hepa.ch

Muscle-Powered Mobility
Base Document for Switzerland

FOSPO
2532 Macolin

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Office of Sport FOSPO

Swiss Federal Office of Public Health FOPH

Table of Contents

Key facts in brief

This booklet is aimed at specialists who are interested in gaining an overview of physical activity and mobility issues. It provides facts and arguments, illustrates relationships and points out initiatives that can be taken to promote "human-powered mobility".

Physical activity and health
Regular physical activity or regular sport that is at least equivalent in intensity to brisk walking provides effective protection against numerous physical and mental health problems. From a health perspective, the promotion of physical activity is particularly important in the case of people who are insufficiently active, since they derive the greatest health benefit from more physical activity. Walking and cycling are particularly accessible forms of exercise for this group.

Physical activity behaviour in Switzerland
Two out of three adults in Switzerland are insufficiently active. The lack of physical activity among the population increased until the late1990s and then stabilised.

Mobility behaviour in Switzerland
Based on the number of daily journey stages and average journey time, walking and cycling are the most important means of transportation, particularly for children and the elderly. This would suggest that many people already benefit from transport-related health-enhancing physical activity – though even more people could follow their example.

Factors that influence mobility behaviour
How much walking and cycling we do is influenced by a wide range of factors. Some of these factors – such as age, sex, weather or local topography – are beyond our control. However, personal factors such as attitude and motivation – and also factors in our living environment – can be changed through appropriate measures so as to enhance human-powered mobility.

The built environment
There is mounting evidence that the built environment can both promote and impede physical activity. Factors conducive to human-powered mobility include high population density, attractively designed neighbourhoods, short distances to destinations, access to "activity-friendly" outdoor spaces, and integrated foot and cycle path networks.

Promotion of human-powered mobility
The Federal Law on Footpaths and Hiking Trails and other regulatory measures provide an important framework for the promotion of human-powered mobility.

All forms of "muscle-powered mobility" are important, whether they are undertaken for recreational purposes or as a means of transportation, and whether they are moderately intensive or competitive. Promising initiatives should win the cooperation of other sectors and a wide range of organisations. Although the evidence underpinning various measures may still be incomplete, it is constantly improving. Further efforts are therefore needed to evaluate them and existing knowledge needs to be exploited and disseminated.

There are different forms of physical activity promotion efforts:
- Changes to the built environment can probably influence human-powered mobility and physical activity behaviour. There is initial evidence to suggest causal relationships.
- Campaigns and events create additional opportunities for health-enhancing physical activity and mobility behaviour.
- Counselling, support and structured activities that are directed at groups, families or individuals and address individual requirements can significantly improve walking in the medium term.
- Financial incentives are a widely acknowledged means of changing behaviour. They are under consideration in the mobility sector and individual initiatives are already in place.

Introduction

For thousands of years, virtually the only way of getting from place to place, of being mobile, was to use one's own muscle power. Within the space of just a few decades, this state of affairs has changed radically. For a great many people in modern industrialised societies, motorised transport has removed the need to move around "under one's own steam".

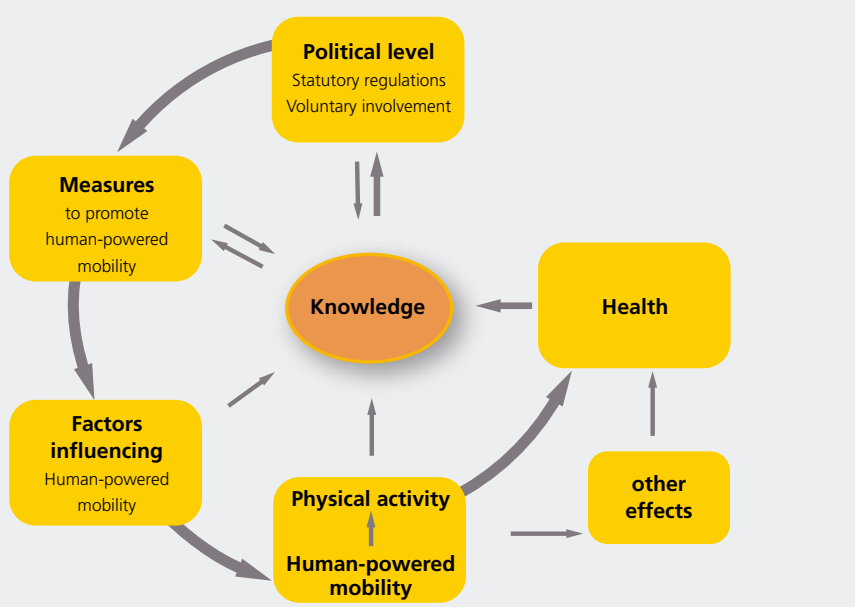
It was only a few years ago that the scientific community and the public at large came to realise that this profound change has robbed our lives of physical activity – with significant implications for our health. Regardless of whether it is undertaken in a competitive sporting context, on foot or wheels, as a means of getting from A to B (to work, for example) or for recreational purposes, muscle-powered mobility is an important and hitherto underestimated health resource.

One of the goals envisaged by the Federal Council in its Concept for a Sports Policy in Switzerland is to improve physical activity behaviour in Switzerland. Among the measures undertaken during the implementation phase from 2003-2006 was the promotion of "Human-Powered Mobility". This involved demonstrating associations between physical activity and mobility behaviour, identifying factors that influence human-powered mobility and collecting experiences from specific interventions. Knowledge was gathered from Swiss projects, the international literature was reviewed and new initiatives by various organisations were evaluated.

This booklet is part of the final documentation for the Human-Powered Mobility project and the Federal Office of Public Health's Action Plan Environment and Health. It is aimed at specialists who are interested in gaining an overview of physical activity and mobility. The booklet provides facts and arguments, illustrates relationships and points out initiatives that can be taken to promote human-powered mobility. This document will also be available to the National Programme on Nutrition and Physical Activity (2008-2012).

Framework for the promotion of physical activity
The framework of the European Network for the Promotion of Health-Enhancing Physical Activity (2006) describes promotion of physical activity as a cyclic process. This booklet makes reference to a version of the framework that has been adapted for use in the promotion of human-powered mobility.

Figure 1



Framework for the promotion of physical activity
a cyclic process: promotion of physical activity through promotion of active mobility;
other levels at which knowledge is gathered and used.

At the political level, the measures to promote active mobility are based either on statutory regulations or on voluntary involvement. They should aim to effect a positive change in the key influencing factors and thus ultimately support human-powered mobility. Ideally, the cyclical process will be knowledge-led – i.e. guided by scientific findings, experiences and expertise from our own projects or those of third parties. In particular, the knowledge base should provide facts on the population's mobility and physical activity behaviour, the importance of different determinants and the acceptance and effectiveness of measures and activities.

The theory and terminology underlying this booklet are informed by the Base Document Health-Enhancing Physical Activity (Federal Office of Sport, 2006). To make this document more readable, source references are listed at the end of the chapters. By way of illustration, several studies are described in more detail and the corresponding references are listed in the text, at the end of the respective box.

Basic concepts

Health-enhancing physical activity

Health-enhancing physical activity (HEPA) is any form of physical activity that improves health and has a minimum of undesirable side effects. Health-enhancing physical activity is characterised by ***intensity, duration*** *and* ***frequency.*** *The health effects of physical activity are defined by the* ***overall activity level.*** *Distinctions are often made between different* ***domains*** *of physical activity, namely domestic activity, transport activity as a means of* ***getting from place to place,*** *at* ***work*** *or during* ***leisure time****.*

The principal source of data on physical activity behaviour in Switzerland is the Swiss Health Survey, which has been conducted by the Federal Office of Public Health (FOPH) and the Federal Statistical Office (SFSO) every five years since 1993 (most recently in 2003).

Mobility

Mobility is understood to mean any form of locomotion that takes place outside of one's own home and serves a specific ***purpose*** *(work, education, shopping, leisure, etc.).*

The most important tool for monitoring mobility in Switzerland is the Transport Survey (Microcensus on Travel Behaviour), which has been conducted by the Federal Office for Spatial Development (ARE) and the Federal Statistical Office (SFSO) every five years since 1974 (most recently in 2005).

Human-powered mobility/non-motorised transport

Human-powered mobility is understood to mean purposeful locomotion on foot, by bicycle or using bicycle-like devices such as pedal scooters or inline skates (rollerblades). It therefore encompasses both ***mobility as a means of getting from place to place*** *(e.g. travelling to work, to the shops or to leisure facilities) and* ***mobility for recreational purposes*** *(e.g. walking, hiking and cycle touring).*

Journey stage

A stage is that part of a journey which is undertaken by a particular mode of transport. For example, a journey to work often consists of several stages (e.g. walk – train – walk).

Modal split

The way in which transport statisticians break down traffic volume by different modes of transport (e.g. pedestrian, car, public railway, etc.) is termed the modal split. The breakdown may relate to the distance covered, the time taken or the different stages.

Physical activity, mobility and health

Physical activity and health

Regular physical activity or regular sport that is at least equivalent in intensity to brisk walking provides effective protection against numerous physical and mental health problems. From a health perspective, the promotion of physical activity is particularly important in the case of people who are insufficiently active, since they derive the greatest health benefit from more physical activity. Walking and cycling are particularly accessible forms of exercise for this group.

The effects of regular physical activity
In many industrialised countries lack of exercise is the commonest modifiable risk factor for conditions such as cardiovascular disease, obesity, type 2 diabetes, various forms of cancer and osteoporosis. Numerous studies show that it is not only intensive sport but also activities such as regular walking or cycling to work that have a significant protective effect. Furthermore, physical activity and sport raise the mood and have an antidepressant effect. Physically active people live longer, need less care and are more independent in old age.

People who have previously been fairly or completely inactive and begin to take regular exercise stand to benefit more from such protective effects than the average person, since the additional health gain from increased physical activity is greatest in sedentary people. Human-powered mobility (e.g. walking) is a particularly suitable form of exercise for these people since it can be integrated into their everyday lives and there is no need either to learn a special technique or to have specific equipment. This also applies to the elderly.

Cycling to work – lower mortality
A series of three studies with more than 30 000 participants investigated the effects of cycling on mortality in Copenhagen between 1964 and 1994. People who used a bicycle to get to work at the start of the study lived longer. Their risk of dying was 28 per cent lower than that of people who did not cycle to work. The protective effect was comparable with the effects of 2-4 hours per week of moderate or intensive physical activity during leisure time. Moreover, the effect was not only observed in healthy individuals, but also in people who suffered from a chronic illness at the start of the study.

Andersen, L.B.; Schnohr, P.; Schroll, M. and Hein, H.O. All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. Arch Intern Med. 2000;160(11):1621-8.

Mobility and overweight
According to a US study (2004), each hour that study participants spent in a car every day increased their risk of obesity by 6 per cent. Conversely, this risk fell by 4.8 per cent for each kilometre that they covered every day on foot.

A study from China (2002) revealed that men in households that had acquired a car during the eight-year study period gained 1.8 kg more weight than men who still had no car of their own.

Frank, L.D.; Andresen, M.A. and Schmid T.L. Obesity relationships with community design, physical activity, and time spent in cars. Am J Prev Med 2004;27:87-96.

Bell, A.C.; Ge, K. and Popkin B.M. The road to obesity or the path to prevention: motorized transportation and obesity in China. Obes Res 2002;10:277-83.

How much exercise do we need?

Adults: Minimum recommendations state that women and men of all ages should do half an hour of physical activity of moderate intensity (i.e. involving a slight increase in breathing rate) every day. Individuals who already achieve this level of activity can do even more for their health, quality of life and fitness by undertaking specific endurance, strength and flexibility training. Endurance training involves doing three 20-minute exercise sessions that work up a sweat every week.

Children and adolescents: Adolescents approaching school-leaving age should be active for at least one hour per day and younger children even more. Optimal development requires a variety of physical and sporting activities. As part of or in addition to the one-hour minimum, at least 10 minutes should be spent several times a week performing activities that build strong bones, stimulate the circulation, strengthen the muscles, maintain flexibility and improve agility. Those engaged in tasks that involve sitting or standing without physical activity for more than around two hours are recommended to take short "active breaks".

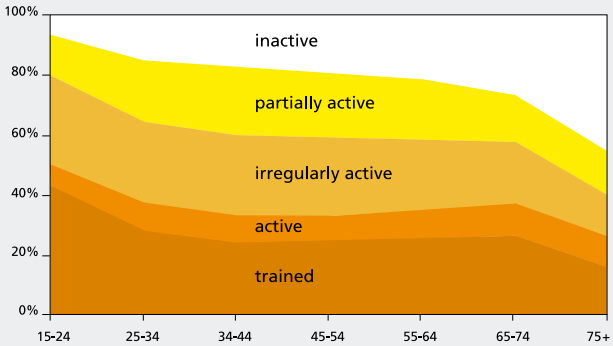
Sources: Federal Office of Sport (2006); Cavill, Kahlmeier & Racioppi. Eds. (2006).

Physical activity behaviour in Switzerland

Two out of three adults in Switzerland are insufficiently active. The lack of physical activity among the population increased until the late1990s and then stabilised.

Data from the Swiss Health Survey 2002 show that around two-thirds (64 per cent) of the adult population neither satisfy the minimum recommendations nor the recommendations for endurance training and can thus be classified as "insufficiently active" or "inactive". At least one-third (36 per cent) do get sufficient exercise: these people either meet the minimum recommendations (9 per cent) or can even be regarded as "trained" (27 per cent) (Figure 2).

Figure 2



Activity levels of the Swiss population

- **Inactive individuals** are physically active for less than half an hour per week.
- **Partially active individuals** engage in certain activities but do not meet the recommended level of physical activity per week.
- **Irregularly active individuals** engage in the recommended amount of weekly physical activity but not with the recommended regularity.
- **Active individuals** engage in activities that get them slightly out of breath for at least half an hour per day.
- **Trained individuals** claim to work up a sweat through physical activity at least 3 times a week.

According to physical activity recommendations, "active" and "trained" individuals get sufficient exercise.

Source: Swiss Health Survey 2002.

People aged 75 and over get significantly less exercise than younger people. People on low incomes get less exercise than people on higher incomes. Although they fulfil the minimum recommendations as frequently as higher earners, they participate in intensive sporting activity far more rarely. There are still no representative data on physical activity behaviour for children.

Inactivity increased between 1992 and 1997 and then stabilised until 2002. In German-speaking Switzerland, where activity levels are in any case higher than in French-speaking areas and in Ticino, the proportion of inactive people has been decreasing slightly since 1997. The trend observed between 1997 and 2002 seems to be primarily attributable to a slight increase in sporting activity. The lack of physical activity in everyday life is, however, continuing to rise. The proportion of people who almost never walk or cycle in everyday life increased from 45 per cent to 49 per cent during this period.

Physical inactivity causes at least 2,900 premature deaths and 2.1 million cases of illness in Switzerland every year. The costs of medical treatment directly attributable to inactivity are estimated at CHF 2.4 billion.

Sources: Lamprecht & Stamm (2006); Federal Office of Sport (2006).

Mobility behaviour in Switzerland

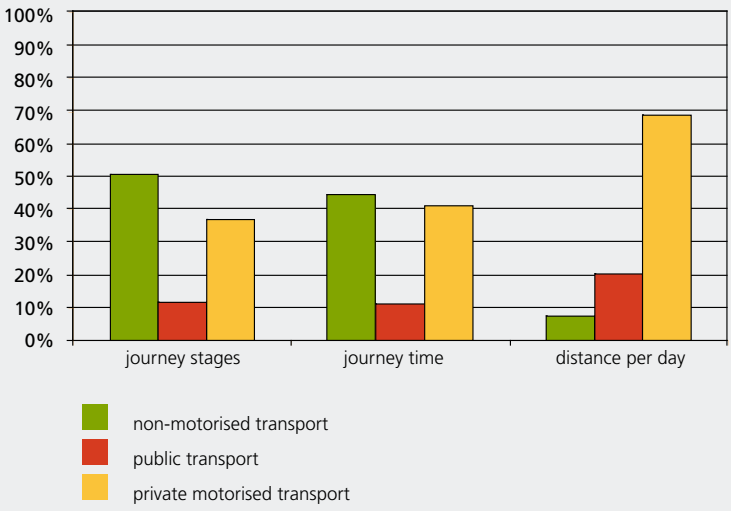
Based on the number of daily journey stages and average journey time, walking and cycling are the most important means of transportation, particularly for children and the elderly. This would suggest that many people already benefit from transport-related health-enhancing physical activity – though even more people could follow their example.

Overview

Nine out of ten Swiss residents are "traffic participants" at least once every day. On average they clock up 37 kilometres per day and spend 88 minutes en route (inland travel only, not including air transport). One in every two journey stages is undertaken on foot or by bicycle (Figure 3), with an average journey time of 39 minutes. The greatest distance is covered by car (25 kilometres), followed by public transport (7.7 kilometres). The average distances covered on foot and by bicycle are 2.1 kilometres and 0.8 kilometres, respectively.

The principal journey purpose is leisure, followed by work, shopping and education. Leisure accounts for around 41 per

Figure 3



Modal split by journey stage, journey time and distance covered
Most journey stages are undertaken on foot or by bicycle, and journey times on foot or by bicycle are longer than by other modes of transport. The greatest distances are covered by private motorised transport.

Source: Microcensus on travel behaviour 2005.

cent of all journeys, 45 per cent of the total distance covered and 52 per cent of the journey time.

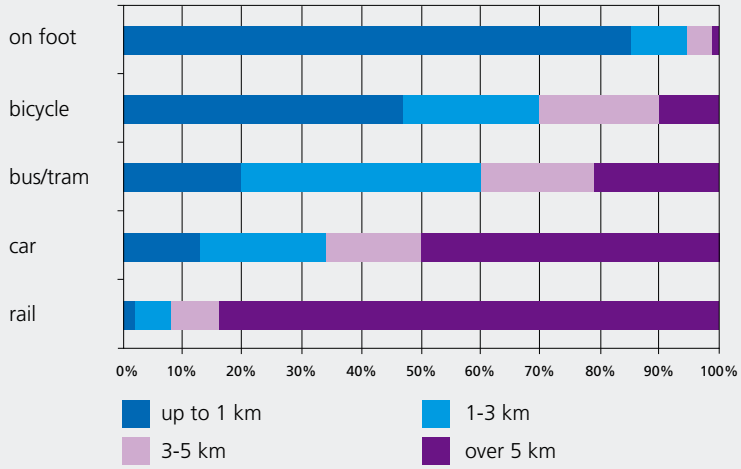
The length of the national road network, the number of cars per capita and traffic volume have increased considerably in Switzerland in recent decades. Less well known is the fact that in the meantime nearly one in every five Swiss households has no car of its own (in cities such as Zurich, Basel or Bern it is nearly every second household). This has virtually no impact at all on the average journey time. It is estimated that someone who never has access to a car will spend 87 minutes per day travelling, whereas someone who always has a car available will spend 94 minutes.

Human-powered mobility

Thus our own muscle power is a major contributor to our mobility. Given that we spend an average of 35 minutes a day walking and 4 minutes cycling, we easily exceed the half hour that is recommended as the minimum for health-enhancing physical activity. However, this does not necessarily mean that this exercise is of moderate intensity, nor that it is done in bouts of at least 10 minutes.

The potential of non-motorised transport has not yet been exhausted. Many bus and tram journeys – not to mention car journeys – are shorter than 3 km, and these trips could also easily be made by bicycle. Moreover, some journeys made by public transport or car are shorter than 1 km – the ideal walking distance (Figure 4).

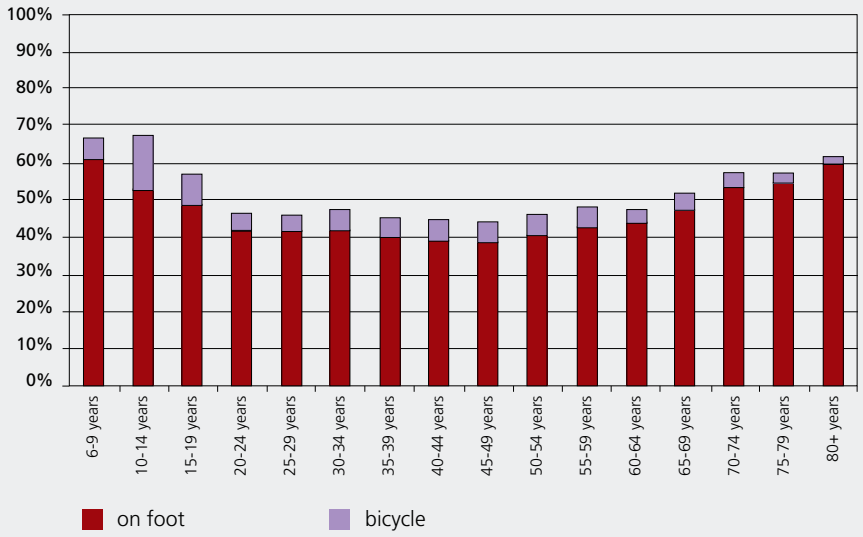
Figure 4



Length of journey stages by mode of transportation
34 per cent of all journey stages made by car and 60 per cent of all stages by bus or tram are shorter than 3km. 50 per cent of all journey stages made by car and almost 80 per cent of all stages by bus or tram are shorter than 5km.

Source: Microcensus on travel behaviour 2005.

Figure 5



Proportion of journey stages walked or cycled, by age group
Children, adolescents and the elderly make journeys on foot far more often than middle-aged people. Cycling is most common among 10-19 year olds.
The same pattern is observed with regard to journey time.

Source: Microcensus on travel behaviour2005.

Age, income and mobility behaviour

The proportion of journeys made on foot by children and adolescents exceeds the average. In the age group 6 to 9 years, two-thirds of all journey stages are made on foot, but this proportion falls steadily in older children (Figure 5).
Children between the ages of 6 and12 make 80 per cent of their school journeys exclusively on foot or by bicycle (a very high percentage by international standards). A further 8 per cent use public transport and undertake at least part of the journey on foot or by bicycle. At first, use of public transport on the way to school or college increases as they get older, but from the age of 18 years onwards car use also increases.

People of working age walk and cycle less, with around four out of ten journey stages being undertaken on foot or by bicycle. This population group could fit more human-powered mobility into their hectic daily routines without sacrificing much (if any) of their precious time.

Like young children, the over-65s tend to cover a high proportion of their stages on foot (Figure 5). For example, walking accounts for two out of three journey stages among women over 80 years of age. Conditions that encourage human-powered mobility until an advanced age therefore contribute substantially to the independence, health and social integration of the elderly, who make up a growing section of the population.

There is also a marked correlation between walking and income: the lower the household income, the more time people spend walking. Generally speaking, everyone (apart from people with impaired mobility) is, to some extent, able to get around on foot. However, the less affluent members of society appear to be more reliant on walking as a means of locomotion. Thus walking becomes a particularly common and important form of physical activity for many people on low incomes. Conditions conducive to human-powered mobility are therefore particularly important for this group of the population.

Bicycles are most commonly used by those on a moderate income.

Leisure-time mobility
Leisure-time mobility encompasses both journeys to leisure activities (e.g. a car journey to a football match or a cycle ride to the cinema) and mobility as a leisure activity (e.g. walking, jogging or a cycle tour). Leisure-time mobility conforms to the overall pattern. Walking is the predominant mode of transport as far as journey stages are concerned, whereas cars lead the way in terms of the distances covered.

Around 12 per cent of all leisure-time journeys are made in order to undertake a sporting activity at the destination. However, people who engage in sport are less likely to walk or cycle to the venue than people on the way to other leisure activities, despite the fact that the trip to training or to a competition (whether on foot or by bicycle) could serve as a good warm-up exercise.

Sources: Federal Statistical Office, Federal Office for Spatial Development (2007); Sauter (2005).

Undesirable effects of mobility on health

As pedestrians, children and the elderly feature disproportionately in road accident statistics. As far as sporting accidents are concerned, human-powered mobility (e.g. cycling or jogging) is low-risk compared with other types of sport. Preventive measures are needed in order to reduce the risk of accidents on the roads, in sporting activities and during leisure time to an absolute minimum.

Accidents
Every year in Switzerland, around 600 000 injuries are sustained in the home and in the course of leisure activities – half of them as a result of falls. An additional 300 000 sporting accidents occur every year. Furthermore, it is estimated that 100 000 people are injured in road traffic accidents (27 000 traffic accidents are reported to the police every year).

Road accidents
In 2006, a total of 76 pedestrians, 35 cyclists, 69 motorcyclists and 156 car users died on Switzerland's roads.

Pedestrians involved in serious accidents are frequently senior citizens over 64 years of age and children aged 4-10 years. Although the number of seriously or fatally injured pedestrians has fallen by 40 per cent in the past 10 years, it has not been possible to achieve a significant reduction in the seriousness of the injuries. Most accidents involving pedestrians occur when they are crossing roads in towns and cities.

The number of cyclists seriously or fatally injured has fallen by 20 per cent in the past 10 years. Especially pleasing is the marked reduction in casualties among children and adolescents, whereas the number of accidents in the age group 45-64 years has unfortunately risen. The majority of these accidents also occur in towns and cities.

Prevention of road accidents
The prevention of serious road traffic accidents involving pedestrians or cyclists is extremely important and has been highly successful in recent years in Switzerland. Methods of accident prevention include: appropriate legislation (e.g. a 0.5 per mille blood alcohol limit for drivers); educational initiatives such as the training of road-safety instructors or the anti-drink-driving campaign; supportive initiatives such as the introduction of 30 kph zones in residential areas; and engineering measures such as the elimination of accident black spots.

Interestingly, the promotion of walking and cycling is a particularly effective way of reducing the risk of accidents:

More pedestrians and cyclists = more safety

A study comparing international data on walking and cycling with accident-frequency figures produced an unexpected outcome. The risk of a road traffic accident is inversely related to the number of pedestrians and cyclists using the roads. This correlation was found to apply in every country, every town/city and every study conducted over a prolonged period. The author's interpretation of this finding is that the care exercised by motorists evidently increases as a function of the number of pedestrians and cyclists that use the roads.

Jacobsen, P.L.: Safety in numbers: more walkers and bicyclists, safer walking and cycling. Injury Prevention 2003; 9: 205-209.

Sporting accidents

The unfortunate corollary of the positive health effects of physical activity and sport are the injuries and accidents that occur in the course of sporting activities. Nearly one in every five sporting accidents is associated with human-powered mobility, i.e. cycling and mountain biking (not including road accidents involving third parties), inline skating, mountain hiking and jogging. These figures do not, however, take into account the numbers of people who take part in the respective sports and how often and for how long they do so. A Finnish study on this topic found these activities to be particularly low risk compared with other types of sport.

Accident risks of different sports

Over 3000 randomly selected individuals in Finland kept a diary in which they recorded all of the physical activity and sporting activities that they undertook over the course of one year. During this period they were telephoned three times to answer questions about injuries. Comparisons were made between the number of injuries sustained per 1000 hours for each physical or sporting activity. For walking, cycling, jogging and inline skating, the risk of injury was low, with the number of injuries ranging from less than 1 to a maximum of 5. The risk was substantially higher (7-18 injuries) for team and contact sports, as well as squash (and orienteering).

Parkkari, J.; Kannus, P.; Natri, A.; Lapinleimu, I.; Palvanen, M.; Heiskanen; M. et al.: Active living and injury risk. Int J Sports Med. 2004; 25: 209-216.

One key factor influencing accident frequency is the level of activity. Clearly, people who are more physically active also run a greater risk of injuring themselves. In Switzerland people who are regularly active suffer sporting injuries around twice as often as irregularly active individuals. These are, however, frequently trivial injuries, whereas the sporting accidents suffered by inactive individuals are often of a more serious nature. This has a direct impact on loss of working hours. The total number of days on which working hours are lost due to a sporting injury is barely 5 per cent higher for regularly active than for irregularly active individuals. Taking the duration of activity into account, the risk of accidents is substantially lower in people who take regular exercise.

Prevention of sporting accidents

In order to gain maximum health benefit from human-powered mobility, one should also seek to reduce the risk of injury to an absolute minimum. When cycling and inline skating it is advisable to wear adequate protective equipment. Furthermore, the speed and the challenges undertaken should be tailored to the conditions and to individual sporting ability. In the case of mountain hiking, proper preparation is important, notably with regard to equipment, choice of route and consideration of weather forecasts. Here it is often crucial whether individuals act appropriately in critical situations (e.g. when a storm gathers). These aspects of accident prevention are covered in good training programmes such as Youth+Sports courses or equivalent courses for adults.

As was explained above, the risk of accidents is to a great extent determined by the degree of preparation. Thus increased physical activity does not necessarily result in increased accident frequency, even though there will be more occasions on which injuries can occur. On the contrary, various studies (notably from military sources, where accidents are very common) indicate that targeted training can substantially reduce the general risk of accidents.

Air pollution and physical activity

Suspended particulate pollution is too high in densely populated areas of Switzerland – and especially near heavy traffic. Furthermore, ozone pollution is so high on certain days in the summer that it can have an adverse effect on health. Sustained and effective measures are needed in order to reduce these airborne pollutants. Until these measures take effect, it is advisable to avoid strenuous outdoor activities close to roads and when ozone levels are high. This applies especially to sensitive individuals such as people with chronic respiratory diseases.

From a health perspective, however, it would be wrong to refrain from walking or cycling for fear of airborne pollutants. Air pollutant levels are also high in enclosed vehicles such as cars or buses. Anyone who takes part in moderate-intensity walking or cycling in everyday life does not need to worry about inhaling too many additional airborne pollutants through increased respiration. After all, the individual risk of falling ill through physical inactivity is many times greater than the risk of suffering adverse health effects due to air pollution.

Sources: Sommer, Brügger, Lieb & Niemann (2007); Lamprecht & Stamm (2006); Federal Office for the Environment (2007).

Factors influencing human-powered mobility

Modifable and non-modifable factors

How much walking and cycling we do is influenced by a wide range of factors. Some of these factors – such as age, sex, weather or local topography – are beyond our control. However, personal factors such as attitude and motivation – and also factors in our living environment – can be changed through appropriate measures so as to enhance human-powered mobility.

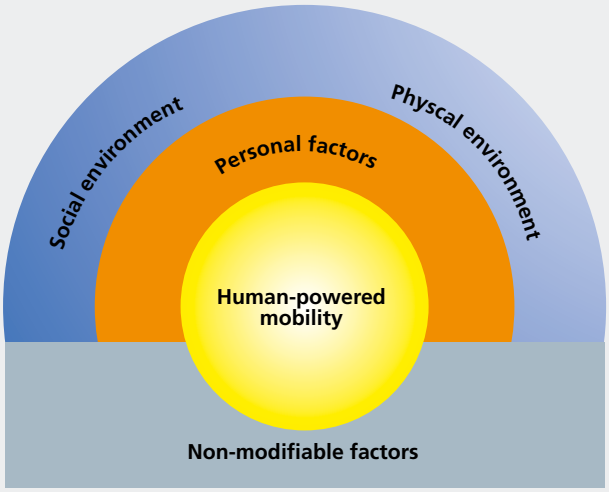
How much we walk or cycle is determined both by non-modifiable and modifiable factors. On the one hand, there are factors such as the weather or topography that are beyond our power to influence. Furthermore, statistics show that mobility behaviour is dependent on socio-demographic factors. For example, children, elderly people and those on low incomes get around more on foot than middle-aged people and high earners.

Among the modifiable factors that influence human-powered mobility – be they positive or negative – are personal factors and our social and physical environment (Figure 6).

Personal factors
These are **attitudes, motivation** or **positive expectations** with regard to human-powered mobility. However, they also include specific **abilities** and **skills**. For example, anyone who does not feel confident on a bicycle will also be less inclined to use one.

Regardless of whether we are talking about walking or cycling to work or during leisure time, "enjoyment" and "journey time" are far and away the most important reasons given for choosing human-powered mobility. Between half and two-thirds (depending on the purpose of the journey) of the people interviewed in the Microcensus on travel behaviour 2005 cite these reasons for choosing to walk or cycle. Cost plays a subordinate role. The principal reason given for cycling to work in the pilot project Bike To Work 2005 was "to do something for my health". (This option did not feature among the possible answers in the Microcensus on travel behaviour 2005.)

Figure 6



Factors influencing human-powered mobility (determinants)
Mobility behaviour is influenced by factors that cannot be changed (gender, age, weather, topography). And also by factors that can be changed. These include personal factors and factors in the social and physical environment.

Social environment
This refers not only to the **family environment,** the **broader social environment** and the circle of friends or peer group, but also to the attitude of the employer and the facilities provided. It likewise includes **offers and events** relating to human-powered mobility and also, in the broader sense, financial incentive systems relating to the social environment.

Physical environment
In the initial phase of physical activity promotion, efforts were mainly aimed at influencing personal factors. In recent years the focus has broadened to include the question of how our physical environment influences physical activity and mobility behaviour. This topic is considered in some detail now.

The built environment

There is mounting evidence that the built environment can both promote and impede physical activity. Factors conducive to human-powered mobility include high population density, attractively designed neighbourhoods, short distances to destinations, access to "activity-friendly" outdoor spaces, and integrated foot and cycle path networks.

Recent decades have seen a sharp increase in the physical separation of dwelling, workplace and recreational amenities, which has also changed mobility behaviour, leading to more motorised mobility. This trend appears to be partly instrumental in the declining levels of physical activity in everyday life. The urban geography of Switzerland has also changed markedly, with three out of four people now living in urban or suburban areas, which extend from the town centres far into the surrounding areas. These suburbs are surrounded by less densely populated residential areas of detached houses, unstructured industrial and commercial zones, and shopping centres with large parking lots. These settlement patterns often necessitate motorised transport.

Residential and community environment

Whereas the association between physical activity behaviour and health is now well and extensively documented, research on the impact of the built environment on physical activity behaviour is still in its infancy. The number of projects under way is increasing rapidly, however, and initial, significant findings are beginning to emerge:

- Residential environments can both promote and impede physical activity behaviour.
- Residential environments can be modified and designed in such a way as to make it easier for people to take regular exercise.

American studies, in particular, have produced insights into how the design of the local environment can influence physical activity and mobility behaviour:

- **Short distances to destination points:** Destination points include stops for public transport, services or schools. If the distance between home and school is less than 1 km, the Swiss Microcensus on Travel Behaviour (2005) indicates that 90 per cent of primary school children make the journey to school on foot or by bicycle, whereas this proportion falls to around 60 per cent for distances between 1 and 3 km.
- **Population density:** The more densely populated an area is, the greater the number of people who get around on foot or by bicycle.
- **Mixed use:** The more heterogeneous the residential environment – workplaces, services, schools – the higher the proportion of pedestrians and cyclists.
- **Road network:** An integrated network of roads that are accessible to pedestrians (e.g. via footpaths, zebra crossings, under- or overpasses) shortens the distances between the starting and destination points, thereby increasing the likelihood that people will walk or cycle.
- **Road design:** Pedestrian and cycle-friendly road network designs stimulate physically active transport. These include engineering measures that reduce traffic speeds and increase alertness among motorised vehicle users.
- **"Activity-friendly" outdoor spaces:** The presence of green spaces such as parks or wooded areas in the residential environment increases people's willingness to take more exercise. This applies especially to children and senior citizens.
- **Neighbourliness:** Good contact with one's neighbours can also stimulate physical activity behaviour.

The links that have been identified so far seem plausible and have been confirmed in various countries and living environments. Although there are still no major Swiss studies, initial investigations reflect these trends.

Physical activity behaviour in three holiday resorts

A comparison of physical activity and mobility behaviour among the local population in three well-known Valaisan holiday destinations – Crans-Montana, Verbier and Zermatt – in 2004 confirmed international findings. In Zermatt, a compact and car-free municipality, 44 per cent of the local population were found to be sufficiently active, whereas the corresponding figures in the sprawling municipalities of Crans-Montana and Verbier were 36 per cent and 33 per cent, respectively. This difference was mainly attributable to people walking or cycling to work. The lack of daily physical activity in Crans-Montana and Verbier was therefore not offset by higher levels of intensive sporting activities. The inhabitants of Zermatt are considerably more active than people in the rest of German-speaking Switzerland, with 44 per cent being classified as «sufficiently active» compared with just 36 per cent elsewhere. The inhabitants of Montana and Verbier are marginally more active than people in the rest of French-speaking Switzerland (36 and 33 per cent, respectively, are sufficiently active, compared with just 31 per cent elsewhere).

Thommen Dombois, O.; Braun-Fahrländer, C.; Martin-Diener, E. Comparison of adult physical activity levels in three Swiss alpine communities with varying access to motorised transportation. Health Place. 2007; 13:757-66.

On foot in Zurich

According to a survey of the inhabitants of two districts of Zurich – one pedestrian-friendly (Seefeld) and the other much less so (Witikon) – the residents of Seefeld spent 35 minutes a week longer on walks originating from their homes than their counterparts in Witikon. As far as general physical activity behaviour was concerned, however, there was no difference between the two districts. Irrespective of their district of residence, the chances of individuals being physically active for at least half an hour every day rose by 13 per cent for each additional destination that was accessible on foot (services, infrastructure, leisure facilities).

Besides asking the participants subjective questions about physical activity behaviour, the researchers also assessed the behaviour of a sub-sample objectively with accelerometers in a pilot study. These more precise assessments revealed first indications of an expected correlation between general physical activity behaviour and district of residence.

Schmid, J. Stadt in Bewegung. Die Fortbewegung aus eigener Muskelkraft in den Zürcher Stadtquartieren Witikon und Seefeld (Report in German only). Statistik Stadt Zürich, 2007. www.stadt-zuerich.ch/statistik.

Schmid, J.; Mäder, U. Städtische Umgebung und Bewegungsverhalten. Eine Auswertung objektiv gemessener körperlicher Aktivität in den Zürcher Quartieren Witikon und Seefeld (Report in German only). Magglingen: Federal Office of Sport, 2007. Report available at www.hepa.ch

Shopping trips

According to data from the Microcensus on Travel Behaviour 2000, the likelihood of people walking or cycling to the shops increases with the quality of the shopping facilities (number of shops and retail floor space) that are located within a 300-metre radius from their homes. However, mobility behaviour is also influenced by other factors, such as age, sex, size of household and household income. If there are no shops at all within a 300-metre radius, barely a third of all shopping trips are made on foot or by bicycle, whereas this figure rises to more than two-thirds if the local shopping facilities are very good.

Baumeler, M.; Simma, A. and Schlich, R. Impact of Spatial Variables on Shopping Trips. Federal Office for Spatial Development, 2005. www.are.admin.ch

Regional connectedness

Overlying the relationships described above between the built environment at local level and mobility behaviour are the regional links to transport axes (i.e. the rail network, the main roads and the motorways). This interplay has not been investigated in any detail as yet.

For trips that are too long to undertake on foot or by bicycle only, combined mobility provides significant opportunities for health-enhancing physical activity. Thus journey stages to public transport stations can be covered on foot or by bicycle.

Sources: Cavill, Kahlmeier & Racioppi. Eds. (2006); Edwards & Tsouros. Eds. (2006); NICE (2008).

Promotion of human-powered mobility

Regulatory framework and other key parameters

Switzerland has an important legal basis for the promotion of walking in everyday life and during leisure time: **the Federal Law on Footpaths and Hiking Trails** (1985). This law is designed to plan, construct and maintain a cohesive network of footpaths and hiking trails. Footpaths are mainly located in residential areas, whereas hiking trails are found in outlying rural areas. Responsibility for the footpath network rests with the cantons, with the Federal Government having an advisory and supportive role.

There is, to date, no equivalent law for the promotion of cycle paths.

Other important requirements for the promotion of human-powered mobility:

- **Free right of access to forests and pastures:** This is a basic right that has been enshrined in the Swiss Civil Code for 100 years. Everyone is allowed to enter forests and pastures in Switzerland. This is a fundamental prerequisite for countless recreational programmes and activities.
- **Infrastructure Fund Act:** This law empowers the Federal Government to grant subsidies to agglomerations for the improvement of rail and road infrastructure and specifically also for non-motorised transport.
- **"Seamless" public transport network:** This enables people who are making longer journeys at least to make their way to public transport stations on foot or by bicycle.

Specific measures

Measures to promote human-powered mobility include the creation of an activity-friendly environment and also campaigns and events. Other initiatives are structured activities and counselling that addresses individual requirements. Financial incentives are a widely used and recognised tool for changing behaviour and are also applied in relation to mobility.

There are different forms of physical activity promotion efforts: As far as general promotion of health-enhancing physical activity is concerned, initiatives are usually divided into four categories: activity-friendly environments; campaigns and events; structured activities; and counselling and support.

This booklet on the promotion of physically active mobility combines structured activities and counselling/support into one category. In addition, it also discusses financial incentives that can be applied in these areas. Thus the following four groups of measures are considered here:

- activity-friendly environments
- campaigns and events
- structured activities, counselling and support
- financial incentives.

Different people respond to different initiatives, which is why the various measures for promoting human-powered mobility and improving physical activity behaviour should ideally be combined into coordinated projects or programmes.

Activity-friendly environments

Changes to the built environment probably have major potential to influence physical activity behaviour and human-powered mobility. There is initial evidence to suggest causal relationships. Although the development of specific research strands has begun, the question of whether a change in the physical environment can bring about a change in behaviour has yet to be completely resolved. Studies of this kind are expensive, methodologically complex and extremely time-consuming.

The possible existence of a causal relationship is supported by the finding that people who move into a new area display more active transport behaviour if their new environment is more "activity-friendly" than where they previously lived. This also applies if the reasons for moving house are taken into account in the data analysis. In the recreational sector too, there is evidence to suggest that people do more walking if new opportunities are created or the environment is made more attractive.

Promotion of cycling in Zurich

Cycling has been promoted in Zurich since the 1970s. Since 1981, traffic counts have been systematically conducted every two years. This has revealed that cycling has increased around threefold in the space of 25 years. For example, the number of bicycles counted on four bridges across the River Sihl during the morning rush hour was found to have risen from around 200 to approximately 600 per hour. The greatest increases were recorded in locations where the infrastructure for cycling had been most consistently improved.

The increase in the number of cyclists can be attributed to new cyclists, since the counts were conducted on bridges that cannot be bypassed (and consequently this increase cannot be due to existing cyclists choosing different routes). However, it is impossible to tell from the counts whether the new cyclists have become generally more physically active.

City of Zurich Planning Office (2000). Veloverkehrszählungen: Velomassnahmen zahlen sich aus (Cycle counts: Cycling measures are paying off. Report in German only). www.stadt-zuerich.ch

From Cycling in Switzerland to SwitzerlandMobility

The Cycling in Switzerland Foundation has created and maintains a network of national, regional and local cycle routes. The Foundation is responsible for this network, but it has the cantons, several offices of the federal administration and a number of associations and private organisations as partners. Cycling in Switzerland also offers communications support and an information platform and provides tourist information.

An extrapolation based on counts and surveys indicates that a total of 4.3 million day trips and 170,000 trips lasting several days were undertaken on the cycling routes in 2004. Eight per cent of the users stated that they did not engage in any sport in their leisure time.

As of spring 2008, the cycling scheme will be developed into the SwitzerlandMobility project, thus adding a coordinated national network of hiking, inline skating, mountain-bike and canoeing routes.

Veloland Schweiz (2004) Zählung und Befragung (Cycling in Switzerland. Counts and survey. Report in German; summary in French). www.veloland.ch

Various European studies have also investigated local traffic-calming measures. As such interventions have never been geared towards physical activity behaviour, physical activity was not assessed specifically. There is, however, evidence to suggest that they may promote physical activity. For example, various studies indicate that measures such as narrowing of traffic lanes, speed bumps, planting and speed limits can result in more activities on the roads and more cycling, but also in a reduction in motorised traffic volumes, accident numbers and noise levels.

Switzerland offers tremendous scope for leisure-time hiking, walking and cycling, with its hiking trails, Cycling in Switzerland/ SwitzerlandMobility, the Vitaparcours fitness trails and the walking and running trails. What these projects have in common, apart from the provision of infrastructure, are consistent communications. It is not possible to evaluate the overall impact of such programmes on physical activity behaviour. However, it is safe to assume that they contribute substantially to Switzerland's reputation as a mecca for outdoor activity.

Researching the built environment

Investigating the impact that the built environment has on our physical activity behaviour poses a major challenge for the scientific community. The key questions to be answered are:

What is cause and what is effect?

Many studies show clear associations between the built environment and physical activity. Still unclear, however, is precisely what is the cause of this link and what is the effect. In other words, do people adapt their mobility behaviour to their living environment – or do they choose a living environment that reflects their own particular mobility preferences?

Conclusion: *Studies on this topic are still rare. Initial findings indicate that it is more a question of the environment shaping physical activity behaviour than vice versa.*

Who is being reached?

What sorts of people are being reached by measures designed to promote human-powered mobility? Is it mainly people who already get enough exercise? Or – more importantly – are these initiatives also benefiting those who are not sufficiently active?

Conclusion: *Counselling and support also make it possible to motivate hitherto inactive people to increase the amount of walking they do. No research has yet been conducted to determine the extent to which this applies to interventions within the built environment.*

Have physical activity levels increased overall?

It is known from international studies and national projects that correlations do exist between the built environment and mobility behaviour. What ultimately matters, however, is how much physical activity an individual gets in total – if all of the activities undertaken in the course of the day are added together.

Conclusion: *There is mounting evidence to suggest that an activity-friendly built environment also is associated with higher overall levels of physical activity. Generally speaking, a lack of physical activity in everyday life is only partially offset by increased sporting activity.*

Are changes attributable to the intervention?

Finally there is the question as to whether an observed change in mobility or physical activity behaviour is, in fact, attributable to the intervention that is under investigation, or whether there are other causes. In order to rule out this uncertainty, one would need at the same time to monitor behaviour patterns in comparable locations where no interventions were taking place.

Conclusion: *Initial studies involving control locations are now under way and results can be expected in the medium term.*

Campaigns and events

Alongside improvements to the built environment, other initiatives are also needed with a view to promoting active mobility. Easy to achieve (and also to investigate and evaluate) are prompts on escalators and lifts to promote muscle-powered mobility. A whole series of studies have shown that staircases are used more often if posters are placed next to the lift or escalator urging people to use the stairs. The effects are, however, temporary, since people become accustomed to seeing the posters. They should therefore either be periodically changed or else removed and then replaced.

Information and awareness-raising campaigns are often used in order to make people's physical activity and mobility behaviour more "health-enhancing" and environmentally friendly. However, health communication studies show that messages alone have little or no effect on behaviour; they mainly set the agenda or have an impact on image. While this may be sufficient to achieve the goal of a campaign in certain cases, it is generally advisable to link the content to concrete activities or events (not least because such campaigns are so costly). Conversely, activities and events must be properly publicised if they are to be successful.

Participation campaigns

slowUp: *Around 400 000 people took part in the 14 car-free action days organised in 2007 by the Cycling in Switzerland Foundation, in cooperation with local and regional partners. A survey of three slowUp events in 2004 had shown that 52 per cent of the participants fell into the "insufficiently active" category. Based on average figures, this group accounts for 64 per cent of the Swiss population.*

bike to work: *In this campaign, employees of participating companies were invited to cycle to work (on a voluntary basis) at least every other working day for one month. Following a pilot scheme conducted by the Swiss Bicycle Advocacy Association in 2005, it was estimated that at least a third of the participants changed from passive transport to cycling for the project. Among the participants, 46 per cent could be classified as "insufficiently active", whereas 55 per cent of the staff who did not take part fell into this category. In 2007, more than 600 companies and over 34 000 people took part in a scaled-up, nationwide version of the campaign.*

Conclusion: *In both campaigns, the proportion of participants who were otherwise insufficiently active was almost as high as in the respective comparison group. It would therefore appear that appropriate campaigns can also appeal to the previously sedentary segment of the population. However, it should be pointed out that these evaluations tell us nothing about medium to long-term changes in behaviour.*

See www.hepa.ch for evaluation reports (in German only).

Creative initiative in Canada

As part of the «Canada on the Move» campaign, pedometers were given away in breakfast cereal packs and consumers were invited to record the total number of steps they took every day on a website. Thanks to national monitoring of physical activity through monthly surveys, it was possible to show the population-wide impact of this campaign. In the quarter after the pedometers were distributed, those people who owned a pedometer and knew about the campaign increased the amount they walked. In fact, these people were three to four times more likely to walk for an hour or more per day than those who did not know about the campaign. Extrapolation of these results to cover a full year and the total population indicates that the proportion of people who spent at least one hour every day walking rose by at least 0.5 per cent.

Craig, C.L.; Tudor-Locke, C. and Bauman, A. Twelve-month effects of Canada on the Move: a population-wide campaign to promote pedometer use and walking. Health Educ Res 2007; 22: 406-13.

Structured activities, counselling and support

Structured activities such as school PE lessons, club activities or individual training with private instructors play a key role in the promotion of physical activity. However, activities of this kind are less important in the promotion of human-powered mobility than in the promotion of physical activity in general. Nevertheless, courses such as those offered by the Youth+Sports organisation (cycling, inline skating and mountaineering) or walking courses provided by Allez Hop have an important role to play. Particular activities may also be especially appropriate for specific groups, examples being cycling courses for schoolchildren or courses that help the elderly to take advantage of a wide range of mobility activities.

Findings from the international literature show that counselling and individual support can also help to ensure that people walk more (at least in the medium term). Counselling can be directed at groups, families or individuals and geared to their individual requirements. In particular, this can also help to reach people who were previously either completely or virtually inactive. Little is still known about long-term effects.

Do-it-yourself-package for employees

In this programme interested members of staff at three companies were given a self-help information pack. This contained local information on footpaths and cycle routes, tips on changing behaviour and safety advice. The study took place in Glasgow (Scotland), where the conditions for cycling are not as good as in Switzerland. After six months the participants walked to work almost twice as often as interested staff from companies who had not received self-help packs. The programme had no impact on cycling, however. The authors conclude that one would need to make the environment more cycle-friendly before cycling to work becomes an option.

Mutrie, N.; Carney, C.; Blamey, A.; Crawford, F; Aitchison, T.; Whitelaw A. "Walk in to Work Out": a randomised controlled trial of a self-help intervention to promote active commuting. J Epidemiol Community Health 2002; 56: 407-412.

Individual mobility counselling

This advice involves contacting households door-to-door or by telephone and then providing individual advice on sustainable mobility according to a standardised protocol. The technique is known as «individualised travel marketing» (ITM) and was developed around 20 years ago in Germany. Nowadays it is mainly used in anglophone countries. In the UK it is reckoned that this approach increases the duration of trips undertaken on foot or by bicycle by an average of 15 per cent. Whether the advice also improves physical activity behaviour in general is not evident from the studies. In some cases, visits to sports facilities are also included in the advice as part of the same «ITM package», which points to a further potential area for the promotion of physical activity. A similar initiative (www.mobilitaetsdurchblick.ch) is currently being developed for Switzerland.

Sustrans (2006). travelsmart. Leading the way in travel behaviour change. www.sustrans.org.uk

Financial incentives

Financial incentive measures are now a widely used and widely recognised tool for altering behaviour patterns or the use of products that are potential threats to human health and the environment. Examples are surcharges on tobacco products, alcoholic drinks, motor fuels and fuel oil, or chemicals.

In Switzerland a series of financial measures targeting transport are discussed, in some cases highly controversial, one example being road pricing (charging motorists to enter heavily congested urban centres). Initial experiences are currently being gathered abroad. It is generally assumed that the introduction of road pricing leads to an increase in the share of walking and cycling, and may therefore have a positive impact on overall levels of physical activity.

London case study

The impacts of the congestion charging scheme imposed in February 2003 for cars entering central London are being monitored and documented at great expense. The introduction of the charge had the following effects in this zone:
Up until 2006, the number of bikes entering the city centre rose by just under 50 per cent, whereas the total number of vehicles fell by 16 per cent. Within the congestion charge zone, the share of cycling in the total number of vehicle-kilometres driven rose from 4 per cent to 7 per cent.
Despite the increase in the number of bikes on the road, accidents involving cyclists were less numerous in 2006 than before the introduction of the charge.

Transport for London. Central London Congestion Charging: Impacts Monitoring, Fifth Annual Report, 2007. www.tfl.gov.uk

A second category of financial incentives consists of measures introduced in companies to promote active transport or public transport (mobility management). These include season ticket subsidies for public transport, car-parking charges or targeted schemes designed to promote cycling, such as company bicycles, cycle stations with workshops, showers or free cycle helmets. As many journeys by public transport are combined with journey stages travelled on foot or by bicycle, the switch from car use to "combined mobility" also has the potential to enhance physical activity behaviour.

The findings to date suggest that such measures promote human-powered mobility, which means that they also have the potential to improve physical activity behaviour as a whole.

Mobility management at Baden Cantonal Hospital

This hospital, with its 1200-strong workforce, is located near the N1 exit slip road and is served by 2 bus routes. Up until 2005, 83 per cent of the staff had claimed a free parking space. Then a charge was introduced for the car parks. Henceforth hospital staff would have to pay CHF 60-100 per month for their parking space, depending on the distance from their home to the workplace. Furthermore, people who did not claim a parking space received an "eco-bonus" of CHF 600-800 per year. Improvements were made to the infrastructure for commuter cyclists. Following the introduction of these innovations, only 53 per cent of the staff continued to use a parking space. Most of those who changed their means of getting to work began to use public transport or human-powered mobility, while a few joined car pools.

Mobilitätsmanagement Kantonsspital Baden. Schlussbericht (Mobility management at Baden Cantonal Hospital. Final Report in German only), 2005. www.badenmobil.ch

Sources: Cavill, Kahlmeier & Racioppi. Eds. (2006); Edwards & Tsouros. Eds. (2006); Thommen & Braun-Fahrländer (2003); Thommen, Kahlmeier, Martin-Diener, Martin, Racioppi & Braun-Fahrländer (2006).

Basic principles for the promotion of human-powered mobility

All forms of "muscle-powered mobility" are important, whether they are undertaken for recreational purposes or as a means of transportation, and whether they are moderately intensive or competitive. Promising initiatives should win the cooperation of other sectors and a wide range of organisations. Although the evidence underpinning various measures may still be incomplete, it is constantly improving. Further efforts are therefore needed to evaluate them and existing knowledge needs to be exploited and disseminated.

Active mobility: the broad view
Walking or cycling can be undertaken for various purposes – be it as a leisure activity or as a means of getting from A to B – and the activity involved may be moderately intensive or highly competitive. As far as effects on health are concerned, all of these activities are important.

Population-wide approach
As lack of physical activity is a population-wide problem, those charged with promoting physical activity should also develop initiatives that appeal to as large a section of the population as possible. The promotion of human-powered mobility, in particular, has major potential to reach broad segments of the population and especially previously inactive groups.

Taking specific conditions into account
Programmes should be developed in consultation with the targeted section of the population. Moreover, specific conditions should be taken into consideration. Activity levels, mobility habits, social norms and financial circumstances may vary considerably from one population group to another.

Getting other disciplines on board
The promotion of physical activity by promoting human-powered mobility requires cooperation with other disciplines. Mostly it is neither the health nor the sports sector that offers the greatest potential, but public and private partners from the fields of spatial planning and architecture, transport, tourism or environmental protection. Much is gained if these players realise that direct or indirect investment in the goals of others can help them to achieve their own goals.

Working at several levels
The promotion of active mobility requires the involvement of national, cantonal and local organisations. The national institutions are responsible for an overview of strategies and measures and for identifying need for action. Furthermore, background information and experiences must be accessible and the exchange at the national and international level should be facilitated. Commitment on the part of cantonal agencies and local players is crucial to the practical promotion of human-powered mobility, especially if it is necessary to involve different disciplines.

Gathering and exploiting knowledge
Measures designed to promote physical activity should always be evaluated. In this way they can be improved and the findings can be channelled into the development of other programmes. Evaluations are often extremely costly and complex, especially in the case of interventions aimed at promoting human-powered mobility. Consequently it is not possible to examine each individual measure in detail. When undertaking model projects, it is therefore particularly important to ensure that physical activity behaviour is also included in the evaluation. This also applies when the projects are planned and executed under the overall control not of the health or sports sector, but of other organisations.

Key sources

The following publications and documents contain detailed data, reviews of other sources or additional case studies.

Swiss publications

- Federal Office of Sport, Federal Office of Public Health, Health Promotion Switzerland, Network HEPA Switzerland (2006). Health-Enhancing Physical Activity. Base Document for Switzerland. Magglingen: Federal Office of Sport.
- Federal Statistical Office, Federal Office for Spatial Development (2007). Mobilität in der Schweiz. Ergebnisse des Mikrozensus 2005 zum Verkehrsverhalten [Mobility in Switzerland. Results from the Microcensus on travel behaviour 2005. Report in German and French; summary in English]. Neuchâtel: Federal Statistical Office.
- Federal Office for the Environment (2007). Sommersmog und Ozon [Summer smog and ozone. Report in German and French]. Bern: Federal Office for the Environment.
- Lamprecht, M. and Stamm, H. (2006). Statsanté. Résultats des statistiques suisses de la santé. Activité physique, sport et santé. Faits et tendances se dégageant des Enquêtes suisses sur la santé de 1992, 1997 et 2002 [Statsanté. Results of the Swiss health statistics. Physical activity, sport and health. Facts and trends from the Swiss Health Surveys 1992, 1997 and 2002. Report in French and German]. Neuchâtel: Federal Statistical Office.
- Sauter D. (2005). Mobilität von Kindern und Jugendlichen. Vergleichende Auswertung der Mikrozensen zum Verkehrsverhalten 1994 und 2000 [Mobility of children and adolescents. A comparative analysis of the Microcensuses on travel behaviour 1994 and 2000. Report in German; executive summary in English]. Zürich: Urban Mobility Research.
- Sommer, H.; Brügger, O.; Lieb, C. and Niemann, S. (2007). Volkswirtschaftliche Kosten der Nichtberufsunfälle in der Schweiz: Strassenverkehr, Sport, Haus und Freizeit (bfu-Report 58) [Cost to the national economy of non-occupational accidents in Switzerland: road traffic, sport, home and leisure. Report in German; executive sumary in English]. Bern: Swiss Council for Accident Prevention bfu.
- Thommen, O. and Braun-Fahrländer, C. (2003). Wirksamkeit von Verkehrsinterventionen für die Förderung der Mobilität aus eigener Kraft bzw. Alltagsbewegung. [Effectiveness of transport interventions to promote Human Powered Mobility (HPM) or daily physical activity. Report in German, executive summary in English]. Basel: Institute for Social and Preventive Medicine, University of Basel.

European publications

- Cavill, N.; Kahlmeier, S. and Racioppi, F. Eds. (2006). Physical Activity and Health: from Evidence to Action. The Solid Facts. Copenhagen: WHO Europe.
- Edwards, P. and Tsouros, A. Eds. (2006). Promoting Physical Activity and Active Living in Urban Environments: The Role of Local Governments. The Solid Facts. Copenhagen: WHO Europe.
- Martin, B.; Martin-Diener, E.; Balandraux-Olivet, M.; Mäder, U. and Ulrich, U. (2004). Transnational Project and Workshop Series of Austria, France, Malta, the Netherlands, Sweden and Switzerland. Transport-Related Health Effects with a Particular Focus on Children. Towards an Integrated Assessment of their Costs and Benefits. State of the Art Knowledge, Methodological Aspects and Policy Directions. Topic Report Physical Activity. Magglingen and Bern: Federal Office of Sport and Federal Office of Public Health.
- National Institute for Health and Clinical Excellence NICE (2008). Promoting and creating built and natural environments that encourage and support physical activity. London: NICE.
- Thommen, O. Kahlmeier, S.; Martin-Diener, E.; Martin, B.; Racioppi, F. and Braun-Fahrländer, C. (2006). Collaboration between the Health and Transport Sectors in Promoting Physical Activity: Examples from European Countries. Copenhagen: WHO Europe.

Published by
Federal Office of Sport FOSPO
Federal Office of Public Health FOPH
Network HEPA Switzerland

Concept and text
Eva Martin-Diener

Editorial board
Brian Martin (FOSPO), Ursula Ulrich (FOPH), Heidi Meyer (Federal Roads Office FEDRO), Gregor Ochsenbein (Federal Office for Spatial Development ARE), Othmar Brügger (Swiss Council for Accident Prevention), Uwe Ewert (Swiss Council for Accident Prevention)

Editing
Ruth Jahn, Pressebüro Index, Zurich

Translation
English: bmp translations, Basel

Graphic design and layout
Monique Marzo, FOSPO

Printing
W. Gassmann, Biel

Photos
Daniel Käsermann, FOSPO (p. 9, 11, 13, 14, 15, 18, 19, 21, 24);
Gianlorenzo Ciccozzi, FOSPO (p. 10)
Domnik Büttner, Zürich; © Pro Velo Schweiz (p. 4, 5)

Availability
• In electronic form: www.hepa.ch
• In printed form: Network HEPA Switzerland, Federal Office of Sport, 2532 Magglingen; info@hepa.ch
Also available in French and German

Suggested citation: Federal Office of Sport, Federal Office of Public Health, Network HEPA Switzerland (2008). Muscle-Powered Mobility. Base Document for Switzerland. Magglingen: Federal Office of Sport.