk can be achieved through relatively modest amounts of physical activity. For example the Honolulu Heart Programme[22] found that the mortality rate in men who walked less than 1 mile per day was nearly twice that of men who walked more than 2 miles per day. Andersen et al[23] reported that higher levels of leisure-time physical activity were associated with lower levels of all-cause mortality in both men and women. Cycling was featured strongly in this study: cycling to work decreased the risk of dying by approximately 40% (as will be discussed later).

Cardiovascular disease

The main forms of cardiovascular disease (CVD) are coronary heart disease and stroke: about half of all deaths from CVD are from coronary heart disease (CHD) and nearly a third from stroke. CVD is the main cause of death in Europe – accounting for over 4 million deaths each year[24]. This is 49% of all deaths (55% for women and 43% for men). CVD also the main cause of years lost due to an early death. The Global Burden of Disease study[25] points out that in established

market economies an average of 31% of all years of life lost are due to CVD. The government has made CVD a priority in the NHS because it is common, frequently fatal, and largely preventable.

Coronary Heart Disease

Lack of physical activity is one of the most important risk factors for CHD. People who have a physically inactive lifestyle have about double the risk of developing CHD compared to those who have an active lifestyle[26]. Higher levels of physical fitness have also been shown to lessen the harmful effects of other CHD risk factors such as smoking, high cholesterol or blood pressure.[27]

Studies have consistently shown that reducing the risk of CHD can be achieved through relatively low levels of activity, and the benefits can be achieved during middle age by replacing an inactive lifestyle with an active lifestyle or increasing cardiorespiratory fitness[28 31]. Previously sedentary people who begin to be regularly active achieve the greatest proportional benefits to health. As well as cycling, activities that have been shown to protect against CHD include walking, sport, exercise and recreational activity, moderate or heavy gardening, and stair-climbing. Physical activity has to be current to be of benefit however – it cannot be 'banked' for later life

Stroke

There is evidence for the protective effect of physical activity against stroke, but the relationship is not as strong as for CHD. There appears to be a preventive effect of physical activity on stroke incidence, and the majority of studies report lower incidence of stroke in association with regular light to moderate activity compared to inactivity. Physical fitness is related to risk of stroke: a recent study found that moderate to high levels of cardiorespiratory fitness were associated with lower risk of stroke mortality[29].

Diabetes

Type 2 diabetes (sometimes known as 'adult onset diabetes') is the most common metabolic disorder world-wide, and is associated with a number of associated illnesses. The incidence of Type 2 diabetes has increased dramatically in recent years, with some cases now being noted in children[30]. Obesity plays a central role in the development of Type 2 diabetes[31].

Physical inactivity is a major risk factor for the development of type 2 diabetes, and can increase the risk of developing type 2 diabetes by 33-50%[32]. Walking and cycling are associated with reduced relative risk for diabetes[33].

Blood pressure

Regular physical activity can help to reduce blood pressure in people with high blood pressure (hypertension). Exercise training can reduce blood pressure in hypertensive patients with average decreases of 11mmHg for systolic and 8mmHg for diastolic blood pressure[34]. Among people with normal blood

pressure, reductions are in the range of 4.4 mmHg systolic and 3.2mmHg diastolic. Again, those at highest risk appear to benefit most.

Cancer

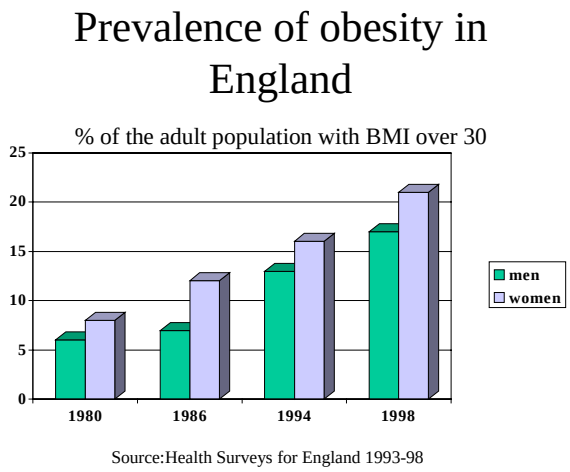
Physical activity is associated with an overall reduced risk of dying from cancer[35]. Several studies have indicated an inverse, dose-response relationship with occupational or leisure-time physical activity.

The strongest evidence exists for cancer of the colon: physical activity has a protective effect on colon cancer [29] with an average risk reduction of 40-50%.

Physical activity appears to be associated with a reduced risk of breast cancer, and there may also be a protective effect on lung cancer, although the evidence is not entirely consistent [29 36].

Overweight, obesity and associated conditions

More than 50% of adults in the UK are overweight, putting them at increased risk of hypertension, coronary heart disease, type 2 diabetes, and osteoarthritis[37]. Obesity occurs when a person puts on weight to the point that it seriously endangers health, and is defined as a body mass index (height/weight^2) of over 30. Levels of obesity have risen dramatically in the UK in recent years: one in five adults is classed as obese, a trebling of levels in the 1970s. This can be classed as an 'epidemic' of obesity, rapidly catching up with levels in the the USA.



Source:Health Surveys for England 1993-98

Obesity is an increasing problem in young people: the Health Survey for England in 1997 found that 20% of four year olds were overweight, and 8% were obese. Among 16 to 24 year olds 23% of young men and 19% of young women were overweight and a further 6% of young men and 8% of young women were obese[38].

Weight gain occurs when the energy taken in as food exceeds the energy expended through physical activity. Food surveys in the UK tend to show that the average energy intake has either fallen or remained unchanged, which implies that declining levels of physical activity are the main cause of the epidemic of obesity[39].

Physical activity does not have to be done at an intense level or in a structured manner to prevent weight gain. One study showed that moderate intensity lifestyle activity (eg cycling, walking or stair-climbing for an additional 30 minutes on most days of the week) combined with dietary intervention, achieved a weight reduction comparable to doing three aerobic classes per week[40]

Mental health and well being

Physical activity is associated with improved subjective well-being, mood and emotions. These effects are seen in populations of all ages and are independent of socio-economic or health status[41] .

Physical activity can also improve self esteem[42] and results in positive changes in various aspects of physical self-perceptions such as body image or physical self-worth. The effect is stronger for those with initially low self-esteem such as mental health patients and those with mild depression. Active individuals also report fewer symptoms of anxiety or emotional distress and report improved sleep patterns.

Inactive people are more likely to develop clinically defined depression[43] .

Physical activity is effective in reducing clinical depression[44] , and has been shown to be at least as effective as traditional treatments such as psychotherapy. Those who maintain physical activity for six months report less use of medication and are more likely to recover than those solely on medication.

Building and maintaining healthy bones, muscles and joints

Physical activity helps to build and maintain healthy bones muscles and joints and hence preserve independent function. Physical activity has particular positive effects three main conditions: osteoporosis, osteoarthritis, and low back pain.

Physical activity has a positive impact on osteoporosis - a bone disorder defined in terms of abnormally low bone mineral density. Osteoporosis increases the risk of fracture and often causes pain, disability and deformity. Physical activity that includes a measure of impact – such as running, jumping and skipping, (but not cycling)– can increase bone mineral density (BMD) in adolescents, maintain it in young adults, and slow its decline in old age[45]. Physical activity can also reduce risk factors for osteoporotic fracture, such as low body weight.

Physical activity may help prevent osteoarthritis although there is not direct evidence. Among people with osteoarthritis, walking has some beneficial effects on disability, pain, and patients' overall assessment of outcomes.

Exercise training is effective in preventing low back pain [39]. General aerobics-type exercise programmes can help prevent recurrence of low back pain, and can be as effective at reducing low back pain as physiotherapy or use of training machines, and are three to four times less expensive[46].

Benefits for older people

Physical activity reduces the risk of diseases and conditions which affect the ability of older people to live independently. Of particular importance is the reduction of risk of falls and accidents through improved strength, balance and co-ordination. Physical activity, and in particular strength training, has been found to be highly effective in reducing the incidence of falls. Strength, flexibility, balance and reaction time have been identified as factors that can be effectively improved by training to produce a reduction in the risk of falls.

The importance of physical inactivity compared to other 'unhealthy' behaviours

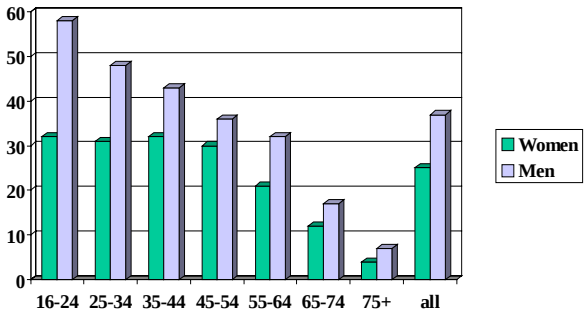
The evidence presented above demonstrates how many aspects of health can be improved through regular physical activity of at least a moderate intensity. But to identify how important it is for public health in the UK, it is necessary to look at physical inactivity compared to other threats to health, and to assess this along with an estimation of the numbers of people affected.

The risk of inactivity

Physical inactivity, as mentioned above, carries a 'relative risk' for coronary heart disease of around 2. This means that an inactive and unfit individual will have roughly two times the risk of coronary heart disease when compared to someone active and fit. This level of 'relative risk' is at a similar level to other factors such as smoking or having high blood cholesterol. From the public health perspective however, the most important issue is the degree of 'population attributable risk'. This provides an estimate of the true public health burden of any threat to health by multiplying the relative risk by its prevalence within the population. So a potentially serious and debilitating disease would have a low population attributable risk if it only affected a small minority of people. Conversely a disease or condition can become extremely important if it threatens the health of a large number of people.

This is the case with physical inactivity: a large proportion of the population can be classed as insufficiently active. Physical activity tends to decline dramatically with age and men are more active than women. For example, the Health Survey for England[47] found that only 37% of men and 25% of women are active at recommended levels, with levels of activity declining with age in both men and women, with a marked decline after the age of 54 years. The prevalence of inactivity is higher in men than women and increases with age. In the oldest age group, just over 7 out of 10 men and 8 out of 10 women are inactive.

Proportion of men and women meeting 'half an hour a day' guideline



Source: Health Survey for England 1998

As a result of these low levels of participation in regular physical activity, the population attributable risk of inactivity is high. The National Heart Forum[48] has estimated that 37% of CHD can be attributable to physical inactivity - second to elevated blood cholesterol in its importance, and far higher than smoking. They estimate that 9% of all Coronary Heart Disease could be avoided if people became just moderately active. As table 2 shows this puts action on physical activity second only to reducing high levels of cholesterol.

Table 2. Proportion of all CHD that could be avoided if levels of five different risk factors were reduced, UK

Risk factor	**Most likely change**	**% reduction in CHD**
Blood cholesterol	All with levels < 6.5 mmol/l	10
Physical inactivity	All light and sedentary become moderate	9
Blood pressure	50% with levels < 140/90 mm Hg	6
Smoking	Prevalence of 24%	0.5
Obesity	6% men, 8% women with BMI >30	2
Total		28

Trends in activity

Another justification for a focus on physical activity is that the trend is in the 'wrong' direction. In the last 20-50 years it appears that there has been a decline in the role of manual occupations, a corresponding increase in desk-bound and other sedentary jobs, and changing patterns of participation in sport and leisure activities. Data to support this are rare however, as few surveys have been carried out over a long-enough time span. The Health Survey for England found that between 1994 and 1998, there was a 5% increase in the proportion of inactive men and a 6% increase in the proportion of inactive women, while the proportion of men meeting the current physical activity guidelines remained

unchanged, with a 3% increase among women. The largest difference in age groups was observed for men aged 16-24 years, with the proportion active at recommended levels increasing by 8% between 1994 and 1998 [40].

Data from the General Household Survey[49] suggests a 20% increase in the number of men reporting any walking occasions between 1987 and 1996 and a 17% increase in the number of women. The proportion of men reporting any cycling occasions increased by 50% but remained relatively unchanged for women. However, it is notable that travel surveys find a contrasting picture: the National Travel Survey suggests that both walking and cycling declined between 1975/76 and between 1998/2000. Total miles travelled per year on foot reduced by 27% and miles travelled by bicycle reduced by 25%. The distance walked fell by a fifth, from an average of 244 miles per person per year in 1985/86, to 195 miles in 1995/97. Over the same period, the average distance cycled fell from 44 to 39 miles[50]. It appears, therefore, that infrequent occasions of long walks and cycling for pleasure have increased in recent years, but walking and cycling for transport have decreased.

Young people are also walking and cycling less, particularly to school. Data on school travel show that the proportion of 5-10 year olds being driven to school has increased from 22% in 1985/6 to 36 % in 1998/2000 [43], with corresponding decreases in the proportions walking and cycling. The school journey masks a more fundamental issue – that for many young people the opportunities to be physically active as part of daily life are becoming increasingly restricted. Parental concerns over safety mean that many young people are not being given the freedom to explore their surroundings on foot or by bike, and instead spend increasing amounts of leisure time playing with computers or watching TV. Coupled with this, pressures on the curriculum have led to a squeeze on the time put aside for physical education and sport. The result is an overall low level of activity among young people: a Department of Health Survey found that around four out of ten young males (aged 4 to 18) and six out of ten young females are not active for the hour a day recommended for young people[51].

Costs to society of an inactive lifestyle

The high prevalence of morbidity and mortality related to physical inactivity also carries great financial costs to society. The National Audit Office produced the first authoritative estimates of the costs and consequences of obesity in England. They estimated that obesity accounted for 18 million days of sickness absence and 30000 premature deaths in 1998. On average, each person whose death could be attributed to obesity lost nine years of life. Treating obesity costs the NHS at least £½ billion a year, with the wider costs to the economy in lower productivity and lost output amounting to a further £2 billion each year [31].

In the US, the direct health care costs associated with inactivity have been estimated at between $24.3 billion and US $37.2 billion[52]. This is between 2.4%

and 3.7% of total health care costs. When obesity costs are included, this rises to a minimum of 9.4% of all direct costs. It has been found that medical costs were on average $330 lower per year for active persons than their inactive counterparts. Thus the costs to society of inactive lifestyles are clearly significant, not only in terms of the pain and suffering caused by premature death and disability, but also in financial terms – especially costs to the health service

How much activity is enough?

During the mid-1990s, an international consensus was established on the value of regular moderate intensity physical activity. The World Health Organization (WHO) was among many international and national agencies that highlighted the importance of moderate activity for health, encouraging at least 30 minutes of physical activity daily. The 30 minutes can be built up over a day, so that two or three bouts of 10 or 15 minutes each provide important health benefits[53]. For young people (2-16) the aim is to be active for an hour a day. Thus cycling is ideally placed to contribute to overall activity levels, as it is one of the few activities that can be carried out as part of daily life, without the need for separate time put aside for exercise. A bike ride of fifteen minutes (at least 2 miles for most cyclists) to work, to the shops or to a friend's house and back being all that is needed to meet the daily recommendation for adults. The following section will describe the evidence for the health benefits specifically related to cycling.

3. EVIDENCE FOR THE SPECIFIC HEALTH EFFECTS OF CYCLING

Cycling is clearly a form of physical activity, but it has a number of specific qualities that affect the potential for improving health. This section will look into the evidence for the specific health effects of cycling.

Cycling uses the large skeletal muscles of the body in a rhythmic pattern, with periods of active work, usually alternating with rest periods. In addition, longer periods of rest occur in 'normal' urban cycling, dictated by factors such as traffic lights and other road users. The rest periods allow recovery from high levels of activity when in motion. The presence of rest periods means that the level of energy expenditure during the active phase can be high. At the same time, the efficiency with which the bicycle transfers human energy to motion allows swift progress relative to energy expenditure.

The energy expenditure by a cyclist obviously varies depending on a range of factors including speed and road and wind conditions. In the laboratory, energy expenditure is relatively simple to measure using a cycle ergometer. "Normal" cycling, which requires the individual to breathe more heavily but without feeling out of breath, is generally considered to be appropriate for health gain without undue risk. Energy use during such "normal" cycling, for instance commuter cycling, is likely to represent around 60% VO2max (VO2max is maximum oxygen uptake and is the standard measure of aerobic fitness). Such levels of activity are sufficient to produce measurable improvements in fitness over a relatively short period of time.[54] These factors make it a highly suitable activity to provide aerobic exercise and so improve physical fitness.[55]

Randomised trials of the effects of cycling on fitness, health and mortality. Randomised controlled trials (where groups of people are randomised into intervention and control groups and the results compared) provide the most reliable evidence for the effect of an intervention. In recent years there have been a number of experiments using this methodology that have included cycling to test the effects of physical activity on health. Dutch research has demonstrated that cycling as part of normal daily activities can yield much the same improvements in physical performance as specific training programmes. The higher the total distance cycled during a 6 month trial period of activity among men and women who had not participated in regular intensive exercise over the previous six months, the higher the gain in maximal external power and maximal oxygen uptake[56] For those with a low initial fitness level, a single trip distance of 3 kilometres per day each way was found to be enough to improve physical performance if repeated at least three times a week. This matches other research which has found that men with low cardiorespiratory fitness who became fitter had a lower risk of cardiovascular disease mortality than men who remained at a low level of fitness.[57]

Research from Finland provides some of the strongest evidence for the health benefits of cycling. Two studies suggest that journeys to and from work by bicycle provide exercise of sufficient intensity and duration to improve fitness and health, and that travel by bicycle provides greater increases in measured fitness than does walking.[58] [59] This was on the basis of cycling for 30 minutes, at the participants' own pace, (one way) during commuting. This intervention involved volunteers at a workplace who previously commuted by car or by bus. Among those changing to cycling important physiological changes were found. These consisted of improved aerobic fitness; decreased cardiovascular load in submaximal standard work; increased use of fats as an energy source in physical activity; HDL cholesterol. These changes were observed in healthy young to middle aged adults of low to moderate physical fitness. The researchers concluded that the activity involved in commuting to work has significant potential to maintain or improve health-related physical fitness of previously relatively sedentary healthy adults.[60]

Epidemiological studies of cycling and health

Studies which follow cohorts of subjects over time and compare the relationships between different variables (in this case between regular cycling and health) provide the next most reliable form of evidence. The most substantive study in this category is the Copenhagen Heart study, which involved 13, 375 women and 17, 265 men aged between 20- 93 years who were randomly selected from a population of 90,000 living in central Copenhagen. Of this cohort 14,976 cycled regularly and of whom 6,954 cycled to work. The average time spent cycling in those who did cycle to work was three hours per week. The study found that cycling has a strong protective function.

Assessed by self-reported health, blood pressure, cholesterol, Body Mass Index, and risk factors such as smoking, the researchers concluded that:

> "even after adjustment for other risk factors, including leisure time physical activity, those who did not cycle to work experienced a 39% higher mortality rate than those who did [61]

This is a very important finding as it provides direct evidence that regular cyclists are likely to have decreased mortality compared to non cyclists.

Other evidence for the health benefits of cycling

A UK study of non-exercisers who agreed to take-up cycling on at least four days a week found that the greatest benefits were near the beginning of the intervention, and the more the volunteers cycled, the fitter they became. Body fat was also significantly reduced among most of those of the volunteers who were overweight or obese at the outset (59% of volunteers). The extent of the fat loss, typically two to three kilograms of fat mass over the period of the trial, should

mean that they achieve a change in energy balance, making it easier for them to control their weight while they continue to cycle.[62]

Leg strength increased overall, showing a more even progression over the entire trial: about 8% by the end of the first six to eight weeks of cycling, and 16% by the final assessment. An even greater improvement, 26%, was apparent among those cycling more than 19 miles compared with 4.5% for those below this distance. The study also reported attitudinal changes which included perceptions of well-being, self-confidence and tolerance to stress, which all rose. In addition, the reporting of tiredness, difficulties with sleep and a range of medical symptoms declined.[63]

In a 1980s study of male factory workers, cycling had the greatest effect on fitness of all the physical activity variables studied. A fitness advantage of about 12% for the cyclists compared with those who did not cycle was reported irrespective of age. Occasional and regular cyclists enjoyed a level of fitness equivalent to being five and ten years younger. .[64]

In the long-term Whitehall' study of 9,000 civil servants between the ages of 45-64, those reporting cycling at least an hour a week in the round trip to work or at least 25 miles in the previous week experienced less than half the non-fatal and fatal coronary heart disease than did those who took no physical activity during the course of the 9 year study.[65] While the authors acknowledged that as only 7% of the men cycled the overall numbers were too small for proper analysis they did suggest that the results indicated that perhaps any habitual cycling in the middle aged men under study usually entailed enough effort for benefit. Similar key findings as to increased protection as energy expended increases have been made elsewhere.[66]

A cross-sectional study from the US where cycling was one of a range of physical activities included by the researchers, suggest that cycling has a protective function so that higher levels of physical activity are associated with lower risk for coronary heart disease than those who participated in low levels of physical activity. The Framingham Offspring study did not discuss cycling's individual contribution although cycling for work and leisure in terms of kilocalories expended was reported as the ninth most significant activity in men and seventh among women of a total of fourteen.[67]

In a post-mortem survey of cyclists and non-cyclists large myocardial scars and blockages were found among the non-cyclists, who also had more aortic atheroma than the cyclists. The mean age of cyclists with coronary heart disease was also greater than that of the control sample indicating that cycling may delay the onset of coronary heart disease. The findings are in keeping with the concept that regular cycling provides some protection from the development of coronary heart disease. .[68]

Cycling and osteoporosis

Studies of the effects of cycling on osteoporosis are few but there is some evidence that non-weight bearing physical activity, including cycling, may be effective in reversing bone loss, especially lumbar spine mineral density, in post menopausal women.[69] Poor compliance with regular physical activity programmes has been identified as a cause of lack of response in prevention of osteoporosis although there is evidence that forearm bone density among cyclists, where cycling was used as therapeutic exercise, was higher than among non regular cyclists.[70]

Cycling and breast cancer

A recent study into the relationship between physical activity and risk of breast cancer[71] found that regular cycling was associated with a significantly reduced risk of breast cancer. There was a 'dose-response' relationship, meaning that as the amount of cycling increased, the risk of breast cancer decreased. Women reporting the highest levels of cycling reduced their risk of breast cancer by 34%.

Summary

It is clear, therefore, that cycling has the potential to make a significant contribution to improving public health. Cycling not only benefits health in a wide variety of ways, but it is also a highly appropriate mode of physical activity as it can be carried out easily as part of daily life. This includes local journeys to shops, schools, and work places, particularly for the majority of the population who live in urban areas where trip distances are often short. For example, with regards to work commuting practical trials have demonstrated this and it has been concluded that:

> "Walking and cycling during work trips currently provide the possibility for regular physical activity for a considerable proportion of the working population, and there is potential for a substantial increase of actively commuting people."[72] p. S93

4. RISKS OF CYCLING

The benefits outlined above need to be weighed against the risks. This section sets out the evidence for any direct risks of injury as well as indirect risks through road traffic crashes.

Direct injury risks arising from cycling

Although injuries sustained during cycling do occur these are mostly associated with athletes and endurance cyclists. Knee injuries appear to be a particular problem where the knee joint has been under high stress in cycling. In has been reported to occur among new recreational riders who make two errors: setting the saddle too low and the gears too high. These mistakes cause excessive pressure on the patellofemoral joint. A better fitting bicycle and saddle, adjusting the saddle properly, and using lower gears help reduce such problems.[73] Expert advice from bicycle vendors may help prevent these problems.

Another common injury cited in the literature is ulnar nerve lesions among competitive cyclists (the avoidance of which requires frequent changes in hand position). Handlebar problems divide readily into compression syndromes and overuse injuries. These are largely found among endurance and sports cyclists [74] involving extensive cycling and involves numbness, weakness, and loss of coordination in both hands.[75] There is little in the way of literature on this issue which can be found relating to non-sport and competitive cycling although some examples are cited by Richmond (1994).[76] He notes that padded cyclists gloves and handlebar padding are widely recommended to alleviate and prevent ulnar compression.

Back pain is reported, with up to 60% of cyclists studied suffering some form of back pain, although again these were athletic and endurance cyclists.

Saddle sores have been reported to be a problem. These include chafing, perineal folliculitis and furuncles etc .[77] Research in the Netherlands found that saddle-soreness was more common than supposed with 20% of all Dutch cyclists suffering from varying degrees of soreness. Saddle sores were the most common complaint. Among men, the second most common complaint was genital anaesthesia (numb penis). This is the result of a more slumped posture, with their weight pressing down on the front of the saddle. For women the second most common problem was irritation of the genitals, often leading to urethritis and painful urination and vulvitis. The researchers concluded that poor saddle design, and poor adjustment to saddles, and handlebars were major contributors to saddle related problems.[78] It might generally be concluded that injuries sustained during riding among regular commuter cyclists are likely to be minimal and where these occur, riding position and correct adjustment of the machine can ameliorate, if not stop, such problems.[79]

Indirect injury risks arising from cycling

Historically the main focus of concern over cycling (and other forms of road transport) among health professionals has been reported road traffic casualties[80]. This concern is shared by existing and potential cyclists: the real and perceived physical danger posed by motor traffic is one of the main barriers to engaging in cycling.[81 82 83]

Data from the Department for Transport shows that in 2001 there were 19,094 reported casualties among pedal cyclists, including 2,541 cyclists who were seriously injured, and 138 killed, as shown in Table 3. Overall this represents a decline from 1991, set against an overall increase in total casualties[84]. This needs to be set against the increase in travel overall - between 1991 and 1999 total distance travelled increased from 681 to 728 billion passenger km – and a decline in cycling.

Table 3 Cycle casualties in GB: Comparison of baseline average and 2001

	1991	2001
Killed	186	138
Seriously injured	3,546	2,541
Slightly injured	20,653	16,415
All cycle casualties	24,385	19,094

It has been noted, however, that there are serious concerns about a reported casualties because of the high level of under-reporting and misclassification of injuries.

> "The problem with casualty reduction is that by using only one set of data the strategy is in reality very unscientific, not least because the data set used is extremely flawed. Reported accidents are simply that, the accidents that are reported to the police. A succession of studies have shown that, for accidents involving injuries to pedestrians and cyclists, less than half are reported. There is also a significant under-reporting of moped and motorcycle casualties. On top of this, even when accidents are reported to the Police, they are often incorrectly recorded. The main mistake is in recording the severity of injury. TRL report 173 “Comparison of Hospital and Police Casualty Data: A National Study” (Transport Research Laboratory 1996) suggests that, if official statistics were adjusted to take account of this misreporting, the number of serious casualties would be increased by 52%. The same report concluded that the level of incorrect recording had increased significantly over the previous twenty years. Therefore in using reported casualties as our primary source of information we are viewing the problem through a very dim glass indeed."[85]

As a result, casualty figures for cyclists need to be treated with caution. In addition, monitoring of cycle activity itself over the past decade has been far less rigorous than for motorised modes.

To offset the effect of increased travel, reported casualties are often expressed as a rate per billion passenger kilometres. This shows the following rates:

Table 4. Death rates by mode 1991-2000

Great Britain	Rates per billion kilometres travelled		
	1981	**1991**	**2000**
Cycle	57	47	30
Foot	77	75	48
Car	6	4	3

This shows that while cyclists do bear a higher risk than car drivers per billion kilometres travelled, they bear a lower risk than pedestrians. This holds true for all active age groups except boys aged 11-4 (who are more at risk from cycling) [86]. It is also important to note that the actual risk remains small – amounting to one cyclist death per thirty three million kilometres of cycling. This distance would take the average cyclist 21,000 years to cycle. Or, put another way, on average 21,000 average cyclists would have to cycle for a year before one of them was killed.

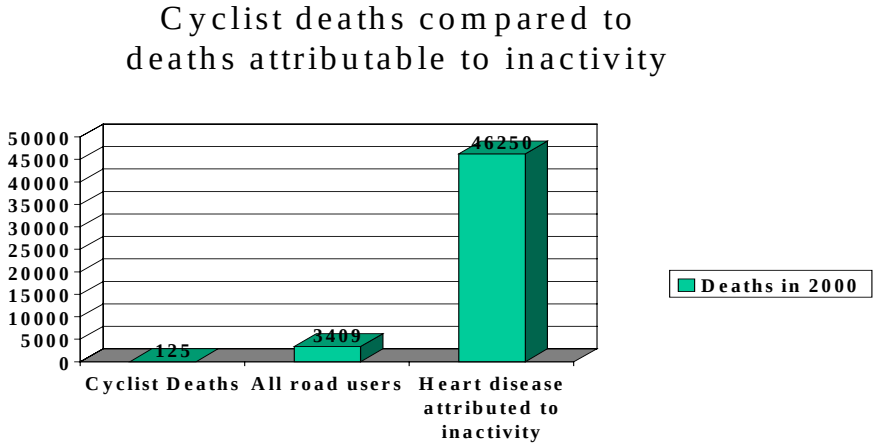
These data also present a skewed picture as the types of roads used by cyclists and cars are different in terms of exposure time. The analysis includes roads such as motorways, which are not used by cyclists. Also, the data include casualties among people aged under 17 who cannot drive cars but are often cyclists.

A Dutch study attempted to remove this bias. The Dutch Ministry of Transport noted that it is more accurate to examine only the risk for distances that can be cycled and not consider the kilometres travelled on motorways, which are the "much safer" kilometres on average. When they adjusted the data to exclude motorway journeys, they found that the chance of being admitted to hospital following a crash is virtually equal for both modes of transport, but in terms of fatalities per billion kilometres travelled there are nearly twice as many among motorists killed as cyclists. In addition, they considered the fact that in the Netherlands, 18-34 year olds drive around one third of the kilometres travelled by car.[87] In this analysis cycling was found to be much safer for individuals age 18-24 than driving a car and that, considering the chance of a fatal accident, persons aged 25-34 could travel by bicycle just as safely as by car for short distances.

It is also important to realise that death rates or casualty rates are extremely blunt indicators as they do not show how people perceive the risk that they take. This can be more important than the 'real' risk, especially if fear of motor traffic stops people from being as mobile as they would like to be.

Two final points are important to note with regard to the balance of risks and benefits from cycling. The first is that cycling is an extremely safe activity in terms of the risk that cyclists present to other road users. Only around 3-7 third parties are killed per year in fatal bicycle crashes, compared to 1,600 third parties killed in fatal car crashes. As one author has noted: "more cycling would almost certainly reduce road deaths[86].

Secondly, the risk of death from cycling pales into insignificance when contrasted with the high rates of death from CHD and other diseases associated with physical inactivity. In 2000, 125,000 people died from coronary heart disease (CHD) in the UK[88]. It is estimated that physical inactivity accounts for 37% of all deaths from CHD[89], meaning that in 2000 over 45,000 deaths were due to lack of activity. An increase in regular cycling would be likely to reduce these rates far more than any increase in risk.



Finally, there has been much debate about the value of cycle helmets with helmet advocates, some of whom wish to see mandatory helmet use, and those opposed to increased pressure for helmet wearing, at loggerheads. Rather than reporting a mass of data here, evidence is drawn from the BMA review of the date published in 1999. This encouraged the use of cycle helmet wearing but was cautious about pressing for this, not least because of a desire not to discourage cycling by placing the onus on the vulnerable to take further action to protect themselves. The BMA report states that:

> Cycling has many advantages to the individual in terms of improved health and mobility, as well as to society via, for example, reduced air pollution and traffic congestion… One of the most important reasons why it could be disadvantageous to make helmet wearing compulsory at the present time, is the risk that it may discourage cycling.[90]

Policies for cycle safety

This analysis above brings up the important issue of transport policies to enhance cyclist safety (ie reduce risk). Low cycling levels, particularly in cities, are often correlated with transport policies that pay little attention to the safety of cyclists. On average 1.5% of all trips in Great Britain in 1999/2001 were made by bicycle.[91].

In York, where the City Council has developed a transport strategy which places vulnerable road users at the top of a road user hierarchy and implemented traffic restraint measures across the city which particularly address motor vehicle speeds, this has led to a reduction in road casualties well above the national average. The priorities are set out in Table 2.

Table 2

York City Council's Transport Priorities[92]

1. Pedestrians
2. People with disabilities
3. Cyclists
4. Public transport passengers
5. Commercial/business vehicles requiring access
6. Car-borne shoppers
7. Coach-borne shoppers
8. Car-borne long-stay commuters and visitors.

Importantly, in York between 1991 and 2000 cycle use has increased from 16% of trips to 19% and walking from 14% to 16% while car use has declined from 55% of trips to 53%. Details of changes in reported road user casualties between the early to mid 1980s and early to mid 1990s are given in Table 5.

Table 5 **Changes to road user casualties in York and the UK**
(Average percentage change 1990-94 from 1981-85 average)[93]

Casualties	York (% change)	UK (% change)
All casualties	-40	-1.5
Pedestrians	-36	-15
Cyclists	-29.5	-12
Powered two wheelers	-65	-54
Car passengers	-16	+16
Car drivers	+ 2.5	+41.5

The level of risk also needs to be related to the potential benefits in terms of improved health. The potential loss of 'life years' (the life expectancy at age of death of all cyclists) in cycle fatalities can be related to the potential gain of 'life years' through improved fitness - particularly as a result of a lowered rate of heart disease. An important report was commissioned by the British Medical

Association (BMA) as a result of concerns among medical practitioners about the levels of death and injury to cyclists. This concern led to a debate and resolution at the BMA's members annual meeting in 1989 for a study of the dangers of cycling to be undertaken. Mayer Hillman, the researcher undertaking the study, persuaded the BMA to include potential benefits of cycling within the research brief. The evidence gathered suggested that when the risks to cyclists of injuries are considered against the benefits to the individual's health from regular cycling the perspective gained is substantially one which favours the promotion of cycling albeit with considerable emphasis on improving safety for cyclists.

> "… existing evidence would suggest that, even in the current hostile traffic environment, the benefits gained from regular cycling are likely to outweigh the loss of life through cycling accidents for the current population of regular cyclists." [94]

Following the publication of the BMA report, the author then published further evidence as the risk and benefits of regular cycling and concluded that the benefits outweigh the loss of life years in cycling fatalities by a factor of around 20 to 1.[95] Furthermore, because it is known from countries such as Denmark and the Netherlands that the risks can be considerably reduced, the potential for an overall benefit to public health from cycling is considerable. However, the more important longer term point is that a shift towards more liveable streets with a 'critical mass' of cyclists and pedestrians being allocated (or claiming) a more equitable portion of the road space would lead to lower traffic speeds and volumes, and a reduction in the risks to cyclists per km travelled.

5. WIDER BENEFITS ATTRIBUTABLE TO CYCLING

The benefits of cycling do not stop at improvements in individuals' physical and mental health but also extend to benefits to wider public health through reduced adverse impacts associated with motor traffic. Reductions in the use of private motor vehicles can, for example, reduce overall emissions from vehicles of both air and noise. Most air pollutants increase proportionately with speed so keeping speeds controlled is important if some motorists switch to cycling and 'release' road space. There is, therefore, a need for road space reallocation. Road space reallocation is likely to be a critical element in increasing levels of cycling.

Improved air quality

It has been estimated that up to 24000 vulnerable people die prematurely each year and similar numbers are admitted to hospital because of exposure to air pollution from particulates, ozone, and sulphur dioxide, most of which is related to road traffic[96]. Air quality is often worse in more deprived areas and affects vulnerable populations more, including exacerbating the symptoms of people with asthma. .

Cycling is a pollution-free, environmentally sustainable mode of transport which makes negligible contributions to congestion. A modal shift (back) to cycling would be good for air quality at the street and district level, and for the environment more generally if some motorists transferred to cycling. Research published in 1991 has suggested that a ten-fold increase in cycling could save up to three quarters of a million tonnes of carbon monoxide, one hundred thousand tonnes of nitrogen dioxide, and sixteen million tonnes of carbon dioxide from being emitted into the atmosphere as a result of modal change to cycling.[97]

It is often assumed that cyclists (and pedestrians), are exposed to higher air pollution levels than motor vehicle occupants because they are physically unprotected. However, in slow moving traffic, typical of 'rush hour' traffic, car occupants can be exposed to higher pollutant levels.[98] Research has concluded that

> 'cars offer little or no protection against the pollutants generated by vehicle traffic. Road users can be exposed to significantly elevated levels of pollutants as they are, in effect, travelling in a 'tunnel' of pollution. Those road users travelling closest to the centre of this tunnel tend to experience higher concentrations of pollutants than those nearer to the roadside'. [99]

Car drivers also suffer up to two to three times greater exposure to pollution than pedestrians in slow moving traffic[100].

Noise pollution
Motorised road transport is a major source of noise in the environmentTraffic noise is likely to contribute to sleep-loss, and stress-related problems such as raised blood pressure and minor psychiatric illnesses.[101] A modal transfer away from car use together with lower speeds would reduce road traffic noise pollution.

Danger
It has been observed that the greater the motor traffic volumes the lower the levels of non-traffic street activity.[102] This is not surprising since more motor vehicles means more noise and air pollution, and greater perceived risk for those on foot and travelling by bike. . Older people and families with young children also find that high road traffic volumes result in insecurity.[103] Heavy traffic, in particular, can frighten and frustrate children.[104] In contrast, streets with relatively low speed limits are safer for cyclists. A review of the results from 250 20 mph zones in England, Wales and Scotland found, among other things, that crashes involving cyclists had fallen by 29%.[105] In addition, crashes at relatively low speeds such as 20mph tend towards less severe injuries and few deaths in contrast to speeds of 30 mph and above.

There is also the potential for reduced danger to cyclists through 'critical mass'. This occurs when there are so many cyclists on the road that they can reasonably expect to be seen by motorists, who tend then to give them greater consideration. This is partly so because when there are relatively high levels of cycling (perhaps over 20%) then it is common for some motorists to also be cyclists. At present the case for a critical mass effect is largely intuitive although lowered risk to each cyclist per unit of exposure, as in cities such as York, Groningen and Copenhagen suggests that critical mass may have a positive influence in reducing danger to cyclists. Of course in locations where cycling is commonplace cycle friendly infrastructure is generally also commonplace.

In addition, there may also be more generic benefits if more people are able to cycle as cyclists may perform a role of 'natural surveillance'. Compared to people in vehicles, cyclists (and pedestrians) are better able to spot anti-social behaviour, deter crime or stop to provide assistance in situations where help is requested

Increased play and activity opportunities for children
As mentioned earlier, the Department of Health recommends that all young people should participate in physical activity of at least moderate intensity (eg feeling 'warm' and slightly out of breath) for one hour per day. Research indicates that only 55% of boys and 39% of girls under 16 undertake at least 60 minutes of physical activity on most days of the week.[106] Some of the reduction in activity levels in recent years has come about because of an increasingly hostile traffic environment, which has contributed to a strong decline in child cycling[110]. In contrast, traffic environments which are supportive of cycling, which control vehicle speeds through cycle-friendly infrastructure such as traffic

calming, and include road space reallocation, can include space for children's play. Research into children's play has concluded that:

> Children's needs for safe access to a diverse outdoor environment on the front street and opportunities for extending their free range mobility along footpath networks and traffic calmed roads, needs to be incorporated in the estate design and management process." [107]

Perhaps more importantly however, high traffic speeds diminishes the ability of young people to interact properly with their environment, learn about their surroundings and develop an appreciation of risk and adventure. Streets with speeding traffic do not make good playgrounds. As one BMJ correspondent stated: "The sad reality is that most streets are now linear car parks with a central race track[108] ".

Social support and inclusion

High levels of motor traffic can increase the extent to which people are cut off from essential facilities and services including shops, health facilities, parks and friends and family. Ease of access to friends and social support is important as social support networks are known to protect health[109]. with some evidence that a lack of social support can increase mortality from coronary heart disease by up to four times.[110] Where a 'cycle-friendly' infrastructure makes cycling a viable option, this enhances opportunities for work, learning, health care, food shopping and other key activities and so contributes to social inclusion. As cycling is cheap relative to car ownership, this also helps those on low incomes to maintain access to work (particularly if public transport is poor), and keep money for food and other critical household expenditure, thus contributing to a reduction in health inequalities.

A high-quality network of separated motor-traffic free cycle paths and off-road routes is needed to help entice would-be cyclists on to bicycles for local trips. Removing some carriageway from motor vehicle use will also help to reduce motor vehicle speed, as speed is directly related to perceived and actual carriageway width. It is important to note that 17% of all trips under 1 mile and 61% of all trips between 1 and 2 miles are made by car,[111] so that there is potential based on distance for a transfer of some of these car trips to cycling.

Benefits to Health and Wealth: a key motivator for cycling

The final argument for stressing the health benefits of cycling is that for many people improving health can be the key incentive that will encourage them to start or maintain cycling. A Dept for Transport survey of motorists who had cut some of their short car journeys recently showed that 34% had done so to get more exercise compared to 8% to help the environment or 2% to reduce congestion[112]. Improving health is clearly a key reason why people may change

travel mode, and cycling can offer a practical and realistic alternative to the car for short journeys, and an amenable mode of exercise.

Cycling to and from work has also been suggested as more acceptable and more cost-effective than formal work-site exercise classes.[113] Advantages to employers have also been reported in a UK survey[114] including improved employee morale, higher productivity and loyalty.

RECOMMENDATIONS FOR ACTION
Health benefits of cycling

- Improving and maintaining health is one of the key reasons why people choose to cycle. Understand the key health arguments to use in discussion with all partners – inside and outside the NHS.
- Address the perceived risk of road crashes and highlighting risks to different modes (eg cars and bicycles) for short journeys set against long term health benefits gained from cycling.
- Stress the importance of physical activity both for personal as well as public health.
- Take a broad view of health benefits – these include casualty reduction and more space for children's play through safer streets as well as a fitter population
- Stress the benefits of a fitter workforce through cycling to employers

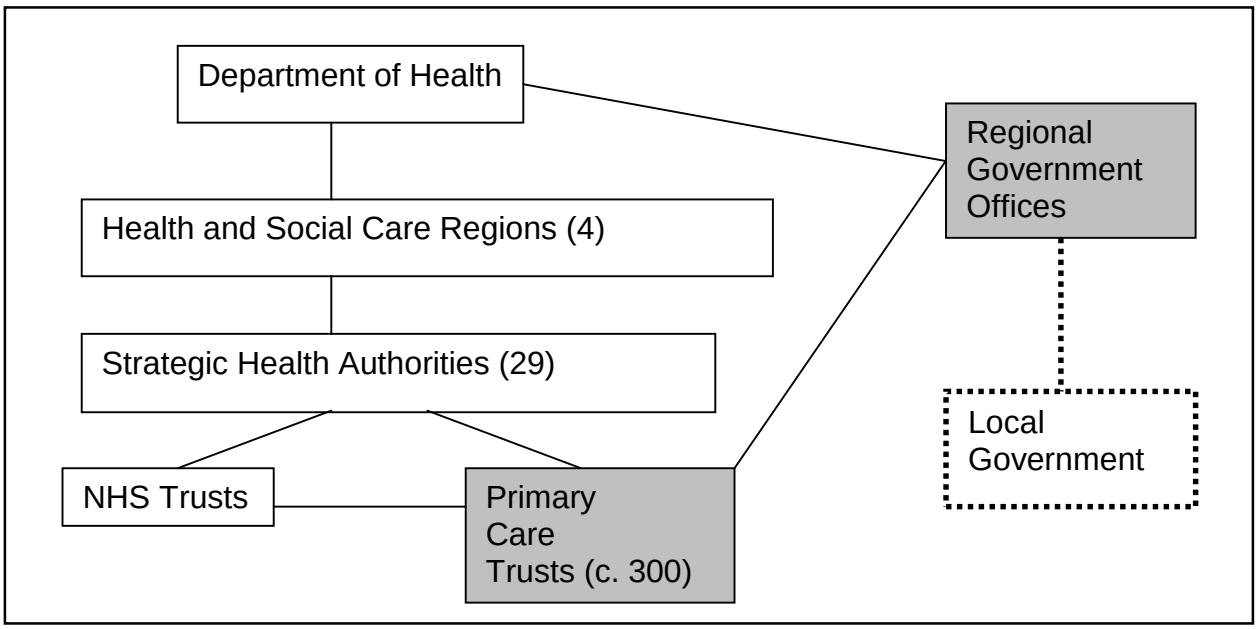
6. CYCLING AND THE RESTRUCTURED NATIONAL HEALTH SERVICE.

A basic understanding of the recently reformed National Health Service (NHS) is essential for all those interested in effectively promoting the links between cycling and health. This section will explain the recent reforms to the NHS; describe the main NHS structures of interest to the cycle promoter; and give some guidance on suggested activities.

The NHS has recently undergone an extensive modernisation programme, representing the largest set of organisational changes in recent years. This follows the publication of a key Department of Health report: Shifting the Balance of Power, in April 2002[115]. This proposed a number of changes to reflect the key themes of devolution of decision-making to front line clinicians and local people. In particular, this emphasised the creation of primary care-led organisations that organise local care, commission from hospitals and also work with local authorities on improving health.

The wholesale restructuring of the NHS has seen the abolition of health authorities and regional offices. They are being replaced with Primary Care Trusts, Strategic Health authorities and a new regional arrangement. Figure 1 shows the new structure from-April 2002. Hospitals and other acute sector care are established as NHS Trusts.

Fig 1: NHS Post April 2002



The Department of Health is the government department responsible for the NHS, and delivers through four new regional departments of health and social care. These in turn manage 29 Strategic Health Authorities, primarily responsible for monitoring and performance management of NHS bodies.

The main NHS organisations of interest to the cycle promoter will be the new Primary Care Trusts. These are statutory NHS bodies that provide the link between the strategic health authority and GP practices and between the demand and supply of acute hospital services. Overall, they are responsible for improving the health of the people in their area, tackling health inequalities and bringing health and social care more closely together.

They have much more flexibility, independence and control of funds than their predecessor organisations - primary care groups. By 2004 they will have 75% of the total NHS budget, ensuring that resources meet local needs. This contrasts with the position in 1997, when GPs were controlling just 15% of NHS spending. The role of the PCT is to steer and support the work of GPs and practice teams, provide a range of community health services through local clinics and hospitals, and commission treatment for patients in acute hospitals

PCTs vary in the size of the population they cover, from around 80,000 people up to around 300,000. The size of the PCT depends on the services it wishes to provide for its local population, the views of local stakeholders and the impact on other local organisations. In many cases PCTs' borders are now coterminous (either singly or jointly with another PCT) with a Local Authority boundary.

In parallel, there is a new arrangement for the Regional Offices of Government. These nine regional offices now contain employees of the Department of Health, responsible for implementing the government's health policies in the regions. This is likely to lead to a greater degree of integration between health and other policies of local government, including transport.

There are two main ways where the NHS can have an influence on cycling (and other forms of transport):

1. Through the public health function
2. As an employer and a transport destination.

These will be outlined in turn.

1. Public Health in the new NHS.

Public Health is defined as:

"The science and art of preventing disease, prolonging life and promoting health through the organised efforts of society[116]

Public health is represented at all levels in the new NHS, with public health staff in both Strategic Health Authorities and Regional Offices of Government. Regional Directors of Public Health will be key people responsible for (among other things) developing public health networks and linking with a wide range of people on the wider health agenda to reduce inequalities. This work is likely to include broad programmes on transport and health.

There will be a public health team in every Primary Care Trust (PCT) focused on improving health, preventing serious illness and reducing inequalities in the populations they serve. The Director of Public Health will be a board level appointment, possibly a joint appointment with the local authority. The Director of Public Health (DPH) is intended to be an accessible, respected and credible authority with local communities and the media, retaining a strong focus on serving local neighbourhoods and communities, leading and driving programmes to improve health and reduce inequalities. They will lead teams of specialist staff, including: public health specialists; health improvement managers; health promotion specialists and health information managers. In smaller PCTs not all of these positions will exist, and some will be part-time. They will have access to modest amounts of funding - a total of £200k-300k for public health in most PCTs. In many cases, public health teams will be particularly interested in adding a public health focus to existing or planned activity carried out by local government.

Links to Local Government

Within the focus on improving health, there is an expectation that the boundaries will increasingly be blurred between local government and the NHS. For example there is increasing evidence of joint appointments of Directors of Public Health between the NHS and local councils, and of pooled resources to create joint units and membership of public health teams. New financial freedoms and flexibilities introduced by the Health Act 1999 strengthen the scope for partnership between PCTs and local authorities by enabling pooled budgets, integrated purchasing and lead agency arrangements at local level, providing the potential for shared resources within and between agencies to address local health and well being.

One of the key developments is the requirement to develop Local Strategic Partnerships (LSPs). LSPs are the new bodies required of local government that "bring together at a local level the different parts of the public sector as well as the private, business, community and voluntary sectors, so that different initiatives and services support each other and work together[117]"

LSPs are expected to highlight how local authorities are delivering all their services including their responsibility for the social, environmental and economic factors which impact on health.

Public Health Networks
Key to implementing changes in the public health function will be public health networks. These are

> "Linked groups of public health professionals working in a co-ordinated manner across organisations and structural boundaries who will have a common agenda to promote health and reduce health inequalities for given populations" [118]

Networks will be needed at different population levels. For example an electronic network at national level to share existing skills and knowledge is proposed, while the nine regional Public Health Observatories will contribute (at the regional level) by providing information and intelligence on health, health determinants and health service responses. Networks will enable the sharing of scarce public health skills and help in the dissemination of good practice within and beyond the NHS.

Main public health policies of interest to the cycle promoter.

Following the changes to the NHS proposed in *Shifting the Balance of Power,* PCTs and primary care practices are a key part of the public health delivery system. The public health function of PCTs is to engage with local communities, local authorities and other local agencies in improving health, preventing disease and reducing health inequalities in the populations they serve.

The main public health targets and priorities have been laid out in three key documents: the public health white paper *Saving Lives*[119], *The NHS Plan*[120] and in the consultation document *Tackling Health Inequalities*[121]. *Saving Lives* set out a new approach to public health that recognises that improvements in the health status of the population require action on the whole range of determinants of health – social, economic and environmental factors as well as lifestyles and access to services. The NHS Plan develops this theme by committing the NHS - and PCTs in particular - to working with local authorities to tackle these wider determinants of ill health and to supporting local strategic partnerships (LSPs). This included the commitment to develop, by 2004 "local action to tackle obesity and physical inactivity, informed by advice from the Health Development Agency on what works."

In addition, national targets have been set for cancer, coronary heart disease, mental health and accidents, together with a number of National Service Frameworks. These will be briefly described.

National Service Frameworks
The NHS Plan emphasised the role of National Service Frameworks (NSFs) as drivers in delivering the modernisation Agenda. NSFs:

- set national standards and define service models for a defined service or care group;
- put in place strategies to support implementation; and
- establish performance milestones against which progress within an agreed time-scale will be measured.

Physical activity has been a component of all the NSFs released to date, including those on Cancer[122], Diabetes[123], Older People[124], and Mental Health[125]. However, the most relevant is the Coronary Heart Disease National Service Framework (NSF)[126]

The NSF for Coronary Heart Disease is the Government's blueprint for tackling heart disease. It sets out the standards and services which should be available throughout England. Prevention of heart disease is a key aspect, and the NSF contains a number of milestones related to physical activity:

> By April 2001 all NHS bodies, working closely with LAs, will:
> - have agreed and be contributing to the delivery of local programmes of effective policies on increasing physical activity.
>
> By April 2002 every local health community (ie at PCT level) will:
> - have quantitative data no more than 12 months old about the implementation of the policies on promoting physical activity.
> – as employers, have developed 'green' transport plans and taken steps to implement employee-friendly policies.

The Health Development Agency has published useful guidance on the preventive aspects of the CHD NSFwhich includes action on promoting cycling.[127]

Health Improvement and Modernisation Plans (HIMPS)
Local strategic partnerships (LSPs) provide the framework for partnership and, more specifically, for linking health improvement and modernisation plans (HIMPs) and community strategies. PCTs have been given the lead in developing and implementing Health Improvement and Modernisation Plans (HIMPs) and this responsibility will come into force from October 2002, subject to new legislation. HIMPs are the three year plan and vision for how the local NHS, with its partners, will modernise services to tackle ill health, as well as the root causes of ill health.

Health Improvement and Modernisation Programmes (HIMPs) are the local plans for improving health and health services and for reducing inequalities in health. As such they might be considered to be the health sector parallel to LTPs. Primary Care Trusts take the strategic lead, but HIMPs are partnership ventures with local authorities and a wide range of other local agencies and communities. Each PCT is required to produce a Health Improvement and Modernisation Plan (HIMP) for their area that will enable the Strategic Health Authority to monitor progress and performance.

Key aspects of the HIMP:

- developed through a bottom up approach involving collaboration with a range of local and community partners including Local Government, private business, voluntary organisations, and more importantly, the patients and public it serves.
- brings together planning for health improvement with the modernisation agenda.
- provides the plan and vision on how the local NHS, with its partners, will modernise services to tackle ill health, as well as the root causes of ill health.
- sets out the three year vision to improve local health.
- includes all key partners in planning of services and they will tackle the root causes of ill health and modernise services.
- will become incorporated within LSPs to help deliver on national health inequalities targets and contribute to neighbourhood renewal
- promote the engagement of PCTs in continuous partnership working with key stakeholders, including StHAs, NHS Trusts, LAs and local communities.
- alignment with other local plans including LA Community Strategies.

PCTs themselves are encouraged to work collaboratively in developing certain aspects of the HIMPs.

There are also a number of area-based initiatives that have been piloting different approaches to health improvement, prevention and tackling inequalities and deprivation. These include the Health Action Zones (HAZ), Sports Action

Zones and other action zones, New Deal for Communities, Sure Start programmes, neighbourhood management pilots and Healthy Living Centres. These can provide PCTs and primary care practices with useful learning from their experiences

Delivery Plans
These are relatively new plans, set out in DH guidance *Priorities and Planning Framework 2003-2006*[128]. This guidance sets out the the priorities for the next three years for the NHS and social services and describes what local organisations and communities need to do to plan for and implement these improvements. It sets out the requirements for PCTs to produce Delivery Plans, which incorporate all previous targets and indicators, including those of the NSFs.

Physical activity strategies.
Many PCTs are involved in developing a strategic approach to the promotion of physical activity across their areas. These often involve close collaboration with the local authority – covering issues of leisure and sport as well as transport. Cycling (both for adults and children) can be a key element of these strategies and PCTs may sign up to targets for increasing both on-road and off-road cycling. Guidance has been produced on the development of local physical activity strategies[129]. A few PCTs have become interested in the potential of cycling on prescription schemes whereby primary care nurses and doctor may prescribe cycling to certain clients. Such schemes are likely to become more popular over the coming years.

PCT development - a cautionary note
The main areas where cycling is of relevance to the NHS have been outlined, and it is clear that there is great potential for development. However, it does need to be pointed out that it is unlikely that cycling will feature prominently on the agenda of most PCT Chief Executives in the first instance. PCTs have a large number of important local and national issues to tackle, and they are relatively young organisations – most have only been in operation since April 2002. Top of mind will be establishing the PCT and its staff, reaching core NHS objectives and targets (as set out in the NHS plan) and balancing their budgets - often while inheriting an overspend from the Health Authority. It is therefore to be expected that there may be initial slow take-up of some ideas about cycling. In some cases cycling may be seen as a peripheral issue - just one form of physical activity, which in turn is only one way of preventing heart disease, for instance. In others, cycling may even be viewed as a dangerous mode of transport which should not be promoted. It will pay to be well briefed on the key arguments and to be persistent.

RECOMMENDATIONS FOR ACTION
Cycling and Public health in the NHS

- Meet the main public health staff in your area: the Regional Director of Public Health (DPH) and the DPHs for the Primary Care Trusts. Find out how they have addressed the issue of increasing cycling.

- Make contact with the public health network and get cycling on their agenda. Offer to make a presentation to one of their meetings.

- Review the extent to which cycling is included in the Health Improvement and Modernisation Plan for each Primary Care Trust. If the HIMP is being drafted, offer assistance.

- Encourage those local authority officials responsible for reviewing and drafting the local transport plan (LTP) to make effective links to the relevant public health professionals on cycling. Make links between LTP and the HIMP.

- Find out if there are any current or planned physical activity strategies for the area, and assess how they address cycling.

- Ask the PCT how they are monitoring their action on physical activity as part of the National Service Frameworks.

- Work with any PCTs or individual GPs surgeries on cycling on prescription or cycle training schemes. Suggest setting some up as pilots.
- Make links with both the PCTs and local authority in helping to develop the Local Strategic Partnership to ensure that matters relating to cycling are included

- GP and nurse practitioners to advocate healthy transport choices for short journeys ie walking for under 1 mile and cycling for under 3 miles
-

School nurses and health visitors to reinforce the message about cycling (and walking) being important for the health of children

- Find local champions supportive of action on cycling and support them

2. The NHS as an employer and transport destination.

The NHS is the largest employer in the UK, and as such is a significant generator of work-related traffic. As well as coping with staff travel, health facilities have to cope with unique problems of traffic congestion caused by the diverse travel needs of patients, visitors and emergency vehicles. This has put a great deal of pressure on the NHS, notably on parking provision within hospitals and other major NHS sites. It is for this reason that emphasis has been placed on tackling this problem at a structural level through NHS travel plans.

Travel plans (sometimes known as *healthy transport plans*) provide a package of measures designed to change the way people travel to health sites. Walking, cycling, travel by public transport and car sharing are all actively encouraged while single car occupancy is discouraged[130]. Measures to encourage cycling thus become a part of an overall package, which may include any of the following:

- Changes to car parking charges and parking restrictions
- Staff discounts for bus season tickets
- Park and ride
- Inter-site shuttle bus services
- Pool cars (reducing the need to drive to work)
- Priority parking for essential users
- Bicycle mileage allowances
- Car sharing schemes
- Traffic calming around the site
- Structural changes to encourage cycling and walking

There are a number of key NHS policy documents that call for the development of travel plans in the NHS:

- The *National Service Framework for Coronary Heart Disease* set a target for the development of 'green' transport plans and employee-friendly policies' by April 2002
- The *New Environmental Strategy for the NHS*[131] also sets a target of the NHS having local transport strategies in place by October 2002.
- *Sustainable Development in the NHS*[132] includes a section on transport which calls for travel plans
- The Department of Health's *Corporate Governance: Controls Assurance* risk management process includes transport as one of the key criterion[133].

Free advice on the development of travel plans is available from **Action Energy** (previously the Energy Efficiency Best Practice Programme) to help organisations overcome transport problems at their site[134]. Sustrans' Active Travel unit also produces a Newsletter which directly addresses travel plan work at NHS sites (e-mail activetravel@sustrans.org.uk to be added to the mailing list).

RECOMMENDATIONS FOR ACTION

The NHS as an employer/destination

- Identify NHS sites in the local area and encourage them to develop travel plans prioritising cycling. Draw upon the resources offered by the **Action Energy** programme, such as free consultancy advice.
- Make sure that cycling for local NHS staff is included as an issue in the local transport plan.
- Encourage NHS employees to develop bike user groups (BUGs). These can offer a valuable forum for support and the sharing of ideas. Help the BUG to get in touch with local cycle pressure groups, local authority, or retailers.
- Help NHS staff to get involved in cycling promotions such as Bike Week or Bike to Work.
- Don't forget smaller NHS premises such as GP surgeries. Bike racks outside surgeries can give a very visible message to the public that the NHS supports cycling
- When premises re-development takes place within PCT and NHS Trusts consider opportunities for improvements for cycle provision – preferably as part of a wider Travel Plan

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