

Active travel in Glasgow: what we've learned so far

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March 2017



ACKNOWLEDGEMENTS

This report draws on a range of work undertaken or commissioned by current or past members of the Glasgow Centre for Population Health (GCPH) team in collaboration with many other organisations and communities. I am grateful to all those who have contributed to the research, analyses, seminars and presentations from which I have drawn the information included in this report. My particular thanks are due to many members of the GCPH team for commenting on drafts and helping to finalise the report. In particular, I am very grateful to Bruce Whyte, Sara Dodds, Fiona Crawford, Lorna Kelly, Jennie Coyle and Pete Seaman for commenting on earlier drafts of this report, to Bruce Whyte and Karen McPherson for information and analysis of relevant data and to Joe Crossland for proofing and editing the report.

My sincere thanks are also due to Glasgow City Council and nextbike for providing an anonymised extract from their cycle hire data for analysis, to Andrew Knight, from Scottish Transport, for updated data and permission to reproduce Figures 4 and 6, and to Andrew Taylor, from the Directorate for Environment and Forestry at Scottish Government, for permission to reproduce Figure 3. Figure 2 is reproduced with permission from The Sheridan Press, on behalf of The American Public Health Association. The full reference is: Pucher J, Buehler R, Bassett DR, Dannenberg AL. Walking and cycling to health: a comparative analysis of city, state, and international data. *American Journal of Public Health* 2010;100(10):1986-1992.

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The Glasgow Centre for Population Health (GCPH) was established in 2004 to investigate issues relating to poor health, generate evidence about new approaches, and work with others to facilitate change. It is a partnership between NHS Greater Glasgow and Clyde, Glasgow City Council and the University of Glasgow, funded by the Scottish Government.

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ABBREVIATIONS/GLOSSARY

- Active travel: walking or cycling or using some other form of physical activity for all or part of a journey, instead of using motorised transport.
- BMI: body mass index. This measure relates a person's weight to their height. The BMI calculation divides an adult's weight in kilograms by their height in metres squared. For example, a BMI of 25 means 25kg/m². For most adults, a BMI in the 18.5 to 24.9 range is considered to be a healthy weight. Lower is considered underweight and higher, overweight. For children and young people aged 2 to 18, the BMI calculation takes into account age and gender as well as height and weight.
- GCC: Glasgow City Council
- GCPH: Glasgow Centre for Population Health
- MVPH: moderate/vigorous physical activity. Current recommendations are for a minimum of 150 minutes of moderate activity or 75 minutes of vigorous activity per week which can be made up of 10-minute bouts of exercise.
- NO_x: NO_x is a generic term for the mono-nitrogen oxides NO and NO₂ (nitric oxide and nitrogen dioxide). These are produced in vehicle engines and contribute to air pollution.
- PM_{2.5}, PM₁₀: particulate matter (PM) is a term used to describe the mixture of solid particles and liquid droplets in the air and is an important and damaging air pollutant. Particulate matter comes from a range of natural and man-made sources. One major source is road transport, which produces primary particles when fuels are burned or lubricants used up in the engine, when tyres and brakes wear down and form road dust. Particulate matter is classified according to size. PM_{2.5} is particulate matter 2.5 micrometres or less in diameter and is generally described as fine particles or fine particulate matter. PM₁₀ is particulate matter 10 micrometres or less in diameter.
- SG: Scottish Government

EXECUTIVE SUMMARY

This report brings together GCPH learning on transport and health, with a specific focus on active travel. Active travel refers to walking, cycling or using some other form of physical activity for all or part of a journey, instead of using motorised transport. Active travel covers all types of journeys and can be undertaken in combination with public transport for longer journeys.

In 2007, the GCPH established a programme of work to gather and analyse information about levels of active travel, to improve understanding of trends and influences on travel choices, and to evaluate the impact of transport policies and programmes on active, sustainable travel in Glasgow and the Clyde Valley area. Since then the programme has collated and analysed national survey and routine data to provide information and trends on modes of travel and casualties for different population groups, conducted wide-ranging research to explore travel patterns and attitudes towards active travel in and around Glasgow, and convened seminars and workshops to discuss the emerging issues and possible ways forward.

Research has shown that active forms of travel, including walking and cycling, are not only important to health for their contribution to increasing physical activity, but also to help address obesity, improve mental health, tackle climate change, reduce air pollution, and can help build more connected communities.

However, despite policies that support and advocate for more active travel at both Scotland and Glasgow levels, current evidence suggests that almost all travel trends are static or moving in the wrong direction in terms of improving health.

This report emphasises the importance of:

- greater leadership and investment in active travel, and improved co-ordination across transport, planning, health improvement, air quality and climate change policies and programmes
- raising the profile of active travel in urban planning and infrastructure development
- supporting culture and behaviour change, as part of a wider strategic approach
- improving monitoring data on active travel, in order to understand which interventions are impacting on active travel trends and how.

This report follows the synthesis of ten years of GCPH evidence published in October 2014 which emphasised, in line with international evidence, the importance of economic, environmental and social factors on health. It is intended to stimulate thinking and provide the basis for discussion with and between the Centre's partners and networks about the further actions that are needed to increase levels of active travel in Scotland.

1. INTRODUCTION

How we travel, and the supporting transport infrastructure, influences where we live, how we relate to those living around us and how safe we feel moving around our cities and towns. Transport is a major factor in how, and even if, we access employment or educational opportunities. Transport also influences our ability to access other facilities and amenities such as parks, sports centres and shops.

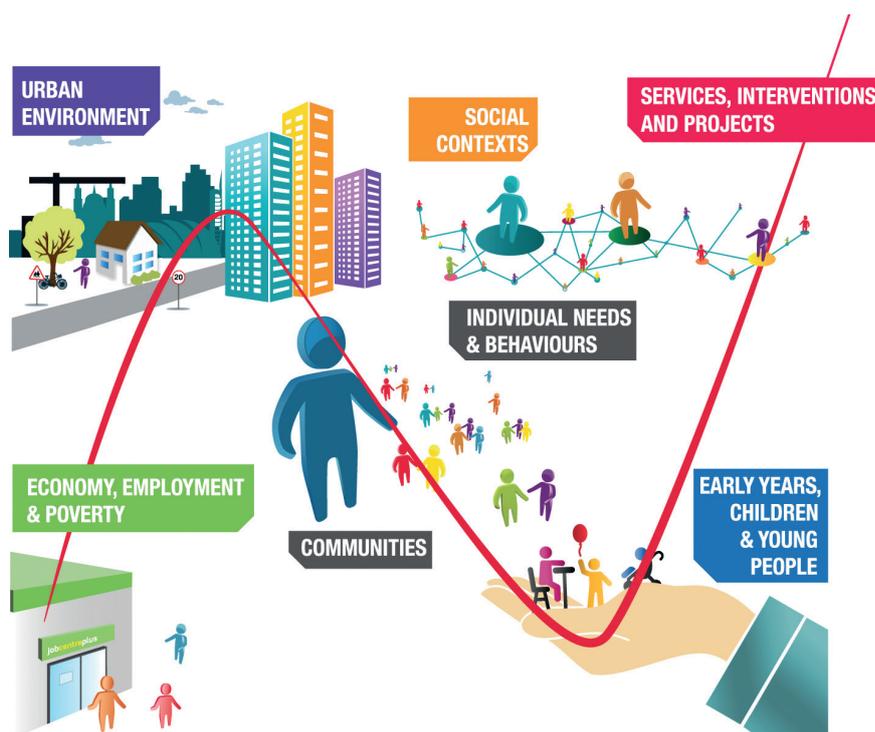
Different forms of transport can influence our health in different ways, for example through associated vehicle emissions and air pollution, physical activity, and road casualties. These influences impact differently on different population groups which means that transport infrastructure and travel choices can influence social and health inequalities. Moreover, the impacts of the decisions we take both individually and collectively about how we travel will have implications not only for our own lives and health, but also for future generations who will live with the environmental and health impacts of these choices.

The Glasgow Centre for Population Health (GCPH) was established in 2004 to generate insights and evidence, support new approaches, and inform and influence action to improve health and tackle inequality. This report brings together GCPH learning on transport and health, with a specific focus on active travel. Active travel refers to walking, cycling or using some other form of physical activity for all or part of a journey instead of using motorised transport. The term covers all types of journeys, including journeys to work or places of study, to shops, to services and for leisure

This review follows the synthesis of ten years of the GCPH¹, published in October 2014, which provided an overview of the evidence base developed by the GCPH and gave high-level implications for policy and practice. That review, in line with the substantial body of international evidence on the wider determinants of health, emphasised the importance of economic, environmental and social factors for the health of individuals and communities. In particular, it described the important role of four key areas (see Figure 1): the economy, employment and poverty; early life experience; urban environments; and social contexts. Interacting with all of these, and having their own effect, are the services, interventions and approaches undertaken to improve outcomes for individuals and communities (represented by the red line in Figure 1). Transportation infrastructure is primarily located within the urban environment domain, but it has influences across all four key areas, and these influences can be both positive and negative.

Active forms of travel are important for their contribution to increasing physical activity, and therefore, to improving physical and mental health. Increasing active travel also contributes to better health by reducing the impact of obesity, climate change and air pollution, and can help build more connected communities. This report is intended to stimulate thinking and provide the basis for discussion with and between the Centre's partners and networks about the further actions that are needed to increase levels of active travel in Scotland.

Figure 1: Influences on health.



Source: Dodds S. *Ten years of the Glasgow Centre for Population Health: the evidence and implications*. Glasgow: GCPH; 2014¹.

The evidence outlined in this report is primarily drawn from the analysis, research and evidence reviews undertaken by the GCPH and from the [GoWell](#)^a research and learning programme. Relevant information from the GCPH's [Understanding Glasgow](#) web resource^b has also been included. In addition, the report incorporates insights from events hosted by the GCPH and GoWell, including Glasgow's Healthier Future Forum workshops, active travel seminars and the joint GCPH/International Futures Forum^c Seminar Series lectures. The GCPH studies included have typically been undertaken in Glasgow or West Central Scotland, but some of the research, data analysis and evidence reviews also have a wider focus on Scotland, the UK or internationally. Where appropriate, relevant research or data from other sources have also been cited.

^a GoWell is a research and learning programme exploring the impact on health and wellbeing of investment in housing, regeneration and neighbourhood renewal across 15 communities in Glasgow. GoWell is a collaborative partnership between the GCPH, and Urban Studies and the MRC/CSO Social and Public Health Sciences Unit at the University of Glasgow. GoWell is sponsored by Glasgow Housing Association, the Scottish Government, NHS Health Scotland and NHS Greater Glasgow and Clyde: www.gowellonline.com.

^b The Understanding Glasgow website was developed by the GCPH, with support from a range of partners, to create an accessible resource providing information about the wellbeing of Glasgow's population across 12 domains (including transport), each with a basket of indicators allowing progress to be monitored: www.understandingglasgow.com.

^c The [International Futures Forum \(IFF\)](#) is an international and diverse group of individuals with different perspectives, disciplines, expertise, life experience and so on, supported by a small organisational infrastructure based in Scotland. The purpose of the IFF is to use draw on the diverse membership to develop a body of ideas and philosophy about how to make sense of today's complex world.

There are some important aspects of transport and active travel that relate to health that are not covered in detail in this report, including public transport, parking, traffic congestion, driver education and specific details of appropriate infrastructure developments. This is not because they are not relevant to health, but rather that GCPH has not undertaken detailed research in these areas to date.

2. TRANSPORT AND PUBLIC HEALTH

The harmful impacts of a transport system dominated by individual motorised vehicles (primarily cars)² include: physical inactivity; obesity and related health problems; injury and death from road traffic accidents; cardiac and respiratory disease from air pollution; community severance or isolation due to busy and multi-lane roads or poor transport infrastructure; and climate change from vehicle carbon emissions. Predicted traffic growth, and the resulting congestion, is likely to increase inefficiencies in an economy that relies on road-based distribution and large out-of-town retail centres. The GCPH has outlined strong health, social inclusion and environmental arguments for reducing car use and increasing travel by other means including active travel and high quality, affordable public transport².

Active travel reduces reliance on cars and road infrastructure, and offers opportunities for increased physical activity and reduced carbon emissions. Improving the walking environment can also help foster a sense of community and increase social contact^{2,3}. Indeed, active travel has been described as both a ‘best buy’⁴ for transport investment and as a ‘wonder drug’⁵ for health and is frequently cited by health experts as a key part of any strategy to improve health^{6,7}. Increasing active travel could help address a number of pressing health concerns: low levels of physical activity across the population; poor air quality; climate change; social isolation; and poor mental wellbeing.

Active travel is most feasible for short journeys, but when combined with public transport as part of an integrated transport system, active travel can also be part of a sustainable and healthy alternative to car-based travel for longer journeys.

The GCPH has had a strong focus on active travel, producing a range of research studies and data analyses^d since the publication of ‘*How can transport contribute to public health?*’ in 2007². The rest of this section briefly summarises the rationale for GCPH’s focus on active travel, and the potential benefits of increasing the number of people who travel actively for all or part of their regular journeys.

^d See the list of GCPH research at: http://www.gcph.co.uk/work_themes/theme_2_urban_health/active_sustainable_travel

2.1 Physical activity

In Scotland physical activity levels are fairly static⁸ with around a third of adults not meeting the current physical activity guidelines^e, while the proportion of people who are obese and overweight continues to rise⁹. This is also true for Glasgow¹⁰. [As data on Understanding Glasgow outline^f](#), physical activity varies across area deprivation; using the physical activity guidelines from 2008-2011⁹, 51% of those in the least deprived areas achieved the recommended levels of physical activity compared with 35% in the most deprived areas¹¹. The variation in physical activity by area deprivation is greater in Glasgow than it is in the rest of Scotland¹¹.

Being physically inactive is linked to increased body fat and obesity which contribute to type 2 diabetes, coronary heart disease, and some types of cancer. Active modes of travel such as walking and cycling undertaken as part of regular journeys can help individuals achieve the recommended level of moderate physical activity¹² and can be easier to fit into a regular routine than leisure time activity¹³. Modest increases in physical activity, such as a brisk 20-minute walk or cycle each day, particularly for those who are the least physically active, bring significant physical health benefits and reduce all-cause mortality even after adjustment for other forms of physical activity^{14,15}. Public health approaches will therefore have the biggest impact if they increase walking and cycling levels in the population groups that are least physically active. Physical activity can also help prevent and alleviate poor mental health¹⁶ and can contribute to improved mental wellbeing¹⁷ and better cognitive function in older people¹⁸.

^e Current UK moderate/vigorous physical activity (MVPA) guidelines for adults are for a minimum of 150 minutes of moderate activity or 75 minutes of vigorous activity per week, which can be made up of ten-minute bouts of exercise. In addition, weight-bearing exercise is recommended at least twice a week.

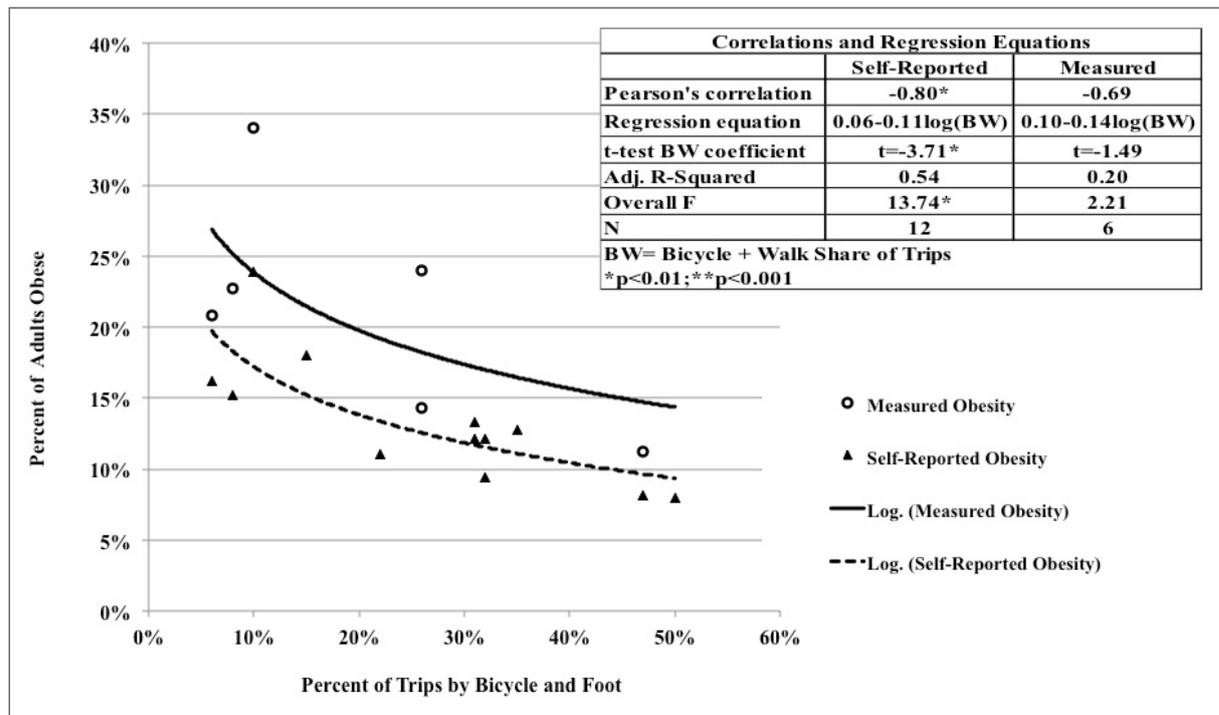
^f Understanding Glasgow. *Lifestyle, Physical activity, Trends in physical activity levels*. http://www.understandingglasgow.com/indicators/lifestyle/physical_activity/trends_in_physical_activity_levels

⁹ 2008-2011 physical activity guidelines for adults were for a minimum of 30 minutes moderate or vigorous physical activity (MVPA) on at least five days a week which can be made up of ten-minute bouts of exercise.

2.2 Healthy weight

Physical activity helps maintain a healthy weight. Countries with higher levels of active travel have lower self-reported obesity rates and vice versa (see Figure 2).

Figure 2: Relationship between adult obesity and active transport in Australia and 13 countries in Europe and North America: 2000–2006.



Source: Pucher J, Buehler R, Bassett DR, Dannenberg AL. Walking and cycling to health: a comparative analysis of city, state, and international data. *American Journal of Public Health* 2010;100(10):1986-1992¹³. Reproduced with permission from The Sheridan Press.

Research has also found that those who commuted all or part of their journey to work (and used public transport for the remainder) had a significantly lower body mass index (BMI) and percentage of body fat compared with those who commute solely by private motorised transport (i.e. cars and taxis)¹⁹. Furthermore, switching from cars to a form of active travel or public transport is associated with a significant reduction in BMI and, conversely, switching from active travel or public transport to car use is associated with a significant increase in BMI²⁰.

2.3 Harmful emissions and air quality

Public and private forms of motorised transport contribute to high air pollution levels, particularly in urban areas²¹. The World Health Organization (WHO) has linked transport-related air pollution to numerous health impacts, including mortality, asthma, rhinitis, cardiovascular disease, cancer, adverse pregnancy and birth outcomes and decreased male fertility²². The House of Commons Environmental Audit Committee reported that long-term exposure to air pollution (PM₁₀ and nitrogen oxides (NO_x)) exacerbates asthma, heart disease and respiratory illness²³. In addition, evidence suggests a causal relationship between PM_{2.5} exposure and cardiovascular morbidity and mortality²⁴. A report by the Royal College of Physicians²⁵ linked outdoor air pollution to cancer, asthma, stroke, heart disease, diabetes, obesity and changes linked to dementia, and estimated that around 40,000 deaths are attributable to exposure to outdoor air pollution in the UK each year. Furthermore, exposure to poor air quality has been found to be associated with socioeconomic status, with people living in more deprived areas often at greater risk of harm^{26,27}. Research also suggests that long-term exposure to air pollution can damage brain structures and impair thinking and memory in middle-aged and older adults²⁸.

In 2015, Glasgow was identified as one of 16 UK cities^h highlighted by the Supreme Court as breaching European legal pollution targets and was ordered to submit new air quality plans to the European Commission by the end of 2015²⁹. The annual mean levels of particulate matter (PM₁₀)ⁱ particles in the air in Glasgow have been reducing overall, but a number of kerbside monitoring sites breached the air quality objective between 2000 and 2015³⁰. The nitrogen dioxide (NO₂)^j emissions at these sites came mainly from transport sources. In relation to the annual mean concentration of NO₂, one city centre monitoring site in Glasgow has consistently breached the limits set in the European Directive 2008/50/EC on ambient air since 1998^{31,32}.

The levels of air pollution at some urban monitoring sites have resulted in some concern that walking and cycling in these areas may increase the intake of air pollution, leading to negative health consequences. This was examined in a recent study³³ which found that, in most urban environments^k, the benefits from undertaking physical activity outweighed risks from air pollution.

Short motor vehicle journeys make a disproportionate contribution to overall air pollution levels partly because over half of all car journeys are five miles or shorter³⁴, and partly because emissions are highest when the engine is first started and gradually reduce as the operating temperature increases³⁵. Yet short journeys are most easily undertaken by an active mode of travel such as walking or cycling. A significant reduction in the number of shorter motor vehicle journeys would have a positive impact in the areas where air pollution levels are above current thresholds. This would also have the greatest positive impact on the population groups most vulnerable to air pollution, such as people with respiratory or cardiac disease, and the very young and old.

^h Other cities included Manchester, Birmingham and London.

ⁱ Inhaling PM₁₀ particles can increase the number and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections.

^j The main effect of breathing in raised levels of NO₂ (nitrogen dioxide) is the increased likelihood of respiratory problems.

^k The global average urban background PM_{2.5} concentration (22 µg/m³).

Climate change, and specifically whether its mitigation can be achieved, is now considered a major global risk³⁶. As well as air pollution, motorised transport contributes a significant amount to total greenhouse gas emissions (a quarter to a third of all carbon dioxide emissions worldwide^{37,38}) and therefore to climate change. Increasing active travel and reducing car use can help cut these emissions more than a shift to other forms of individual motor vehicles (e.g. low emission vehicles) can achieve alone³⁹. However a recent report found that, while Scotland has achieved its overall carbon emission reduction targets to date, there has been a lack of progress in reducing emissions from transport⁴⁰. The report suggests that improved vehicle efficiency has been offset by increased motorised travel as a result of the growing economy and falling fuel prices and that more needs to be done to improve the transport sector's contribution emission reductions.

2.4 Economic and social benefits of active travel

A study by the London School of Economics demonstrated the direct economic benefits that cycling provides, contributing nearly £3bn a year to the UK economy through, for example, bike sales, manufacturing, reduced traffic congestion, lower pollution levels and lower NHS costs⁴¹.

The GCPH calculated¹ that the annual health [economic benefit accruing from cycle trips](#) into and out of Glasgow city centre in 2012 (calculated on the basis of reduced mortality) equated to over £4m⁴². This substantial sum is likely to be an underestimate as it was based on reductions in mortality and not reductions in illness or the other health benefits resulting from cycling. In addition, only cycle journeys in and out of Glasgow's city centre were considered, rather than journeys on other routes in the city. A study of the impact of cycling in the Netherlands estimated that, in addition to considerable health economic benefits, cycling prevents about 6,500 deaths each year and that cycling added six months to life expectancy⁴³.

Those who walk and cycle are also more likely to spend money in local areas than those in cars who tend to drive through^{44,45}. A report⁴⁵ commissioned by the Department of Transport focuses on evidence of the wider economic benefits of cycling, including retail revenue, employment effects, and public spending efficiencies. In common with research on the changed street environments in New York City⁴⁶, it found that cycling schemes (and wider public realm and sustainable transport schemes) often resulted in increased trade in local businesses. It also cites studies which show that, while cyclists spend less per visit, they tend to visit shops more regularly resulting in higher weekly spends⁴⁵. Therefore, increasing cycling and walking can stimulate economic growth and vibrancy in urban areas and benefit smaller local shops. UK and European cities which have invested in infrastructure and support for walking and cycling have experienced visible increases in both economic growth and vibrancy⁴⁴.

¹ The GCPH research team estimated the annual health economic benefit accruing from cycle trips into and out of Glasgow city centre in 2012 using an online modelling tool created by the World Health Organization that calculates the health economic benefits from cycling (<http://www.heatwalkingcycling.org>).

Evidence has shown that people are more likely to make active travel choices when streets and public places are attractive and well designed²⁷. Increased levels of walking and cycling also contribute to safer, more appealing public spaces. Where motor traffic is lighter, people interact more and feel a greater sense of community^{1,3}. Neighbourhood designs that favour walkers and cyclists, and provide access to a range of amenities which allow people to socialise can help to build social networks²⁷.

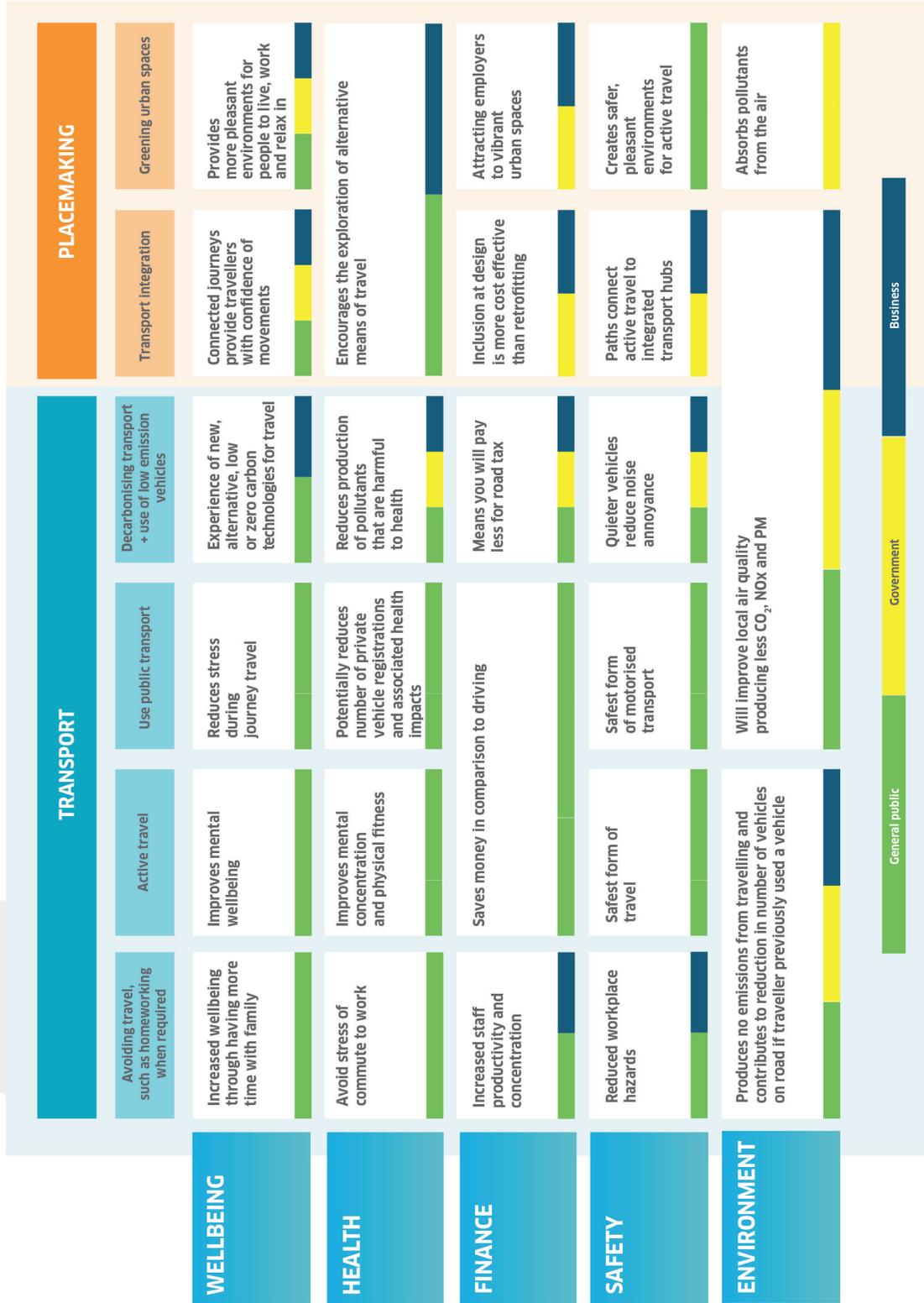
3. WIDER CONTEXT FOR ACTIVE TRAVEL

3.1 National and local policies

The benefits of increasing both the number of journeys made actively and the number of people travelling actively are recognised in a number of strategies and policies at UK and Scotland levels, and within Glasgow. In general these documents, which are detailed in the appendix and summarised in Table 1, have increasingly supported active travel in recent years. For example, the Cycling Action Plan for Scotland (2010)⁴⁷ aims to increase levels of cycling to 10% of all journeys by 2020 and the National Walking Strategy (2014)⁴⁸ seeks to create a walking culture in Scotland. In addition, Transport Scotland has published a long-term vision for active travel in Scotland (2014)⁴⁹. The Active Scotland Outcomes Framework⁵⁰ sets out the Scottish Government's key outcomes for physical activity and an Implementation Plan describes the related actions⁵¹. The Climate Change (Scotland) Act 2009⁵² and associated Delivery Plan⁵³ commit Scotland to reductions in greenhouse gas emissions in the medium and longer term, and Cleaner Air for Scotland is the national air quality strategy which gives a framework for improving air quality⁵⁴. It highlights the disproportionate impacts that air pollution has on the most vulnerable members of society, including the very young, the elderly, people with existing medical conditions and those living in deprived urban areas. It also outlines the multiple benefits that accompany actions to improve air quality and reduce air pollutants through transport and placemaking interventions (see Figure 3)⁵⁴.

Within Glasgow, the City Plan 2 (2009)⁵⁵ considers walking and cycling to be an “efficient, cost-effective, sustainable and healthy means of travel”. The Glasgow City Centre Transport Strategy (2014-24)⁵⁶ and Glasgow's new Strategic Plan for Cycling (2016-2025)⁵⁷ describe how Glasgow will achieve its vision for increased cycling and walking.

Figure 3: Multiple benefits of good air quality.



Source: Scottish Government.
Cleaner air for Scotland: the road to a healthier future.
 Edinburgh: Scottish Government; 2015⁵⁴.
 Reproduced with kind permission from Andrew Taylor, Directorate for Environment and Forestry, Scottish Government.

Table 1. Summary of key policies and strategies relating to active travel at Scotland and Glasgow levels.

Strategy/Policy	Year	Published by	Key points
Scottish Transport Strategy ⁵⁸	2006	Scottish Government	Outlined the vision to “increase the proportion of short journeys made on foot and on bicycles which has the effect of reducing carbon emissions, improving air quality, reducing congestion, and contributing to the achievement of a healthier Scotland.” It went on to say that “by investing in better infrastructure links between community facilities such as health centres, transport hubs and schools, we believe that cycling and walking as travel options are realistic alternatives to using the car for journeys to work, school and for leisure purposes.”
Scotland’s Road Safety Framework to 2020 ⁵⁹	2009	Scottish Government	Encourages local authorities to consider 20mph zones in all residential areas.
Cycling Action Plan for Scotland ⁴⁷	2010	Scottish Government	Aims to increase levels of cycling by 2020, with 10% of all journeys taken by bike.
National Walking Strategy for Scotland ⁴⁸	2014	Scottish Government	Lays out a vision of a Scotland where everyone benefits from walking.
Scottish Government’s long-term vision for active travel ⁴⁹	2014	Transport Scotland	Aims to encourage more people to walk and cycle for everyday shorter journeys.
Let’s Make Scotland More Active ⁶⁰	2003	Scottish Government	A 20-year plan which lays out a broad framework for the promotion of physical activity in Scotland along with targets to achieve 50% of adults and 80% of children meeting the minimum recommended levels by 2022.
Physical Activity guidance ⁶¹	2012	Jointly published by the Chief Medical Officers from all four UK countries	Revised recommendations on the level, frequency and intensity of physical activity and these recommendations remain current ^m .
Active Scotland Outcomes Framework ⁵⁰	2014	Scottish Government	The Scottish Government’s key ten-year outcomes for increased physical activity in Scotland towards the revised recommended levels of physical activity.
National Physical Activity Implementation Plan ⁵¹	2014	Scottish Government	Outlines the actions that will be undertaken to achieve these outcomes in the Active Scotland Outcomes Framework.
Climate Change (Scotland) Act ⁵²	2009	Scottish Parliament	This Act commits Scotland to a 42% reduction in emissions by 2020 and annual reductions between 2010 and 2050.

Table 1 continues on page 18.

^m The different physical activity guidelines for adults are given below.

pre-2008: A minimum of 30 minutes moderate or vigorous physical activity on at least five days a week which can be made up of **15-minute** bouts of exercise.

2008-2011: A minimum of 30 minutes moderate or vigorous physical activity on at least five days a week which can be made up of **10-minute** bouts of exercise.

2012 (MVPA): A minimum of 150 minutes of moderate activity or 75 minutes of vigorous activity per week which can be made up of **10-minute** bouts of exercise. In addition, weight bearing exercise is recommended at least twice a week.

Table 1. Summary of key policies and strategies relating to active travel at Scotland and Glasgow levels (continued).

Climate Change Delivery Plan ⁵³	2009	Scottish Government	This sets out the measures required in each sector to meet Scotland's statutory climate change targets, and expresses the need for focused planning in order to reduce the need for travel, the carbon intensity of travel and to maximise active travel.
Route Map Towards Healthy Weight in Scotland ⁶²	2010	Scottish Government	States that "We will create environments that make walking and cycling part of everyday life for everyone".
Healthy Eating Active Living Action Plan (2008-2011) ⁶³	2008	Scottish Government	Described plans to "create, improve and maintain the supply of natural and built environments to encourage more active lifestyles".
The Revised Air Quality Strategy for England, Scotland, Wales and Northern Ireland ⁶⁴	2011	UK government	A long term strategy (to 2050) which set out air quality objectives and policy options to improve air quality in the UK.
Cleaner Air for Scotland – Road to a Healthier Future strategy (CAFS) ⁵⁴	2015	Scottish Government	Lays out a national framework to achieve further reductions in air pollution and fulfil legal responsibilities on air quality. Also outlines the contribution that better air quality can make to sustainable development while improving health and the natural environment and reducing health inequalities for the citizens of Scotland.
Glasgow's Physical Activity Strategy (2007-2012) ⁶⁵	2007	Glasgow City Council	Laid out the intention to promote active travel through the developing integrated and green transport policies, investment in infrastructure and environment and the dissemination of information.
Growing a Healthier Glasgow ⁶⁶	2006	Glasgow City Council	Reported the findings and recommendations of the Glasgow Health Commission which sought a greater emphasis on safe, active and sustainable modes of transport as the main feature of future transport growth in the city.
Glasgow's Local Transport Strategy (2007-2009) ⁶⁷	2007	Glasgow City Council	Included actions to encourage more people to cycle including expanding the cycle route network and promoting cycling.
Glasgow City Plan 2 ⁵⁵	2009	Glasgow City Council	This forms part of the city's development plan. Its 20-year vision lays the foundation for development across the city. It aims to tackle growing concerns about climate change and also the health of residents, and includes a range of policies to help address these. It makes explicit references to walking and cycling as "efficient, cost-effective, sustainable and healthy means of travel" and the intention to "maintain and improve on current figures." It states that "walking and cycling require to be given a high priority in the design of new developments".
Glasgow Strategic Cycling Plan (2010-2020) ⁶⁸	2010	Glasgow City Council	Describes how Glasgow will achieve its vision of cycling as the biggest participation activity in the city by 2020.
Strategic Cycling Plan (2016-2025) ⁵⁷	2016	Glasgow City Council	Replaces the Strategic Cycling Plan (2010-2020). Extends the Glasgow City Council's commitment to high quality cycling infrastructure and facilities in Glasgow.
Glasgow City Centre Transport Strategy 2014-24 ⁵⁶	2015	Glasgow City Council	The strategy aims to deliver transport benefits, encourage sustainable transport and provide a vibrant city centre in line with City Centre Strategy objectives and it explicitly states that it seeks to improve the health of Glasgow citizens by increasing the proportion of trips to, from and within the city centre that are undertaken actively.

If these policies are to achieve the intended increases in active travel, then their implementation needs to be supported through investment as well as national and local action. A [policy analysis](#) undertaken by the GCPH⁶⁹ in 2010 found limited evidence, at that time, of prioritisation and resource allocation to support active travel at a local level in Scotland. Specifically it concluded that, despite policy aspirations, central funding for infrastructure and support for active travel was low and effectively static in comparison with the investment at the time in roads. This was reinforced in 2015 at the Glasgow's Healthier Future Forum 16 seminar on active travel⁷⁰, hosted by the GCPH, where the supportive national and local policies were commended but frustration was expressed at the more limited prioritisation and funding to support implementation.

3.2 Investment in active travel

Updated data from Spokes⁷¹, the Lothian Cycle Campaign which also lobbies the Scottish Government, are presented in Table 2. They show that, while investment in active/sustainable transport as a proportion of overall transport investment has increased in recent years, it remains less than 2% of the total transport budget and around £7 per person in Scotland. This compares with around £24 per person in The Netherlands^{43,n} where around 26% of all journeys are made by bicycle and 19% on foot⁷².

Table 2. Investment in active/sustainable transport as a proportion of overall transport investment in Scotland.

Scottish Government spend in real terms	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
Total transport investment (£m)	1,769	1,892	1,864	1,812	1,893	2,019	2,019	2,108
Investment for cycling/walking (£m)	11.9	11.5	16.4	15	17.9	20.4	39.1	39.5
% of total transport spent on walking/cycling	0.7	0.6	0.9	0.8	0.9	1.0	1.9	1.9

Source: Spokes⁷¹.

At local level, however, there are examples of the active travel aspirations being reflected and supported financially. For example, Edinburgh City Council committed to spending 9% of its 2016/17 transport budget (capital and revenue) on projects to encourage cycling as a mode of transport in the city. This follows commitments of 5% in 2012/13, 6% in 2013/14, 7% in 2014/15 and 8% in 2015/16⁷³. The current investment equates to more than £11 per person. Transport trends in Edinburgh already bucked those of

ⁿ Calculated based on capital investment by all levels of Dutch government in road and parking infrastructure for cycling of almost €0.5 billion per year in recent years.

other Scottish cities before this additional investment: walking, cycling, bus and train use increased between 2001 and 2011, accompanied by an increase in households without a car⁷⁴. However subsequent improvements in active travel trends are likely to have been assisted by this increase in funding.

Edinburgh's investment in cycling is approaching the 10% that has been advocated by a wide range of public health and active travel experts⁷⁵ but few other UK cities have so far taken similar action⁷⁶. The Association of Directors of Public Health, in their Action on Active Travel report⁷⁵, recommended that 10% of all transport budgets should be invested in active travel while the All Party Parliamentary Group on Cycling recommended a cycling budget of £10-£20 per year per head of the population, for a sustained period⁷⁶.

3.3 Active travel infrastructure in Glasgow

It is not easy to identify a figure for Glasgow's financial commitment to cycling to date. Using information about the funding that has been committed to cycling infrastructure in Glasgow, including matched funding from Sustrans, it has been estimated that the spend on active travel was around £6.60 per person in 2015/16 (Whyte B, GCPH, personal communication; 2016)^o. This investment has funded a number of specific local infrastructure projects which have attracted walkers and cyclists. Glasgow's mass automated cycle hire scheme (run by the German company, nextbike), launched in 2014 to coincide with the Commonwealth Games, was extended to the south and east of the city in May 2015 reflecting its success. New proposals to further extend the scheme were announced in August 2016⁷⁷ which will double the number of bikes and bike hire stations and expand the scheme beyond the city centre⁷⁸. Some new segregated cycling and pedestrian routes, such as the 'Connect2' route from Anderston to Kelvingrove⁷⁹ (now known as the West City Way), and new Clyde crossings⁸⁰ for pedestrians and cyclists have also been developed. Glasgow City Council's figures in 2015 stated that 314km of cycle routes existed in Glasgow of which 13km were segregated routes on roads or shared paths^{57,81}. Going forward, Glasgow City Council has committed to investing £2m per year over three years in cycling and cycling infrastructure⁸².

Glasgow's [strategic plan for cycling 2016-2025](#)⁵⁷ replaced the 2010-2020 strategic cycling plan in early 2016 after a consultation exercise⁸³. The focus of the new plan is on increasing cycling for everyday journeys, the creation of a cycle network in and around the city, and provision of cycle training and support in primary schools to encourage more children and young people to cycle.

Glasgow City Council is also seeking to encourage more people to walk and cycle by reducing the road speed in Glasgow. The Council prioritised the first phase of mandatory 20mph zones in 2010. There were primarily in residential areas and around schools and were implemented in 2011 and 2012⁸⁴. Four subsequent phases between 2012 and 2016 have resulted in 65 20mph zones covering approximately 163km in Glasgow.

^o The Glasgow figure is based on the spend that the Council has committed to cycling 'in the next 3 years' (assumed to be 2016/17 – 2019/20) and includes match funding from Sustrans and/or the Scottish Government'. See: <http://www.bbc.co.uk/news/uk-scotland-glasgow-west-35715957>.

A mandatory 20mph zone order came into force in the city centre in March 2016⁸⁵, and there are plans for more as part of Phase 5.

The Glasgow and Clyde Valley City Deal⁸⁶ announced in 2014 is intended to improve transport infrastructure and develop new sites for housing and employment in and around Glasgow. It includes a number of major transport projects and offers a unique and important opportunity to shape the way people move around West Central Scotland, how communities connect and interact, and how people within those communities access employment and other opportunities in a sustainable, healthy way. Specific developments proposed include a footbridge over the river Clyde, linking Govan and Partick, and a pedestrian/cycle bridge across the M8 to Sighthill, but the City Deal also provides opportunities to expand and integrate active travel infrastructure beyond these individual developments.

4. TRAVEL TRENDS IN GLASGOW AND BEYOND

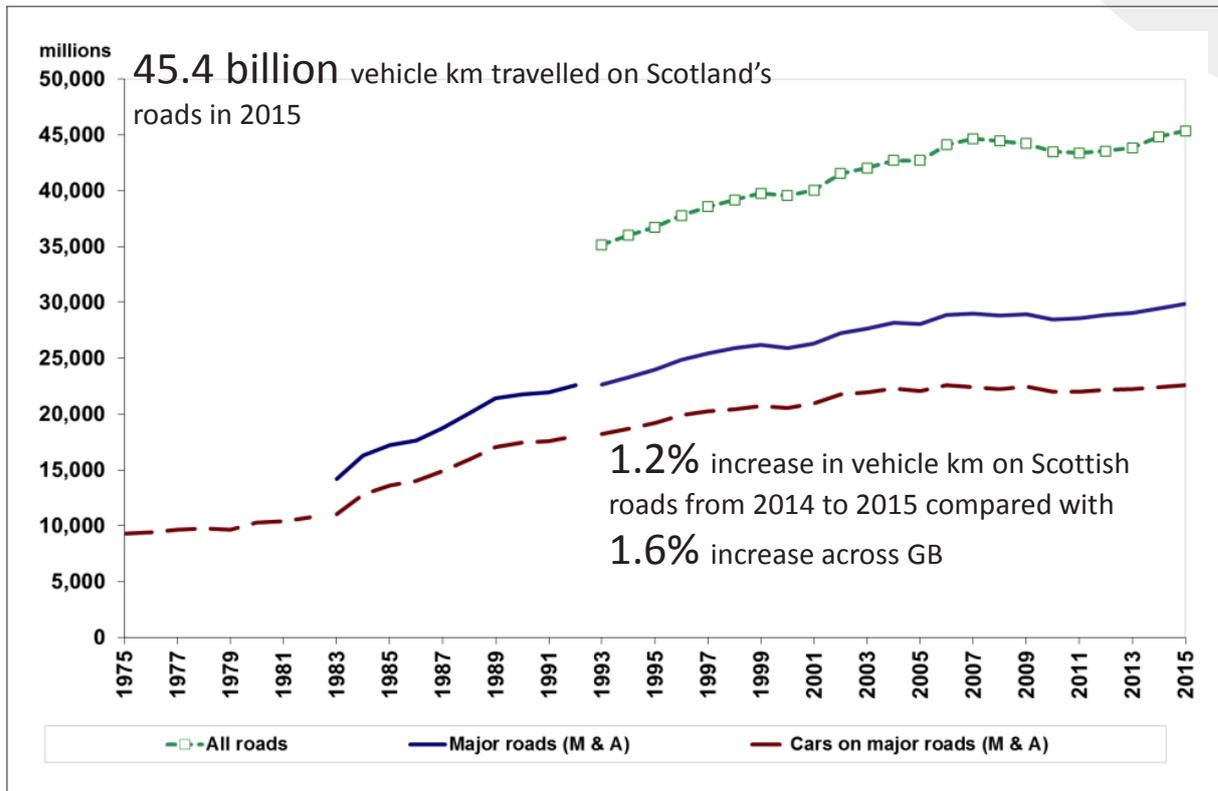
The GCPH's online resource, [Understanding Glasgow](#), brings together data relating to active travel, and the recent [GCPH publication on cycling and pedestrian casualties](#) outlines the key trends in modes of travel as well as casualties⁸⁷. This section summarises these data. It shows that, despite the supportive policies and recent developments, active travel trends have changed very little over the last decade.

4.1 Trends relating to car ownership and use

The number of licensed motor vehicles in Scotland is at its highest ever, having risen from less than 1.5 million in 1975 to 2.86 million in 2015 (of which 2.547 million are private or light goods vehicles⁸⁸). An estimated 45.4 billion kilometres were driven by traffic on Scotland's roads in 2015 which is the greatest level recorded and an increase of 1% on the 2014 figure⁸⁸. Seventy per cent of households had access to one or more cars or vans for private use in 2015⁸⁷. Among Scottish local authorities, Glasgow had the largest total number of vehicles licensed at the end of 2014 (258,600) but one of the lowest levels of registered cars per head: Glasgow had the third lowest figure (370 cars per 1,000 adults) behind Edinburgh (340) and Dundee (358). The number of cars registered per head was higher in rural areas with, for example, 577 cars per 1,000 people in Stirling, 555 per head in Aberdeenshire and 509 per head in the Scottish Borders⁸⁹. Despite the rise in car ownership, 31% of households in Scotland did not have a car available for their private use in 2011, with the figure for Glasgow much higher at 51% of households without access to a car⁹⁰.

Given the increase in car ownership, it is not surprising that the number of vehicle kilometres travelled on all Scottish roads has risen so substantially since the 1970s⁸⁸ (see Figure 4). [Let Glasgow Flourish](#), published by the GCPH in 2006, predicted that, left unchecked, traffic in Glasgow would grow by nearly 25% between 2001 and 2021⁹¹. Department of Transport data shows that the increase in vehicle kilometres travelled in Glasgow City by 2014 was 14.3%⁹².

Figure 4: Traffic in Scotland (vehicle km).

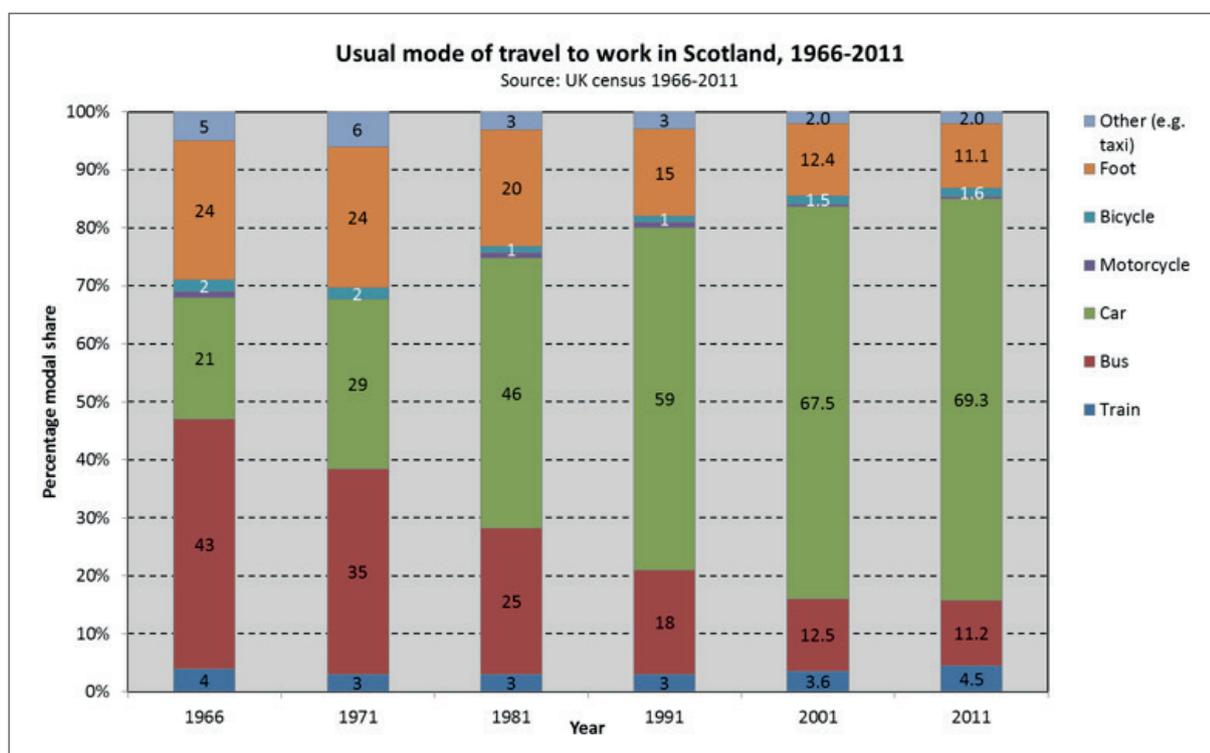


Source: Transport Scotland. Reproduced with kind permission from Andrew Knight, Transport Analytical Service, Transport Scotland.

Adult commuting patterns (to work) have changed significantly over the last 40 years in Scotland: commuting by car has increased dramatically from 21% in 1966 to 69% of journeys in 2011 while bus and pedestrian commuting have fallen dramatically to 11% each (see Figure 5). Car driving increased in every local authority in Scotland between 2001 and 2011 except Edinburgh.

In 2015, employed adults (who don't work from home) reported that 14% of their journeys to work were on foot, 11% were by bus, 4% were by train, and just less than 2.2% were by bicycle. Around 66% of journeys to work were by car as either a driver or passenger⁸⁸.

Figure 5: Usual mode of travel to work in Scotland, 1966-2011⁹³.



Source: UK census.

Note: The data shown above are sourced from UK censuses conducted in 1966, 1971, 1981, 1991, 2001 and 2011. This analysis is based on responses from employed adults regarding their usual mode of travel to work.

4.2 Trends in active travel

The Scottish Government National Indicator that tracks the proportion of journeys to work made by public or active transport reported that 31.4% of all journeys to work in Scotland in 2015 were undertaken by public transport or active means⁹⁴. This figure has changed little in recent years although this is a slight increase on the 2014 figure (29.8%)⁹⁴.

Cycling

Census data show that the proportion of Scottish commuters who cycle to work has been low and relatively static, but rose very marginally from 1.5% in 2001 to 1.6% in 2011⁹³ (see Figure 5). Underlying this overall figure, there are geographical variations in cycling across Scotland. For example, within Glasgow, 1.6% of people cycled to their place of work or study in 2011, compared with 4.3% in Edinburgh⁹⁵. Estimates from annual cordon count^p surveys in Glasgow give an indication of annual changes in cycling levels into the city centre. These data from 2009-2016 indicate that there was an 85% increase in cycle trips into and out of the city over the period⁹⁶. The 2016 data show more cycling trips

^p Glasgow City Council has commissioned counts of cyclists and pedestrians entering and leaving cordons around the city on specific dates each year over recent years. A total of 35 sites form a cordon around the centre of the city and are monitored between 6:00am and 8:00pm over two successive days each September. All pedestrian and cycle movement at these locations, to and from the city, are counted.

over the two days (of the cordon count) than the previous peak recorded in 2014 shortly after the Commonwealth Games. This increase is likely to reflect the cycle hire scheme launched in 2014 and new active travel infrastructure in and around the city centre, such as the West City Way⁷⁹, the South West City Way and the Tradeston footbridge (the ‘Squiggly bridge’) across the Clyde⁸⁰.

Walking

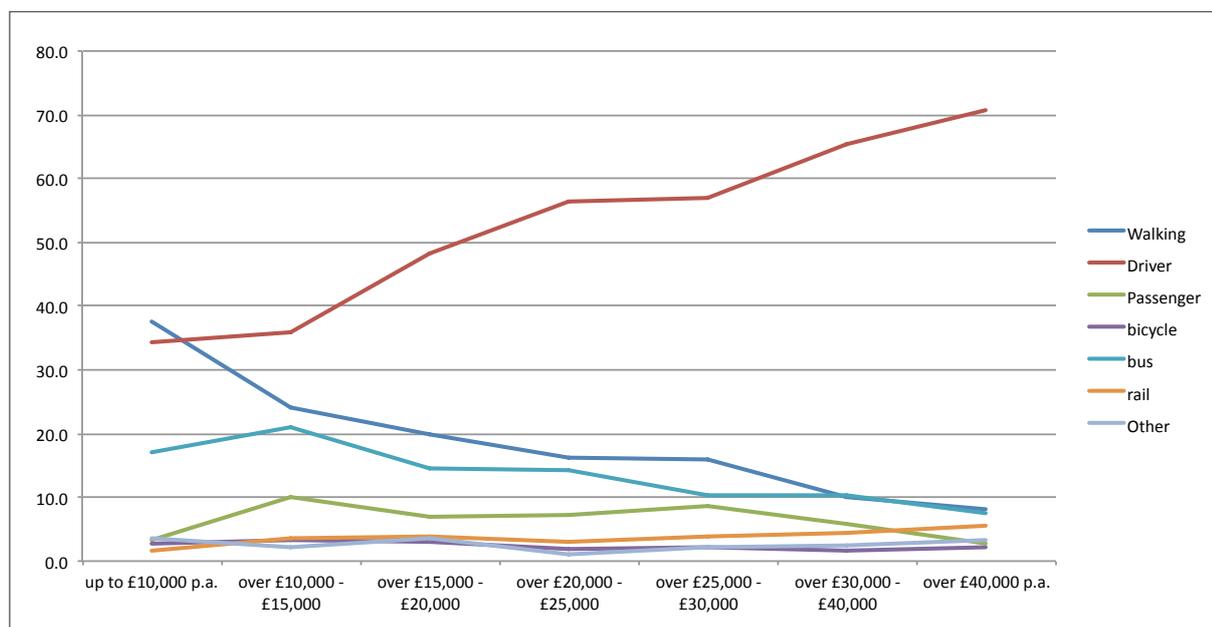
Levels of walking have fallen dramatically over the last few decades with reported levels of walking to work falling from 24% of adults in 1966 to 11% in 2011 in Scotland (see Figure 5)⁹³. As the use of public transport generally involves more walking as part of the overall journey compared with car use, the reductions in bus and train use that have also been observed in recent years are likely to be associated with less walking. However, in terms of all journeys (i.e. those that are not just commuting journeys to work and study) Scottish Household Survey data suggest there was little change in walking between 2012 (when the survey methodology changed) and 2014⁹⁷ (26% and 25% respectively). This may indicate that the overall decline in walking is stabilising. Furthermore, cordon count data from Glasgow recorded a 12.5% increase in pedestrian trips into and out of the city between 2009 and 2016⁹⁸. In 2015, the cordon survey counted over 92,000 pedestrian trips into and out of the city centre per day.

4.3 Inequalities and mode of travel

There are considerable differences in the ways that people travel related to their household income (Figure 6)⁹⁹: Scottish Household Survey (SHS) data from 2015 show that fewer people from households with incomes of less than £10,000 per year usually drove to work (34%) than those from households with annual incomes over £40,000 (71%). Commuters from low-income households were much more likely to walk (38%) or take the bus (17%) than commuters from high-income households (8% and 7% respectively).

In terms of cycling, while signs of an increase in cycling in Glasgow are encouraging, the low baseline of around 1.6% of commuting trips means that, even with these increases, cycling levels remain low. In Glasgow, cycling is dominated by the most affluent of the population: those in the least deprived decile are nearly three times more likely to cycle than those in the most deprived decile¹⁰⁰. More affluent households are also more likely to own bicycles⁸⁸. This highlights the risk that investment in cycling infrastructure and initiatives might reinforce existing inequalities in health if they only benefit those that already cycle¹⁰¹. There needs to be a clear recognition of this risk in any strategy to increase cycling, and action taken to mitigate this possibility.

Figure 6: Travel to work (excluding those who work at/from home) shown by annual net income of household, 2015.



Source: Transport Scotland. Reproduced with kind permission from Andrew Knight, Transport Analytical Service, Transport Scotland.

4.4 Commuting to school

In 2015, just under half of pupils in Scotland (49.7%) normally travelled to school by active means (e.g. on foot, by bike or on a scooter, skates or skateboard). Forty-two per cent reported that they normally used some form of motorised transport¹⁰². Overall in Scotland the trend over the last 20 years has been towards less walking and, in some areas such as Glasgow, greater car travel to school. Scooting and skateboarding have increased across Scotland, albeit from a low base (increasing from 0.7% in 2008 to 2.9% in 2015)¹⁰². In Glasgow over 30% of pupils were normally driven or travelled by taxi to school in 2015 compared with 23.9% nationally. In the same year, 49.5% of children walked to school in Glasgow and 48.4% in Edinburgh, down from 55.7% and 51.5% respectively in 2008¹⁰².

In general, younger pupils are more likely to walk and to be driven to school than older children who are more likely to take the bus, and greater proportions of primary pupils cycle (5%), scoot (4.5%) and walk (45%) to school than secondary pupils (1%, 0.2%, 43% respectively)¹⁰². Although levels of walking to school have remained high, particularly in primary schools, there has been a trend towards greater car use and less walking over the last 20 years. This is despite a range of strategies and policies promoting active travel to school¹⁰³.

The percentage of children who cycle to school is at a high of 3.5% of respondents to the Hands Up survey in 2015¹⁰². This average masks local variations: 2.9% of children in Glasgow and 4.7% of Edinburgh pupils cycled to school. A survey of Glasgow children in 2007 found that nearly 10% would like to cycle to school¹⁰³ although, at that time, only 1.4% of children actually did so¹⁰².

It seems likely that the fall in active commuting to school and the rise in children who are driven to school reflects broader shifts in culture across society over the last 20 or so years: the rise in car ownership and car-based commuting to work; increased working hours and the more complicated journeys required to balance work and caring responsibilities; parental fear that the increased volume of traffic on roads makes walking or cycling to school unsafe; and increased social anxiety about children being out without adult supervision. Respondents to the Scottish Household Survey who drove their children to school were most likely to give convenience (41%), safety (20%), too far a distance to walk (16%) and speed (14%) as the reasons for their choice⁸⁸.

The GCPH undertook an analysis of travel diary responses by Glasgow and Clyde Valley residents in the period 2001-2006 which suggested trends that may also have influenced increased car use¹⁰⁴: for all types of journey, the distances travelled on foot, by bus or as a car passenger reduced while distances travelled as a driver increased.

4.5 Physical activity

Analysis of the Scottish Health Survey (SHS) undertaken by the GCPH found that walking is the predominant way that adults achieve recommended physical activity levels (Shipton D, GCPH, personal communication; 2015). This reflects similar findings from Germany and the USA¹⁰⁵. More detailed analysis of the SHS published recently highlights the important contribution that walking and occupational activity make to daily activity, which the authors suggest reinforces the need to continue develop and evaluate walking interventions in Scotland¹⁰⁶.

[Understanding Glasgow](#) presents the SHS (2008-2011) findings relating to the previous physical activity recommendations which were revised^m in 2011¹⁰⁷. The previous advice stated that adults should do at least 30 minutes of moderate activity on most days of the week. The SHS (2008-2011) found that 40% of respondents in Glasgow met the minimum recommended levels, which is similar to the rest of Scotland. Younger adults were more likely to meet the recommendations than older adults, and men of all ages more likely than women. The SHS data also showed a deprivation gradient with 35% of those in the most deprived areas meeting the guidelines compared with 51% in the least deprived areas. GoWell research found that over 60% of respondents to the 2008 survey had not done any moderate or vigorous physical activity in the previous week, and only a quarter of respondents said they had walked ten minutes or more in the same period¹⁰⁸.

The revised national physical activity guidelines, which were adopted in 2012, are more detailed and are tailored to specific age groups over the life-course⁶¹. They advise that adults should be moderately active for a minimum of 150 minutes a week. The proportion of adults meeting these new recommendations in 2014 was 63%, ranging from 54.4% in the most deprived areas to 70.2% in the least deprived areas¹⁰⁹. These new guidelines are different to the previous (pre-2012) ones and are therefore not comparable.

4.6 Casualties

The GCPH's recent [Trends in pedestrian and cyclist casualties in Scotland](#) study brought data from a range of sources together to highlight casualty trends for those engaging in active travel in Scotland⁸⁷. It highlighted the following points:

- Total road traffic injuries (of all types) are at their lowest level in Scotland since records began more than 50 years ago. During the period 1999/2003 – 2009/2013⁹, there was a decrease in the adult casualty rate of between 27% and 47% for all modes of transport, apart from cycling which rose by 16%. The majority of adult road casualties continue to be those travelling by car.
- Child casualty rates for all modes of transport, except car casualties, fell by over 50% during the decade 1999/2003 to 2009/2013. Child car casualties decreased by 43% over the same period. Despite these reductions there was a higher rate of child casualties among pedestrians than for any other mode of transport throughout this decade.
- Child and adult pedestrians are more likely to be casualties both as a result of accidents *in the most deprived areas and if they live in deprived areas*. Child pedestrian casualty rates were 3.2 times higher in the most deprived quintile (20%) of areas compared with the rate in the least deprived quintile in the period 2009/13. The equivalent adult pedestrian casualty rates were 2.4 times higher.
- In terms of cycling, child cyclist casualty rates have fallen in the last decade, but the rate is considerably higher in deprived areas.
- Adult cycling casualties across Scotland (as recorded by the police and through hospital statistics) have increased both in terms of casualty numbers and as a population-based casualty rate: adult cyclist hospital admission rates increased from 5.5 per 100,000 in 2003/2007 to 7.4 per 100,000 in 2009/2013 (an increase of 34%), while police-reported adult cyclist casualty rates increased from 12.9 per 100,000 in 2003/2007 to 16.1 per 100,000 in 2009/2013 (an increase of 25%).
- The rise in adult cyclist casualties is particularly notable in large urban areas – and also in some rural areas – including each of Scotland's four largest cities (Glasgow, Edinburgh, Aberdeen and Dundee, by population). The increase occurs across all levels of socioeconomic deprivation but the highest rates are in the least deprived areas (there were 1.4 times as many casualties per 100,000 population in the least deprived fifth of areas compared with the most deprived fifth of areas in 2009/2013) which reflects the fact that cycling rates are higher in less socioeconomically deprived communities. Further analysis, which is detailed in the GCPH report⁸⁷, suggests that the rise in cyclist casualty numbers may be associated with the rise in the prevalence of cycling.
- Pedestrian and cycling casualty rates also vary by gender for both adult and children, with men and boys several times more likely to be injured than women and girls.

⁹ Casualty trends are based on five-year moving averages e.g. the 1999/2003 casualty rate, is an annualised average based on five years of casualties from the period 1999 to 2003 divided by the average population in that five-year period.

5. FACTORS WHICH INFLUENCE TRAVEL CHOICES

The GCPH has undertaken a [range of projects](#) exploring the factors that influence how people travel and what influences their transport and active travel choices. These factors can be broadly split into five categories: safety; traffic speed; the built environment; convenience, time efficiency and cost; and culture and social norms.

5.1 Safety

Many people are discouraged from making the shift from car-based travel to walking or cycling because of real and perceived safety concerns¹¹⁰. These concerns are particularly influenced by traffic speed which is discussed in Section 5.2 below.

Within schools, the existence of safe routes to school, official crossings and patrols, and low perceptions of safety risks within school communities were found to [contribute to higher levels of active travel of all types](#)¹¹¹. Children living in disadvantaged communities in the West of Scotland, and particularly younger children, have reported that danger from traffic was a particular concern¹¹².

The importance of a sense of safety was highlighted in the [evaluation](#) of a new segregated walking and cycling route in Glasgow⁷⁹. Users of the Kelvingrove-Anderston route – now known as the West City Way – reported that they were motivated to use the route because they felt it was safer. Over 20% of responders reported that they had changed their mode of transport from driving or public transport to walking or cycling on the route, and others opted to use the route even if it lengthened their overall journey. The raised kerb, intended to segregate cars and cyclists, was considered particularly important in creating a sense of safety. Cyclists reported feeling more confident about cycling on the route during peak hours than they would on a road without a dedicated cycle path.

A discussion about improving safety for cyclists at a [GCPH seminar on active travel](#) in 2015¹¹³ highlighted the importance of: cycle routes being suitable for use by young and relatively inexperienced cyclists; adequate signage to raise awareness of the different types of route users, and to ensure users can follow the links between routes; and gritting and maintenance plans to ensure routes can be used safely all year round.

It is not just concerns about road safety that influence decisions about active travel: personal safety was also highlighted as a concern in relation to active travel for leisure [in qualitative research into running and cultural participation](#) in Glasgow¹¹⁴. Participants from more deprived neighbourhoods reported a lack of safe and established routes for running and inadequate street lighting. Although parks in the surveyed areas were reported to be good places to run, runners felt insecure when running alone there in the dark. Their other safety concerns related to the condition of the streets, and included potholes, dog

faeces and broken glass. Other safety concerns given in the Scottish Household Survey as reasons why people choose not to cycle include: too many cars on the roads (18%), traffic too fast (12%), inconsiderate drivers (9%), concerns for personal safety (7%), road surfaces are dangerous (4%) and concerns about pollution from traffic (1.5%)⁹⁹.

5.2 Traffic speed

Traffic speed affects safety, particularly for those who are walking or cycling, and for children.

Slower road vehicle speeds improve safety by reducing the number and severity of road traffic accidents. There is clear evidence that pedestrians are more likely to be severely or fatally injured when hit by cars at higher speeds, and particularly when the car is travelling more than 30mph¹¹⁵⁻¹¹⁸. A Transport Research Laboratory report concluded that a 1mph reduction in average speeds on urban roads with already low average speeds should result in a 5-6% reduction in incident frequency¹¹⁷. [Data brought together by the GCPH](#) has shown that child pedestrians are more likely than adults to be injured in road traffic accidents, that road traffic injuries are more likely in deprived areas, and that adult cyclist casualties are increasing⁸⁷. Cities that have introduced 20mph zones and limits have experienced a decrease in casualties, particularly among cyclists and children^{117,119,120}.

Slower road speeds also improve perceptions of safety which encourages more people to walk and to cycle. A pilot of 20mph limits in areas of Edinburgh was associated in an overall reduction in traffic speed (of 2mph) in most of the locations studied and an increase in the number of children walking (63% to 65%) and cycling (4% to 12%) to school, and playing unsupervised outside the home (31% to 55%)¹¹⁹. As a result, the 20mph limits are being extended to the majority of residential streets in the city¹²¹.

5.3 The built environment

There is a relationship between the environments we create and live in, and the opportunities that we have for engaging in physical activity and making social connections. The GCPH [built environment and health evidence review](#) describes how aspects of the built environment, which includes housing, neighbourhood design and transport infrastructure, can shape the social, economic and environmental conditions which determine health²⁷. The physical characteristics of neighbourhoods identified as having a positive impact on health, wellbeing, physical activity and walkability are:

- choice and diversity
- well-kept environments
- affordable and efficient public transport
- safe and sociable play areas
- well-lit and pedestrian-friendly footpaths
- street patterns that allow residents to meet informally
- the presence of greenspace.

Well-connected and attractive places and streets can encourage more people to make active travel choices, and neighbourhoods which provide access to amenities within walking distance are likely to have higher levels of walking and cycling. Affordable public transport options within walking distance are also important for residents to access education and employment opportunities outwith their immediate neighbourhood. In Glasgow this is particularly important given that less than half of all households own a car.

The GCPH undertook a [study](#) to explore the quality and accessibility of greenspaces and community resources (e.g. halls and leisure centres) across two socially contrasting areas of Glasgow. The more affluent locality was relatively socially advantaged in terms of the built environment, local amenities and population characteristics compared with the more deprived locality. There was considerable variation in the quality of facilities in both areas and respondents in the more deprived locality had a perception of their local neighbourhood as more unattractive and lacking amenities which might encourage physical activity¹²².

[Research](#) presented at the 2016 PHINS seminar¹²³, found that people living in deprived areas are more likely to walk for a purpose, such as to work or school or to go shopping. Those living in more affluent areas with an attractive environment are more likely to undertake walking for recreation or leisure. This may reflect, in part at least, the lower car ownership in more deprived areas.

The importance of street pattern and traffic flow and volume for encouraging physical activity and building social connections was highlighted in the famous Appleyard research of 1969³ which demonstrated the influence of traffic volume on the 'liveability' of a street. The findings, which have been replicated in subsequent studies¹²⁴, were that streets with high volumes of traffic are associated with lower social interaction, less outdoor activity on the streets and smaller perceptions of one's 'home territory'.

Drawing on this research as part of his [GCPH seminar series lecture on urban design](#)¹²⁵, Howard Frumkin highlighted the negative impact that 'car-dependent sprawl' has on mental wellbeing and social capital through reduced social contact and interaction. He described how a car-dependent economy isolates those without access to a car, who tend to be concentrated in more deprived areas. This can result in severance of these communities from other parts of the city and, importantly, from a range of employment and educational opportunities¹²⁶.

The quality and design of the built environment also influences physical activity levels, in particular how possible it is and how likely people are to walk or cycle around their neighbourhood or from their neighbourhood to other destinations. Within cities, high quality, interconnected public transport services and active travel infrastructure are essential to enable people to get around, to be active and to interact. Without adequate public transport and active travel infrastructure in more deprived areas, residents risk isolation from important amenities and opportunities.

5.4 Convenience, time efficiency and cost

Alongside safety concerns and the design of neighbourhoods, convenience, time efficiency and cost are also important influences in shaping the travel choices of adults in Glasgow. The Scottish Household Survey found that, while around 45% of car commuters could use public transport for their journey, the main reasons they chose not to were because they felt it would take too long (48%) or because there was no direct route (30%)⁹⁹.

Qualitative [research](#) by the GCPH into adult barriers to and motivations for different types of travel suggested that active travel modes such as walking or cycling appeal to more people when interventions are put in place to make car travel less convenient or more expensive¹¹⁰. Similar views were expressed by respondents to the [Kelvingrove-Anderston cycle route evaluation](#)⁷⁹.

Those who are required to make complex journeys or who balance work with caring responsibilities are often very reliant on cars for the flexibility, ease and speed they offer, compared with active or public transport¹¹⁰. Similarly GCPH [research with lone parents](#)¹²⁶ found that, without access to a car, the complex and costly nature of public transport was an important barrier to employment and other connections with communities. If infrastructure is not interconnected and coherent, combining active and public transport can be difficult, time-consuming and expensive, particularly for those with multiple stops to make on a journey or with demands on their time (such as caring responsibilities). Not only does inadequate active and public transport infrastructure disadvantage those without access to a car, but it contributes to a perception that car use is essential.

5.5 Culture and social norms

A [qualitative study](#)¹¹⁰ by the GCPH reinforced evidence from other studies that, alongside the factors described above, an individual's choice about their mode of travel is influenced by their own sense of who they are and what they consider to be normal. The study found that convenience, freedom and independence was associated with cars and that, for most people, cycling was not considered to be embedded in their local culture and was therefore not considered as a transport option¹¹⁰. The research concluded that unless there is a shift in priority in urban spaces from cars to more active modes of travel, the cultural norm of car dependency will continue.

Within schools, creating a culture where active travel modes are the 'norm' is also important if high levels of active travel are to be achieved. The GCPH [study exploring travel choices to and from school found that, in the 18 schools](#) included in the study, an important factor affecting walking and cycling to school, was predictably, whether the pupil's home was considered to be within walking or cycling distance¹¹¹. Primary schools were more proactive in promoting active travel and many had active travel plans, whereas secondary schools tended not to have initiatives to promote active travel. However, while the distance between home and school was important and school active travel plans were helpful in increasing active travel to schools, the most important factors were support and encouragement from the school, parents and the local community which, together with appropriate infrastructure, could create or reinforce a norm for active travel. The behaviours established in primary school were found to influence the likelihood of older pupils walking to secondary school¹¹¹.

6. WHAT IS NEEDED TO INCREASE THE NUMBER OF PEOPLE WHO TRAVEL ACTIVELY?

It is clear from the evidence considered as part of this synthesis that changing the way that people travel, and specifically increasing the proportion of people who travel actively and sustainably, and reducing the proportion who travel by car, would have multiple, important benefits for individual and population health. These include increasing physical activity and reducing weight gain and related ill health, improving mental wellbeing, reducing road casualties, reducing carbon emissions and improving air quality, improving social interaction within communities, and enabling more equal access to amenities, education and employment opportunities.

Policies in Scotland are generally supportive and recognise the importance of increasing active travel¹²⁷, but the trends in walking and cycling are not showing much, if any, change and car use is rising. The learning gathered by the GCPH indicates where efforts should focus in order to increase the proportion of people who travel activity. Specifically, there needs to be strong leadership and a shift in investment, innovative and progressive urban planning and infrastructure development, and cultural change.

6.1 Strong leadership and a shift in investment

Strong leadership should encompass clear statements of intent to increase active and sustainable transport, effective community engagement in planning processes and commitment to the investment required.

The GCPH policy review published as part of the [Moving in the Right Direction?](#)⁶⁹ series in 2010 concluded that for levels of active, sustainable travel to increase, strong political leadership and commitment is needed to shift strategic resource allocation and to support fiscal measures that positively discriminate in favour of walking, cycling and public transport use over the car.

European cities similar to Glasgow, and starting from a similarly low active travel baseline, have developed joined-up, safe infrastructure for active travel and have achieved high levels of walking and cycling. In their document, *Civilising the Streets*¹²⁸, Transform Scotland investigated sustainable transport in 13 European cities similar to the size and geographies of Scottish cities, exploring how social, political, geographical and cultural conditions have led to 'best practice' and brought about high rates of walking and cycling. The report suggests that the key ingredients of success were:

- visionary leadership (from politicians, civil servants and Council officers)
- sustained investment over several years and sometimes decades
- pedestrian- and cycle-friendly zones taking priority over motorised transport schemes.

In 2012, two GCPH team members and a Glasgow City Council education colleague undertook a study visit to Gothenburg in Sweden. The purpose of this visit included learning more about the development of active sustainable travel in the city.

The [report from this visit](#)¹²⁹ describes Gothenburg's aspirations, political commitment and public demand for high quality active and public transport infrastructure and integrated transport routes. Once a car-based town, its wide city roads now separate motorised traffic, cyclists and pedestrians, and ambitious targets exist for reducing carbon emissions, encouraging cleaner cars and increasing walking and cycling. In 2011, Gothenburg, which is a similar sized city to Glasgow, had 770km of cycle paths (including 470km of segregated cycle paths and 7,400 spaces for cycle parking in the city centre) and 10% of commuting journeys were by bicycle. These figures dwarfed the equivalent figures for Glasgow. An important driver of these developments was the projected increase in Gothenburg's population and the need to maximise available road space for pedestrians and cyclists to avoid congestion. A key factor in achieving this scale of cycling infrastructure and investment was the strong political leadership and investment in active travel (over and above the supportive policies and strategies).

A [second visit](#) took place in 2013 to learn more about future plans to redevelop Gothenburg city centre to give an even greater priority to bicycles and to reduce the traffic speed. By then traffic into the city had been reduced by 14% through the introduction of a congestion charge and there were plans to reinvest the revenue from the charge to improve cycling facilities and to reduce traffic speed in the city centre¹³⁰.

After the first visit the GCPH's recommendations for Glasgow included more safe, good quality cycling infrastructure in and around Glasgow, with physical separation of bicycles from other road traffic wherever possible. The GCPH also recommended the introduction of a cycle hire scheme in Glasgow. As is discussed in Section 6.4, a cycle hire scheme was adopted by Glasgow in 2014 with considerable success.

After the return visit to Gothenburg in 2013, GCPH recommendations included a more cohesive approach to transport in Glasgow and the surrounding areas, better alignment of relevant policies, increased efforts by local authorities to ensure their vehicles have low emissions, and improved conditions for pedestrians and cyclists, including reduced road speeds¹³⁰.

At the [Anderston-Kelvingrove study seminar](#)¹¹³ and the [Healthier Future Forum 16 meeting](#)⁷⁰ which were both hosted by the GCPH in 2015, the need for political leadership and dedicated financial resource were again highlighted, commending cities such as Edinburgh and Gothenburg for making a shift away from cars and towards cycling and walking. Scotland has supportive policies, but delegates concluded that, without leadership and investment the aspiration outlined in these policies, for high-quality, well-used, integrated and sustainable transport systems in Scotland, is unlikely to be realised.

6.2 Effective community engagement

Recent examples of public opposition to new segregated cycling infrastructure developments in East Dunbartonshire and Ayrshire¹³¹ highlight the importance of proactive engagement, provision of clear and accessible information and timely dialogue with local communities about local transport infrastructure plans. Left unchecked, increased car use will increase congestion, air pollution, and contribute to climate change. Increased numbers of cars also makes walking and cycling on these roads unappealing and less safe. In the face of this, politicians and councils have a duty to act, but to be effective this action should reflect a clear and consistent vision, should be supported by strong leadership and appropriate investment, and should be jointly agreed with communities following a process of engagement and deliberation.

6.3 Urban planning and neighbourhood design

Approaches to planning, neighbourhood design and transport systems which prioritise walking and cycling over motorised vehicles will improve health by increasing physical activity, reducing road traffic accidents, improving air quality, and by supporting stronger communities where people can access local amenities on foot, bicycle or by public transport, and have more opportunities to interact with each other²⁷.

A [GCPH study of neighbourhood improvements](#) found that improved street lighting, pavements and a new local supermarket contributed to an increase in the numbers of people walking¹³². [GoWell research](#) on neighbourhood walking found that designing neighbourhoods which include high-quality local amenities such as parks, play areas and local shops and which allow people to walk safely between the amenities increases the likelihood of regular walking¹³³. The report suggests that regeneration strategies should seek to increase the number of people using local amenities, since this was found to be associated with higher proportions of people walking in their neighbourhood, and that important considerations are the variety, quality, accessibility and affordability of these local resources.

[Glasgow's Health Commission](#) of which the GCPH was a part, recommended that the city's future transport growth should have a greater emphasis on safe, active and sustainable modes of transport for all⁶⁶. It concluded that integrating cycling and path development with an effective and affordable public transport system alongside effective speed control initiatives, such as 20mph limits and zones^r for road users, would help create a safer transport system. This, in turn, would help reduce road casualties and would encourage more people to walk and cycle.

There is convincing evidence from systematic reviews that 20mph zones and limits can be effective in reducing accidents and injuries, traffic speed and volume, as well as improving perceptions of safety¹¹⁹. The evaluation of the 20mph pilot in Edinburgh found that average road speeds fell by 2mph following the intervention¹²¹. Slower traffic makes roads safer by reducing the number and severity of road casualties. Evidence from

^r 20mph zones are more expensive to develop than 20mph limits as they require additional road engineering, such as speed bumps, however they result in more consistent reduction in speeds as it is considerably more difficult to drive at higher speeds in such areas.

Greater Bristol also suggests that their 20mph pilot zones contributed to an increase in cycling and pedestrian activity (increases in walking counts ranged from 10% to 36% and increases in cycling counts ranged from 4% to 37%)¹³⁴. The GCPH support Glasgow City Council's plans to reduce road speeds through the introduction of speed restrictions in the city centre¹³⁵ and in its Strategic Plan for Cycling 2016-2025^{83,84}.

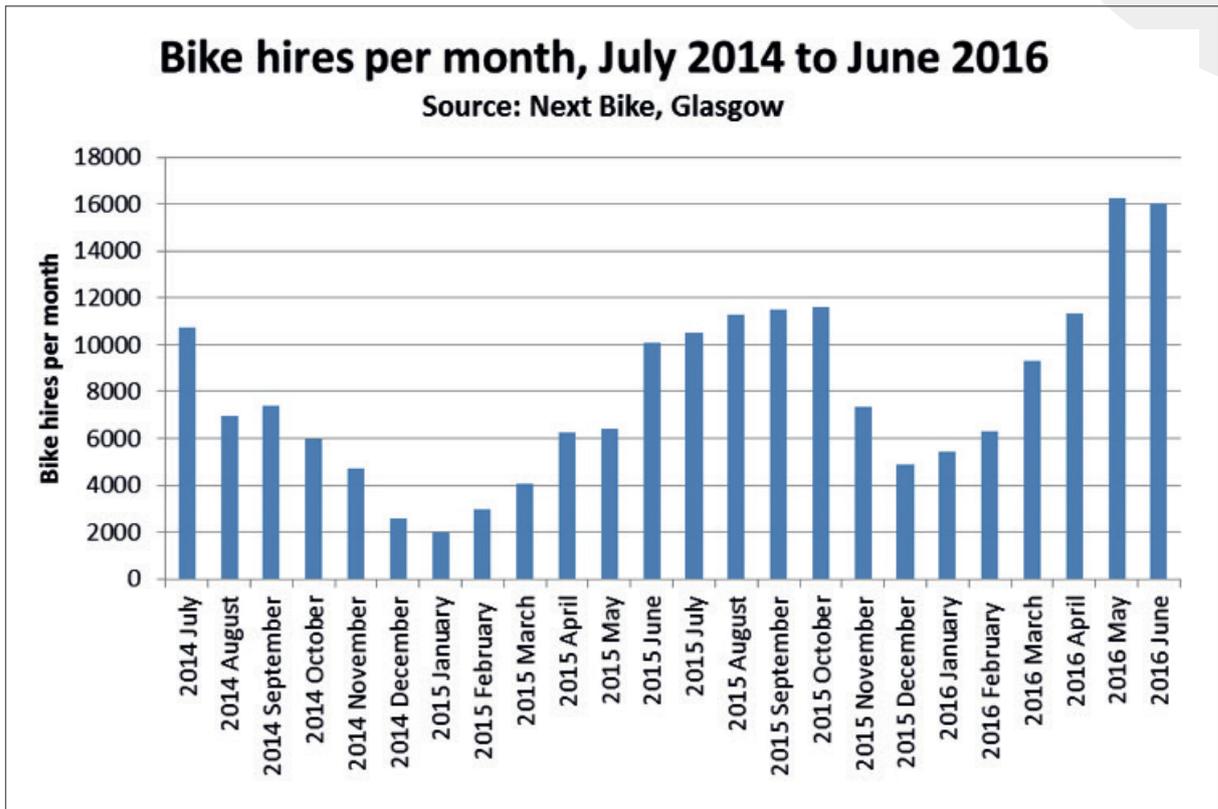
6.4 Integrated infrastructure

Infrastructure that allows for the integration of active and public transport in a safe, convenient and affordable way is vital for increasing active travel rates and reducing car use. This is demonstrated by the positive impact of increased investment in active travel infrastructure on active travel levels and public transport use in other cities, such as Edinburgh and Gothenburg as previously discussed (see Section 3.1 on funding, and Section 6.1 on leadership and investment).

The construction of the Tradeston footbridge (known locally as the Squiggly Bridge) for cyclists and pedestrians over the river Clyde in Glasgow provided an opportunity for the GCPH to explore the extent to which improvements in infrastructure could influence levels of active travel, and specifically active commuting⁸⁰. Using quantitative data from cordon counts, this study found that the new bridge was associated with an increase in cycling and pedestrians entering and leaving that sector of the city. It also found that the highest level of cycle commuting was from the sector of Glasgow with the best cycling infrastructure, and that the highest level of pedestrian commuting was in the sector without significant road or river barriers and where there were connections to other routes and public transport hubs.

Data from the nextbike Glasgow cycle hire scheme, which was introduced shortly before the opening of the 2014 Commonwealth Games as part of an initiative to encourage active travel during the Games, allows an assessment of how such a scheme can influence travel behaviours. Introduced to encourage spectators to use active means to travel to Games events, the scheme recorded nearly 76,000 hires in the first year of operation (July 2014 - June 2015). The GCPH analyses of nextbike data for this period found that the average distance travelled on a hire was just less than 2km, with 10 minutes representing the average duration of a journey (McPherson K, GCPH, Personal communication; 2016). Hires were slightly higher during the week and up to four times higher in the summer months (June-August) compared with the winter period (December-February) (see Figure 7). The available data suggests that the scheme has contributed to a rise in cycling in the city overall, with commuters forming a high proportion of users. Registration data also indicate that the scheme has potentially contributed to an increase in the proportion of female cyclists. The success of the first three years of the scheme has prompted an expansion to include stations in the south and east of the city linking with existing transport hubs⁷⁸. The GCPH are in the process of publishing a series of reports in active travel trends in Glasgow.

Figure 7: Nextbike hires in Glasgow per month, July 2014 to June 2016.



Source: nextbike: <http://www.nextbike.co.uk>

These examples, along with the previously mentioned evaluation of the new Anderston-Kelvingrove (now renamed the West City Way) route⁷⁹ and the learning from Gothenburg^{129,130} demonstrate the contribution that appropriate, convenient and connected infrastructure and reduced road speeds can make to shifting travel behaviour towards more active modes.

6.5 Culture and behaviour change

It is clear from GCPH research that social norms and culture influence transport choices and behaviours^{110,111}. In schools, the culture and social norms influence the proportion of children who walk or cycle to school. Among adults, we have found that people are unlikely to consider cycling as part of their commuting journey if they do not consider this a social norm¹¹⁰ or if they consider it to be too unsafe, too costly or too inconvenient to walk, cycle or commute by public transport. Increased car ownership and the belief that cars provide the most convenient and safe mode of travel are likely to reinforce this culture of car dominance and dependency. In a city like Glasgow where car ownership sits at around 50%, there is a risk that such a culture may influence planning decisions, further isolating vulnerable communities, particularly those residents without access to a car.

In addition, there is growing evidence from the previously mentioned stalled and reversed cycling infrastructure developments in East Dunbartonshire (Bear's Way) and Ayrshire (Holmston Road) of the need to engage with local communities to address concerns and provide information prior to and during improvements in active transport infrastructure in order to ensure that the developments meet local needs and have local support and attract local users¹³¹. Indeed, the monitoring report from the Bristol 20mph project highlights the importance of community engagement, underpinned by detailed information, effective communication and driver education in supporting the introduction of new initiatives intended to encourage changes in transport choices and behaviours¹³⁴.

Encouragement and support for people to change their behaviour (for example through workplace and school travel plans, campaigns, public transport information and marketing, car sharing, and car clubs) are important in helping to shift societal perspectives, but there is limited evidence for the effectiveness of these 'soft measures' alone¹³⁶. To be effective, such initiatives need to be introduced alongside – and not instead of – a clear and consistent vision, strong leadership, adequate investment, supportive policy, and planning and infrastructure developments which recognise and address cultural barriers to increasing active travel, as well as early and ongoing community engagement which allows accurate information to be shared in a timely way with the communities involved, and local concerns to be expressed, discussed and considered as part of the planning processes.

7. CONCLUSION AND RECOMMENDATIONS

7.1 Recommendations

Since 2007 the GCPH has been developing an information base on active travel and health, improving our understanding of trends and influences on travel choices, and assessing the impact of transport policies and investment in active, sustainable travel in Glasgow and the Clyde Valley area.

Active, sustainable travel is good for individual and population health and for the environment, yet current trends are moving in the wrong direction:

- Car use is increasing, and walking and public transport use have been, at best, static over the last ten years among both children and adults.
- Cycling has increased very slightly (from a low base), mainly among the better off, but cycling casualties have increased disproportionately.
- Road accident casualty rates for most modes of travel – with the exception of cycling – are falling, but pedestrian and child casualties remain more likely in deprived areas.
- Air pollution is a growing concern in Glasgow City; this is a health risk for everyone but particularly for children and older people and those with existing respiratory problems.
- People are increasingly physically inactive and overweight or obese, dramatically increasing the likelihood of future ill health.
- Climate change is now considered a major global risk and transport, which contributes between a quarter and a third of CO₂ emissions worldwide, plays a major role in this. Developing more sustainable transport is therefore critical to successfully addressing climate change, and there are potential synergies between policies and actions that can be taken to reduce carbon emissions, to address air pollution and to promote active and sustainable travel, particularly in relation to health.
- Many people, and particularly children, would like to cycle and walk more, but feel that the number of cars, the design of roads, societal culture and the existing infrastructure make it too unsafe, too inconvenient, or too costly to do so.

This report has brought together the GCPH's research and learning relating to active travel. It is clear that the existing policies and strategies in Scotland and Glasgow City are supportive but require implementation in a more joined up way, on a larger scale, with stronger leadership, greater public engagement and increased investment. Furthermore, an integrated set of measures are required to allow for more accurate, timely and useful monitoring of emerging trends.

Specifically there needs to be:

Stronger leadership, improved co-ordination and a shift in investment

Scotland and Glasgow have policies and strategies that lay out a clear vision of a future transport environment that promotes active, sustainable travel. These recognise the potential and wide-ranging benefits which include increased physical activity and related improvements in health, improved air quality, reduced carbon emissions, more connected communities and improved mental wellbeing. Yet actions to achieve this vision have been less forthcoming. Promising developments in Glasgow such as dedicated walking and cycle paths and bridges, and the city's cycle hire scheme are being well used, although care is needed to ensure that these investments benefit all population groups and don't further reinforce socioeconomic inequalities. Developments need to be larger in scale and better connected if they are to influence population-level trends in active travel.

Active travel, air quality, climate change and public transport strategies should be integrated and backed by high-level support, political consensus and a long-term shift in investment towards safe, well-designed infrastructure which supports this vision. Less reliance on individual motorised transport should be the aim alongside more active and sustainable travel by everyone.

The proportion of transport investment spent on walking and cycling should increase: a number of bodies consider 10% of the transport budget appropriate⁷⁴. Use of this investment must be sensitive to inequalities, planned with communities within the localities likely to be affected by the investment, and carefully monitored to ensure that inequalities are not widened and benefits are more equally shared between different population groups.

Increased focus on active travel in urban planning and integrated infrastructure development

A recurring theme at the Healthier Future Forum 16 active travel seminar in 2015 was the need for adequate resourcing and implementation of the good policies that exist in Scotland in order to build "an integrated active and public transport system that works for everyone". This was considered an important part of a wider response to inequalities given that a third of Scotland's population do not own a car, and that car ownership rates are lowest in the most deprived areas⁸⁷. It also reinforces, again, the need for consistent political support for the existing policies, clear and accessible information for the public to back up these policies, and effective engagement with communities so that, as far as possible, the needs of all population groups are reflected in a sustainable local transport plan.

There needs to be a greater emphasis on safe, active and sustainable modes of transport as a key feature of future urban growth. Large-scale infrastructure investments, including City Deals⁸⁵, provide an opportunity to build the necessary infrastructure in an integrated and connected way. Potentially these could encourage and allow more people to reduce their reliance on cars and, instead, utilise modes of transport which are better for health and for the environment. New infrastructure

should also support better and more interconnected public transport and active modes of travel in and between urban areas and surrounding neighbourhoods in order to allow more equitable access to education and employment opportunities.

Consideration should be given to extending vehicle speed restrictions more widely, and particularly to areas where pedestrian and cyclist casualties are highest, and where young people are most vulnerable to traffic. Priorities should also include addressing pollution levels in identified hotspots, proactive maintenance of pavements, paths and roads to ensure they are safe for pedestrians and cyclists all year round, and improvements in streets and parks to make active travel more pleasant and practical. This would have the potential to reduce inequalities in health outcomes caused by road traffic accidents as well as encouraging more people to walk and cycle.

Support for culture and behaviour change

A culture dominated by cars is not sustainable and has multiple adverse effects on individual and population health. As more people opt to use cars, public transport becomes less viable, and active travel becomes less attractive and less safe. This, in turn, means that more people will resort to the car. While strong leadership and greater investment in good infrastructure are needed to make more sustainable transport possible, people need to want to change how they travel.

Initiatives should be developed that encourage a greater understanding of the inter-relationships between some of the common challenges Scotland faces such as climate change, air pollution, physical inactivity, obesity and social isolation and how all of us can contribute to addressing these by changing the way we move about and live our lives. Initiatives should also seek to help shift societal norms by encouraging people to try different modes of travel and to raise awareness and acceptability of the public transport and active travel options available for everyday commuting journeys.

Improving road safety and personal safety for those who walk and cycle will encourage more people to travel actively, but to be effective these initiatives must be developed in tandem with policy and infrastructure changes.

Improve monitoring data on active travel

More detailed and comprehensive information on active travel will support planning, stimulate civic discussion and help measure progress. A range of new and existing monitoring data should be collected and made available on an openly accessible website in order to show trends, enable comparison and monitor progress. At a minimum, this should include data on walking and cycling relating to prevalence, casualties, lengths and types of walking/cycle routes, and areas covered by 20mph zones and limits.

7.2 Conclusion

There is a compelling case to increase active travel and move away from a dependency on individual motorised transport, particularly in cities. The case has become stronger since the GCPH started its active travel programme of work in 2007. At that time, the argument for increased active travel was largely, though not exclusively, focused on the contribution that active travel could make to physical activity and, as a result, to addressing obesity and related health problems. Since 2007, there has been a growing recognition of the contribution that transport, and particularly high levels of car use, make to air pollution and the impact of this on respiratory health, to social interaction within neighbourhoods and the impact of this on community cohesion, and in accessing amenities, education and employment and the impact this has on social justice.

Furthermore, the unequal burden of the negative impacts of the present transport system is becoming increasingly clear. There is a risk that the growth in car ownership and use makes some public transport routes less viable. This further isolates those without access to a car, or forces car ownership on low-income households who find themselves without any other reliable means of travelling around the city, for example, to their workplace. In recognition of this broader view of the relationship between transport and health it now seems more accurate to frame this programme of work as active *and sustainable* transport.

There is great potential to build on the supportive policies that already exist and the promising developments and early signs of change in Glasgow and across Scotland. There are also tremendous opportunities offered by large-scale infrastructure developments to better support more active and sustainable travel.

However, vision, leadership, investment, culture change and prioritisation of active and sustainable travel will be required if the considerable benefits for health, the economy and the wellbeing of all of the citizens of cities like Glasgow are to be realised.

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