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Child mph

Delivering Safe Walking and Cycling Infrastructure for Children and Young People in Scotland | TECHNICAL BRIEFING NOTE

January 2022 - FINAL

Prepared by Walking | Cycling | Climate Action Ltd for the Active Nation Commissioner

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Glossary of Terms:

CLF	**Continuous level footway**
DMRB	**Design Manual for Roads and Bridges**
KSI	**Killed or seriously injured**
Mega tonne	**Million metric tonnes**
$MtCO_{2e}$	**Mega tonne carbon dioxide equivalent**
SIMD	**Scottish Index of Multiple Deprivation**
TSRGD	**Traffic Signs Regulations and General Directions**
vpd	**Vehicles per day**

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REPORT BACKGROUND

This technical briefing note was commissioned by the Active Nation Commissioner of Scotland Lee Craigie to conduct a proof-of-concept exercise for the potential of using child mph speed limits and placemaking traffic calming approaches as widely used in Europe as means of self-enforcing school & play streets, compared to potential enforcement approaches such as ANPR.

Why we conducted this report:

The use of a child mph speed limits has potential to be a gamechanger in delivering two main Active Nation Commissioner priorities: travelling to school and the importance of play. Furthermore, this approach could add a robust traffic management mechanism which would contribute to fundamentally shifting transport and the economy towards climate prosperity.

ACTIVE NATION COMMISSIONER PRIORITIES

1. **Considering community infrastructure**
2. **Travelling to school**
3. **Supporting our workplaces and the economy**
4. **The importance of play**

The technical briefing note is equivalent to RIBA Stage 0 – "Defining the Brief". This is a short piece of works which brings together high-level data and evidence in support of the need for innovative traffic management approaches together with best practice and on-the-ground insights. Two pre-engagement workshops with a self-selected group of local authority stakeholders were conducted to establish an informed, practice-based starting point. The aim of the briefing note is to establish whether this traffic mechanism bears further investigation, and if so to identify key delivery partners and next steps.

How we conducted this report:

Two "Child mph" Inspiration Workshops were held with a group of self-selected local authority stakeholders from Glasgow and Edinburgh, and then Perth and Kinross and Stirling in September 2021. A total of 30 stakeholders attended. The discussion points from these workshops provided a starting point to further explore related data, evidence, and European best practice.

Data sources used to prepare this report:

- Scottish Health Survey
- Scottish Household Survey
- Hands Up Survey
- Scottish Transport Statistics
- Scottish Crime and Justice Survey (2019-20), including additional breakdowns for young people by age and gender and SIMD, and by gender and rural/urban.

Playing Out © Edinburgh Playing Out

"Enter into children's play and you will find the place where their minds, hearts, and souls meet."
-Virginia Axline

INTRODUCTION

Strategic context

There are close to 1.5 million children and young people in Scotland who depend on the road environment for their basic health yet are highly vulnerable to traffic-related risks such as road danger, air pollution and **the greatest road danger of all – not being able to walk, wheel or cycle for everyday journeys**. Unlocking road potential which enables children and young people to move naturally and safely is urgently needed for the sake of children's health and wellbeing. It is also needed to secure large climate, health, nature, and transport benefits - in real terms, the foundation for a health and wellbeing economy for Scotland.

What is "child mph"?

The concept of a "child mph" speed limit originates in the legal speed limit applied in play streets in Germany of "Schritttempo", which translates literally as "walking pace" – however fast a child or anyone else is walking is the speed limit. Use of 24/7 play streets was introduced into traffic law in Germany in 1980. Children are allowed – no, encouraged! – to play in the carriageway and everyone expects this. Cyclists, car drivers and lorries have a legal duty of care to give way to children and pedestrians in the carriageway. This child-friendly speed limit is expected to be self-enforcing through traffic calming and clear threshold treatment such as continuous footways and signage. This is fair for drivers who can feel and see from the road layout that they have entered a play street.

Figure 1 ***A 24/7 play street in Germany, with a "child mph" speed limit – children are expected to play in the carriageway, cars and vehicles can still access properties © Atelier Dreiseitl / J Read***

The translation of "child mph" was arrived at in a moment of inspiration as it best communicates the intention of giving priority to children and other humans. For the purposes of this technical briefing note, the concept of "child mph" has served as a starting point for exploration: Could a "child mph" speed limit be applied in Scotland in play streets?

Could it potentially have application in wider settings such as school streets or cycle priority corridors? Should “child mph” be reserved for settings where children are expected to play in the carriageway? Or is the term “child mph” an umbrella term to explore how design guidance and legislation can be innovated to enable low speed environments to look and feel like low speed environments and thus be self-enforcing? These questions have proved useful starting points to begin to identify potential actions to make delivering safe walking and cycling infrastructure for children and young people easier for local authorities.

Children in Scotland are not active enough

Physical activity levels decline strongly from ages 8-10 so that by ages 13-15 years only 53% of Scottish children meet physical activity guidelines. This is arguably the start of a lifelong decline in health for children in Scotland. **The road environment, and specifically the footway, is the most important setting for both girls and boys being active across all SIMD.** Walking is important for children, particularly the most vulnerable, and has the largest modal share at 52%. The walking environment is likely where most younger children also scoot, wheel and cycle. Cycling levels for children are generally low at 2%, and the large gains in cycling seen in younger children are lost entirely by ages 16 to 18 years. Car dependency is highest in children 4-7 years at 33%, and lowest in children 12-18 years at 20%. There is a distinct shift in school travel and physical activity levels at the time of transition from primary to secondary school. For older children and children in rural areas, ‘activating’ bus services may be beneficial.

Focus on Children and Young People

Due to the steep decline in physical activity from age 12 there is need for a specific focus on the needs of secondary aged children. Given that the traffic risk is highest for young people aged 14 to 18 years but also in their early 20s, traffic risk for walking and cycling should be monitored for children from aged 12 and include young people < 24 years.

The Innovation Toolbox

The starting point for exploration in the two inspiration workshops held with local authority partners was a toolbox of seven innovations which could be game changing for children, as well as potential instances for application of a child mph speed limit. The toolbox includes:

- Playing out
- 24/7 play streets
- School streets
- Pedestrian priority zones
- Cycle priority zones
- Use of continuous footways on residential streets <3000 vpd,
- Walking and cycling friendly roads

Implications for Practice

Resulting from the workshop insights, data and evidence explorations, the report identifies 40 implications for practices which are captured in each section and summarised in *Section 12*. The aspects identified are across data, innovation and practice, communication, and legislation.

Recommendations to Explore Further

The following are recommendations to progress and explore further. Please see each section for more detailed implications for practice and policy:

1) Explore "child mph" both as a speed limit and as a package of measures

The workshops and data, evidence and best practice explorations suggest that child mph may have value as a speed limit and may also be a good way to communicate with drivers and the public. Equally, exploring the use of a "child mph" speed limit may also provide a wider framework to develop a package of transport innovations to enable delivery of self-enforcing low speed environments.

2) Prioritise walking infrastructure

Walking is important for younger children to walk, wheel and cycle to school. Prioritising investment in walking infrastructure would benefit children, but also older people, Disabled people and have large congestion, health, carbon, and socio-economic benefits. Investment in walking infrastructure has a high cost-benefit return, and there is potential to double walking modal share across Scotland.

3) Streamline the Playing Out process, and establish the legislative framework for 24/7 Play Streets

Develop a national process to simplify Chapter 8 and advertising requirements, ensuring that Playing Out sessions can be enabled quickly in response to resident demand. Clarify the legislative basis for 24/7 play streets and establish a design primer. Aim to deliver one Playing Out per 250 children, and one 24/7 play street per 1000 children.

4) Ensure road and cycling design standards enable an older child to cycle safely and independently in the carriageway as a basic design standard.

What age do children make the transition to cycling in the carriageway? Is this at the time of transition to secondary school? What is our design age? All cycling infrastructure needs to meet a basic standard of ensuring a child aged 10 or 12 (?) is safe and happy. Future proof for the impact of ecycling and escooters.

5) Improve data practices to capture children and young people

Including walking and cycling data in annual daily traffic counts, traffic surveys and traffic models will improve delivery, lead to better decision making, and ensure there is a baseline to measure impact against.

6) Ensure road safety commitments embed children and young people

Add children from age 12 and maintain young people up to age 24 or 25 years in interim road safety targets. Report KSIs per mile walked or cycled for children and young people. Collecting near-miss data could be a powerful prevention approach.

7) Upgrade signage to respond to innovation needs

A bundle of signage has been identified to review and upgrade to communicate more fairly to vehicle drivers their duty of care, enable innovation and to improve road safety.

8) Conduct a road safety assessment of continuous footways

Continuous footways benefit people walking and are fundamental to securing road safety for cyclist and other vehicle users on the perpendicular carriageway. Establishing the road safety impact of continuous footways in higher capital investment types and lower cost alternatives to would help develop a national best practice.

9) Start a national conversation about the harms of car dependency

It's a difficult conversation, but one we need to have. Our shared dependency on cars is endangering our safety and prosperity. Frame a national conversation to warmly hold this difficult conversation. Set a wellbeing and safety protocol for active travel engagement.

10) Develop a Child mph innovation project with local authority partners

A child mph innovation project could form the basis of a local-national dialogue to develop best practice and generate insights to inform design guidance, practice, legislation, and policy. See *Section 10* for a more detailed description. The following is an **innovation toolbox** which summarises potential application of child mph against conventional speed limits. A fundamental assumption is that these need to be self-enforcing through traffic calming and legible materiality:

Tools/Interventions	Children Playing in Carriageway	Child MPH applicable	Alternative Standard Speed Limits	Place or Movement Weighting
Playing Out	Yes	Child mph	5 mph	Place
Play Street 24/7	Yes	Child mph	5 mph	Place
School Street	No	Child mph	10 mph	Place/Movement*
Pedestrian Priority	Maybe?	Child mph	10 mph	Place
Cycle Priority	No	Child mph	10 mph	Movement
CLFs on Residential Streets <3000 vpd	Maybe?	Child mph	10 mph	Place
Walking and Cycling Friendly Road	No	Child mph	20 mph	Movement

Table 2 ***Innovation toolbox comparing potential application of child mph to lower speeds.***
**** Secondary schools, and some primary schools, can be located on transport corridors. CLF = continuous level footway***

"Play is the highest form of research." – Albert Einstein

The following are questions which have broadly been identified as starting points for discussion:

Q: At what age to children make the transition from walking, wheeling, and cycling on the footway to wheeling and cycling in the carriageway?

Q: Do current guidelines, particularly the DMRB, cater for the needs of children? Are walking infrastructure design guidelines sufficiently robust? Are the new Cycling by Design guidelines robust for children? Do they sufficiently future proof for emerging topics such as uptake of ecycling and escooters which can impact safety for child cyclists?

Q: Can walking and cycling traffic survey data be differentiated for child users?

Q: What is the best way to collect near-miss data?

Q: Does the use of a "child mph" speed limit enable all vehicle users - including cycles, cars, vans, buses, and trucks - to know what to do? In every context?

Q: Who or what would be a good Yogi Bear figure to communicate road safety to adults, children, and young people alike?

Q: Are key road signs clear and legible to every vehicle user? Are key road signs legible to children and young people?

Q: What does child mph mean to the general public?

Q: What does child mph mean to a child?

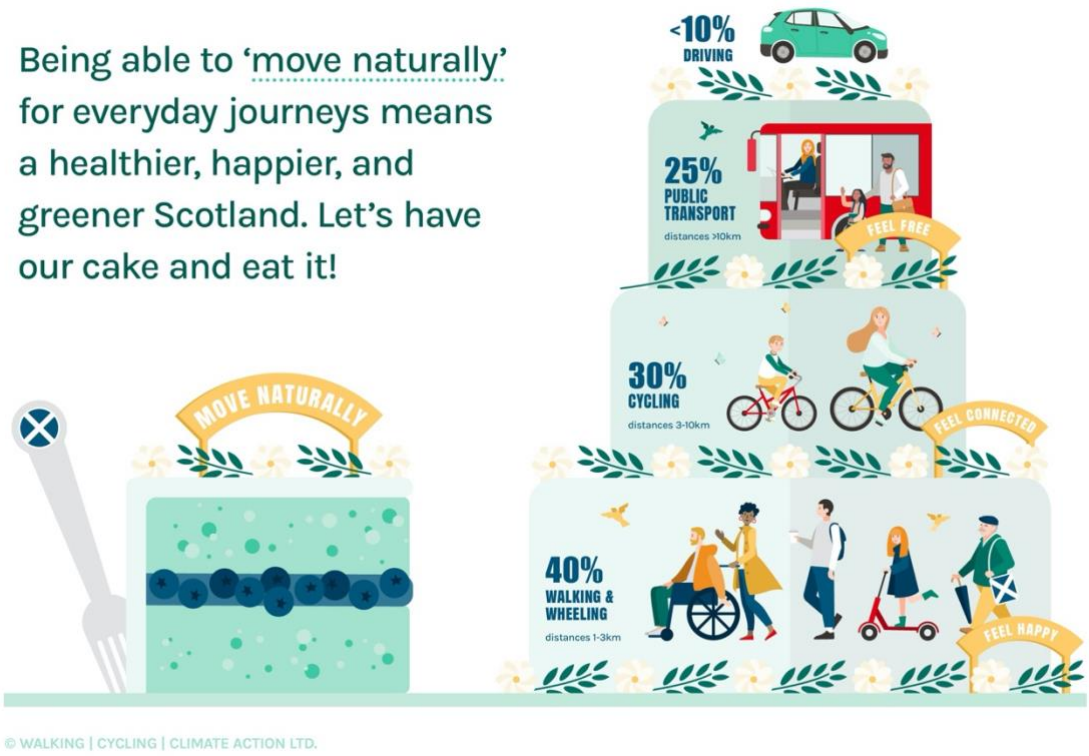

Figure 3 ***Designing safe walking and cycling infrastructure for children will meet the needs of most other people too – not least the people who travel with children.***

Who do we need to talk to next?

Children:

- Work with children's' parliaments, e.g. a joint children's' parliament across Glasgow and Edinburgh?

Community delivery partners such as:

- Play Scotland, Living Streets, The Daily Mile, Cycling Scotland

Transport policy, funding, delivery and operational partners such as:

- Transport Scotland, Sustrans, Police Scotland, Public Health Scotland

1 Background

1.1 Children and Young People in an Ageing Scotland

There are 1,081,485 children and young people in Scotland aged 0 to 18 years - 20% of the population[1]. Including a wider age range of 0 to 24 years due to traffic risk as explored in *Section 1.3*, there are 1,483,665 children and young people in Scotland - 27% of the population. Considering that Scotland has an ageing population, with over 1 million people over 65 years, a total of **46% of the population is age-vulnerable in the Scottish road environment**. Despite improvements over the past 100 years, Scotland has some of the lowest life expectancies in the UK, and across Western Europe. Life expectancy and healthy life expectancy are sharply contoured by affluence, with people in the poorest communities living up to 28 fewer years of good health[2]. A young person today has lower life expectancy than an older person today. **Being physically active has protective health benefits for children regardless of their weight[3], and is an intergenerational priority for children, young people, and older people alike[4].**

1.2 Child Physical Activity in Scotland

Being physically active is associated with physical, emotional, and social health benefits for children[5]. The UK Chief Medical Officers' physical activity guideline for children aged 5 to 18 years is to be active for at least 60 minutes per day, including muscle-bearing and skill developing activities, and – an important new update - to break-up sedentary time. Data from the Scottish Health Survey shows that **by age 13-15 years only 53% of Scottish children meet physical activity guidelines[6]**. While boys and girls are equally active from ages 2 to 12 years, girls show a greater decrease in physical activity at ages 13-15 years with 59% of boys meeting guidelines compared to 46% of girls. This gender disparity continues through-out the life course. It is well established that this difference in physical activity is due to gender – that is socio-cultural norms – not biological sex[7]. Overall, being physically active is strongly shaped by deprivation, age, and gender for children in Scotland[8] - so headline findings may mask the differences in experience for children across Scotland. **The road environment, and specifically the pavement, is the most important setting for both girls and boys being active across all SIMD[9].**

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[1] National Records of Scotland (2021) Mid-Year Population Estimates. *Table 2: Estimated population by sex, single year of age and administrative area, mid-2020*
[2] Scottish Government (2018) Public Health Priorities for Scotland.
[3] Werneck, et al.(2020) Physical activity attenuates metabolic risk of adolescents with overweight or obesity: the ICAD multi-country study. Int J Obes 44, 823–829. https://doi.org/10.1038/s41366-020-0521-y
[4] Living Streets Scotland (2021) Our Streets Too - WHY WALKING INFRASTRUCTURE IS A PRIORITY FOR HEALTHY AGEING AND PROSPERITY IN SCOTLAND.
[5] Department of Health and Social Care, Welsh Government, Department of Health Northern Ireland, Scottish Government (2019) UK Chief Medical Officers' Physical Activity Guidelines.
[6] Scottish Government (2021) Scottish Health Survey 2019. *Table 341: Whether meets physical activity recommendations INCLUDING activity at school (children), by age, 2019.*
[7] Cooper et al (2015) Objectively measured physical activity and sedentary time in youth: the International children's accelerometry database (ICAD). *International Journal of Behavioral Nutrition and Physical Activity*; 12:113. DOI 10.1186/s12966-015-0274-5
[8] Scottish Government (2021) Scottish Health Survey 2019. *Table 343: Whether meets physical activity recommendations INCLUDING activity at school (children), by SIMD quintiles, 2019*
[9] Scottish Government (2021) Scottish Health Survey 2019. *Table 361: Where done physical activity (children), by age, 2017/2019 combined.*

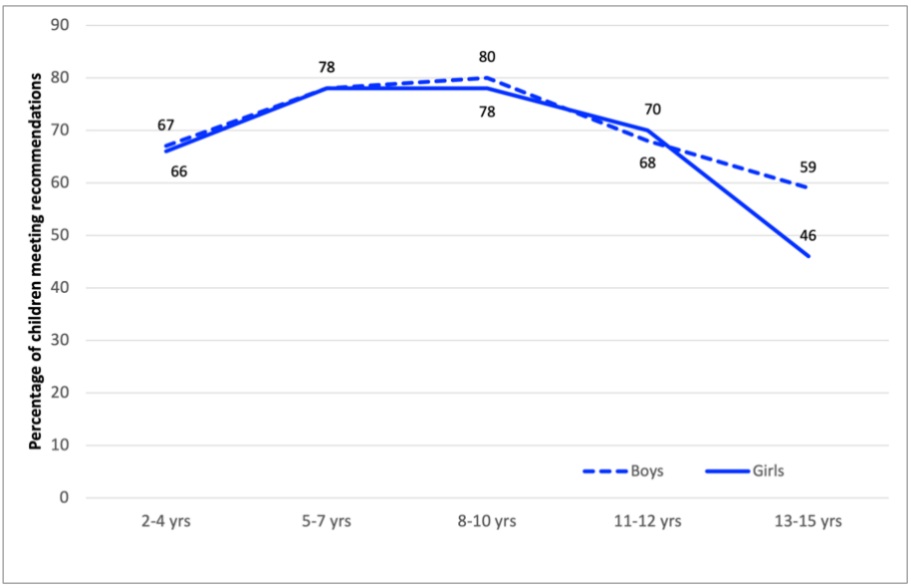

Figure 4 ***Children in Scotland meeting physical activity guidelines by age[10].***

→ Girls and boys are equally active from ages 2-12, but not after ages 13-15 years.
→ There is a large decline in physical activity at the age transition from primary to secondary school.
→ Being physically active is strongly shaped by deprivation, age and gender.
→ Child physical activity data by BAME/ethnicity, and Disability was not available.
→ The road environment is the most important setting for children.

Implications for Practice:

→ Include a focus on secondary aged children.
→ Disaggregate results for primary and secondary aged children.
→ Explore how results can be meaningfully disaggregated for gender, deprivation, BAME and Disability.

1.3 Road Traffic Risk for Children and Young People

In non-infant deaths, most child deaths in Scotland occur in the age range 15-18 and are related to road traffic and suicides[11]. Exploration of causes of death in 2019 show that pedestrian and cycling fatalities are low[12] – it should be noted that levels of cycling exposure are low, so these outcomes cannot be directly translated to road safety outcomes. Overall, there is a notable increase in road traffic fatalities from ages 15 to 19, which carry through to ages 20 to 24 years – this is for traffic related deaths both inside and outside vehicles. Although caution is needed when reviewing these statistics as three-year averages should be used, this suggests that particular **attention should be paid in this period where young people become more independently mobile while still cognitively vulnerable**. There would be value in reporting KSIs per km walked or cycled for children and young people as this reveals a more accurate picture of road safety in relation to exposure.

[10] Data source see reference 2.
[11] Scottish Government (2014) Child Death Review Report
[12] National Records of Scotland (2020) Vital Events Reference Tables 2019. *Table 6.04: Deaths, by sex, age and cause.*

The recently published Scotland's Road Safety Framework to 2030 – sets out an ambition for Vision Zero by 2050, and a vision to have the best road safety performance in the world by 2030[13]. The Road Safety Framework outlines a safe systems approach, recognising the role of safe speeds, safe roads and roadsides, safe road use, safe vehicles, and post-crash response. Intermediate Outcome 05 is a 70% reduction in road users aged between 17 and 25 killed or seriously injured, which would include young people walking and cycling as well as young people in motorised vehicles. **Fundamental to achieving these road safety outcomes is safe and attractive segregation of both walking and cycling infrastructure – which is designed to specifically meet the needs of children and young people.**

In the interest of child safety, it is important to be frank that current exposure levels to cycling risk are extremely low. Envisioning large scale increases in older children and young people in particular means matching delivery of high-quality infrastructure provision with better road use, and safe speeds. As such the **use of a "child mph" speed limit could have value in good road infrastructure contexts, as it could communicate to drivers – in an immediate and tangible way - both a speed limit and their responsibility towards children.**

Implications for Practice:

→ Establish national standards for segregated walking and cycling infrastructure which meets the needs of children and young people, embedding this in Cycling by Design and the DMRB.

*→ Where segregated tracks are not viable, explore transformational road space approaches such as laid out in the **Innovation Toolbox in Table 23.***

→ Add children from age 12, and maintain young people up to age 22 or 25 years interim road safety targets.

→ Report KSIs per mile walked or cycled for children and young people.

→ Explore use of Child mph to communicate to vehicle drivers their duty of care towards children and young people in the road environment, as part of a safe systems approach.

[13] Transport Scotland (2021) Scotland's Road Safety Framework to 2030: Annual Delivery Plan 2021-2022

2 Best Practice for Play Streets

2.1 UK Roots

In 1926 Nancy Astor told the House of Commons: ***"There is no more pitiable sight in life than a child which has been arrested for playing in the street... Though these children may be fined, we stand convicted."*** [14] As a result of her campaign, legislation was passed in 1938[15] and the first Play Streets were designated in East London during WWII to protect children from being run over by newly proliferating cars. Prior to this, New York City introduced its first Play Street in 1914 to give poorer communities access to safe outdoor play[16]. The trial was so popular that by 1924 there were 50 Play Streets in NYC. There are historical photos of Play Streets in Edinburgh and Glasgow, and by the 1950s there were 700 Play Streets across England and Wales. Sadly, by the 1980s Play Streets had all but disappeared in the UK.

Today, designated 24/7 Play Streets are widely used across Germany, Switzerland and Austria and many other European countries.

2.2 Play Streets in Germany

Figure 5 **A 24/7 play street in Germany with a "child mph" speed limit – children are expected to play in the carriageway, while cars and vehicles can still access properties © Ramboll / Atelier Dreiseitl / J Read**

[14] https://www.londonplay.org.uk/content/29934/our_work/recent_work/play_streets/the_history_of_play_streets
[15] https://api.parliament.uk/historic-hansard/lords/1938/mar/31/street-playgrounds-bill
[16] https://www.thirteen.org/program-content/a-history-of-nycs-play-streets/

The use of 24/7 play streets was introduced into traffic law in 1980 in Germany. Play Streets have simple signage, traffic calming features and clear threshold treatment to adjoining roads. They are expected to be self-enforcing as it is difficult to enforce low speeds. Enforcement after a speed infringement is dangerous for children as it means the risk of danger has already occurred.

The key traffic regulations are[17]:

- Pedestrians can use the full carriageway, and ***children are allowed to play everywhere!***
- Legal speed limit of "walking pace", 4-7km/hr (2-3 mph) which cyclists, mopeds, cars and lorries must adhere
- Pedestrians have priority – cyclists, cars, vans and lorries must give way
- Vehicles are not allowed to endanger or obstruct pedestrian
- Pedestrians should not abuse this priority and unnecessarily obstruct vehicles
- Parking on designated areas only, except for loading
- These rules apply at night too

Play streets in Germany can be delivered in attractive high-quality materials such as the example above, or humdrum ordinary road materiality. They tend to be successful when they are self-enforcing through traffic calming and have high natural surveillance to allow parents and carers reassuring glimpses of their children roaming past a front window.

Figure 6 **A 24/7 play street in Germany in more ordinary road materials but still self-enforcing with traffic calming © Alexandra Kratz**

[17] https://www.polizei.bremen.de/detail.php?gsid=bremen09.c.30495.de

2.1 Play Streets in Switzerland

Play streets are also widely used across Switzerland using a slightly different model based on 20 km/h (12 mph) and pedestrian priority[18]. The Swiss approach is also based on self-enforcement with threshold treatment, seating and planting elements so that it feels like a play street.. Play streets can only be on streets without public transport, adjacent to roads with 20 mph speed limits, and where front doors open on the street. Basel, which is a town in Switzerland about the size of Dundee, has retrofitted eighty play streets since 2015[19].

Figure 7 **A play street in Basel - pedestrians have priority at all times. © Planungsamt BVD**

Figure 8 **A play street in Basel showing the threshold treatment and 12 mph © Planungsamt BVD**

[18] https://www.planungsamt.bs.ch/oeffentlicher-raum/begegnungszonen.html
[19] https://www.planungsamt.bs.ch/oeffentlicher-raum/begegnungszonen.html

3 Precedents for Play Streets in Scotland

There are historic precedents for play streets in Scotland which paint a delightful picture of active and sociable play. The legal basis for these playstreets is unknown at present.

3.1 Glasgow

Figure 9 **Lauriston, Gorbals, 1963. © Eric Watt / Glasgow Life 2018**

Figure 10 **Middleton Street, Glasgow. ©GoogleMaps**

3.2 Edinburgh

Figure 11 **Johnston Street, Edinburgh. The sign reads: CHILDREN'S PLAYGROUND, NO VEHICLES PLEASE, 4PM TIL SUNSET © Unknown**

Figure 12 **Orwell Place, Edinburgh 1966 © Crawford Tait**

3.3 Evidence-base for Playing Out

The Playing Out[20] approach in the UK uses a temporary street play order to allow children to Play Out during a specific time – for example, once a week, once a month or just once per year. A recent study commissioned by the Department of Health found that Playing Out resulted in additional minutes of physical activity and wellbeing for children[21]. The study identified that **Playing Out was an important setting to learn to ride a bike and benefitted the wellbeing of older people too**. The disadvantage of the Playing Out process is that there can be a postcode lottery effect, where although national legislation has been changed to make temporary street play orders easier[9], a lot depends on the willingness of local officers and the commitment of an individual resident.

Figure 13 **Playing Out session in Edinburgh © City of Edinburgh Council**

Figure 14 **The Playing Out model is resident led and high impact. © PlayingOut**

[20] https://playingout.net/
[21] University of Bristol (2016) report "Why temporary street closures for play make sense for public health" http://www.playengland.org.uk/wpcontent/uploads/2017/07/StreetPlayReport1web-4.pdf

4 European Best Practice for Cycle Priority Streets

The use of cycle priority approaches is well established in the Netherlands, but has also been growing rapidly recently in Germany, Switzerland, and the USA. Reprioritising offers a spatially pragmatic and cost-effective solution to delivering high quality and safe cycling infrastructure. This approach works with rather than against the reality that we are a car dependent society, and we need to put solutions in place which provide alternatives to car travel before taking this away.

4.1 Germany

Figure 15 **Cycle priority approaches are being rapidly adopted across Germany which allows Germans to still love their cars and park right outside of the shops while giving themselves and their children safe options to cycle. © Ralph Peters**

Figure 16 **Signage is in the positive, reinforcing the road use priority. Left sign is resident access only, right sign is access for cars and motorcycles. © Unknown**

4.2 Netherlands

Figure 17 **Cycle Priority Streets are widely used across the Netherlands, and supported by a rule of no overtaking cyclists to support child road safety. © J Read**

Figure 18 **The surface treatment of cycle priority streets in the Netherlands make them highly recognisable for all road users. The brick colour is also attractive, and the smoothness appealing for skateboarders and roller blading as well as cyclists. © J Read**

5 What Local Authorities are Doing Well

5.1 Edinburgh - Spaces for People

Figure 19 **Forrest Road Spaces for People Scheme in 2020, Edinburgh © Mies Knottenbelt / Spokes**

Edinburgh City Council introduced 'Spaces for People' pop-up walking and cycling measures during 2020 and 2021 to give people more space on pavements and roads during the Covid-19 pandemic[22]. These measures included temporary pop-up approaches to deliver:

- 39 km of segregated cycle infrastructure
- 54 measures around schools to give more space to pupils and their parents/carers
- removing street clutter such as unused poles and parking signs

The 'Spaces for People' installations created space for everyone and made it easier and safer for people to move around when walking, cycling, using a wheelchair or other mobility aid, and pushing prams or buggies. Measures were also intended to support businesses as they re-opened and adapted to a new way of operating such as space on pavements for queuing at a safe distance. All schemes were funded by over £5 million from Sustrans, which was awarded to make temporary changes to Edinburgh streets.

While some Spaces for People installations have needed to be removed, the pop-up approaches used have provided real insight into transformational approaches to both segregation and reprioritising road space. This is of high relevance to piloting and delivering walking and cycling infrastructure which is safe and appealing for children and young people.

[22] https://www.edinburgh.gov.uk/spaces-people-1

5.2 Glasgow - School Car Free Zones

Figure 20 **Battlefield Primary School Car Free Zone © Glasgow City Council**

Figure 21 **Using time-base vehicle restrictions to deliver school zones © Glasgow City Council**

Glasgow City Council School Car Free Zones aim to promote active travel to school by prioritising walking and cycling, which in turn, will help to reduce congestion and pollution in the area and better manage parking23. The programme started in August 2019, with 37 zones delivered as of August 2021, a total of 44 expected by January 2022, with up to 60 zones delivered by Easter 2022. The main approach used is vehicle restrictions during school drop-up and pick up times, with permitted access for blue badge and parking permit holders.

[23] https://www.glasgow.gov.uk/schoolcarfreezones

5.3 Stirling - Cycle Priority Street

Figure 22 **Visualisation of a continuous footway along Raploch Road © Stirling City Council**

Raploch Street is part of a key transport corridor in Stirling connecting from the city centre to Forth Valley College, Castle Business Park and the Castleview 'Park and Choose' site[24]. The project design is characterised by introduction of a 20 mph zone, narrowing of the carriageway, continuous footways at side junctions, raised tables, frequent crossing points, smooth wide pavements and segregated cycle tracks along parts of the route.

Continuous footways will give greater priority to people travelling across side roads. This is done by raising up the road at the junction mouth to the same level of the pavement or footway. Material that is used to form the footway is then 'stretched' over the road. Drivers exiting or entering side streets will then be in effect driving over the footway and will need to be more aware of pedestrians and required to stop fully before crossing the pavement.

This project is being delivered by Sustrans in partnership with Stirling Council, as part of the Walk, Cycle, Live Stirling programme. Raploch Street Design is an exciting initiative to get local people involved in improving public space on Raploch Road. Since the project was launched in September 2018, over 2,000 people have contributed to the design through hundreds of comments and suggestions from residents, business owners and young people collected in over 40 meetings and activities.

[24] https://forthvalleycollegeroute.commonplace.is/about

5.4 Perth & Kinross - Continuous Footways

Figure 23 **Continuous footway using pulled back give way markings along the School Road junction with the A94 near Burrelton Primary School © Perth & Kinross Council**

Perth & Kinross Council have delivered a number of continuous footways and footway improvements along school routes. One location is the School Road junction on the A94 in Burrelton. This route is used by pedestrians travelling to the primary school and by pedestrians going to the village shop, butchers and using the bus stops. There is no footway on one side of School Road, and therefore very poor visibility for pedestrians trying to cross. The new layout gives pedestrians priority over vehicles and reduces the speeds of vehicles coming out of School Road. In another example, Broich Road is a well-used route to both the Primary and Secondary schools in Crieff. The footway was realigned and widened up to 3 m and continuous footways installed using raised level tables and give-way markings.

Figure 24 **Use of double give way markings and a raised continuous footway on the route to a. primary and secondary school on Broich Road in Crieff © Perth & Kinross Council**

6 Toolbox of innovation approaches

6.1 Innovation Toolbox

Two workshops were held with local authority stakeholders in September 2021 to explore a toolbox of potential gamechangers which could benefit from the use of a "child mph" speed limit. These were examined as in context case studies as shown in *Section 6.2*. Two fundamental assumptions guide this toolbox. Firstly, while segregated cycling tracks are ideal, these are often not viable particularly in non-arterial and historic road settings. For this reason, **secondary network approaches which work with reprioritising road space rather than reallocating road space are important additional approaches**. The second fundamental assumption is that these **interventions need to be self-enforcing through traffic calming and attractive, legible materiality**. The application of a speed limit alone is not sufficient. This is because for children and young people prevention of road danger is of primary importance, with enforcement of road safety an important supporting approach.

Tools/Interventions	Children Playing in Carriageway	Child MPH applicable	Alternative Standard Speed Limits	Place or Movement Weighting
Playing Out	Yes	Child mph	5 mph	Place
Play Street 24/7	Yes	Child mph	5 mph	Place
School Street	No	Child mph	10 mph	Place/Movement*
Pedestrian Priority	Maybe?	Child mph	10 mph	Place
Cycle Priority	No	Child mph	10 mph	Movement
CLFs on Residential Streets <3000 vpd	Maybe?	Child mph	10 mph	Place
Walking and Cycling Friendly Road	No	Child mph	20 mph	Movement

Table 25 ***Innovation toolbox comparing potential application of child mph to lower speeds. * Secondary schools, and some primary schools, can be located on transport corridors. CLF = continuous level footway***

Q: Does the use of a "child mph" speed limit enable all vehicle users - including cycles, cars, vans, buses, and trucks - to know what to do? In every context?

6.2 Exploratory Applications

During the two inspiration workshops with local authority stakeholders, the toolbox of interventions was explored in real world settings to provide a basis for discussion. The following examples are not formal or approved positions by the respective local authorities.

Figure 26 ***Envisioning Middleton Street in Glasgow as a high specification 24/7 play street.***

Figure 27 ***Envisioning Middleton Street in Glasgow as a lower specification 24/7 play street. Yogi Bear is indicative only of a playful but firm character who can reinforce road safety message.***

Figure 28 ***Envisioning Whitehouse Loan in Edinburgh as a pop-up Cycle Priority Corridor. Delivering this in a higher quality specification could include an attractive cycle friendly surface, and potential for reprofiling the road for greater flood resilience.***

Figure 29 ***Envisioning the entrance to James Gillespie's Primary School as a pedestrian zone. Not, this is not dissimilar to the approach being implemented around schools in Paris.***

Figure 30 ***Envisioning Bute Drive in Perth as a cycle priority corridor, with associated footway and cycle parking upgrades. Cycle priority corridors can be accessible to buses, with local access only.***

Figure 31 ***Envisioning Torbrex Lane in Stirling as a pedestrian priority zone, which is welcoming and accommodating for the older people who live locally. The concept offers improved cycle priority access from the alternate school entrance to Stirling High School.***

Note – the depiction of Yogi Bear is indicative only of a playful figure which could help communicate road safety messages to children and adults alike. In it's origin, Yogi Bear played a role as an educational figure, teaching people about not lighting fires in high fire risk areas, reducing drug use for young people, and being prepared for earthquakes. What would be a good character for Scotland?!

Q: Who or what would be a good Yogi Bear figure to communicate road safety to adults, children and young people alike?

6.3 Continuous Level Footways

A fundamental assumption is that road interventions need to be self-enforcing through traffic calming and attractive, legible materiality. The use of continuous level footways is widely established across Europe as the best practice for improving road safety for pedestrians and cyclists, but also vehicle users. Iconically, this question was asked in Copenhagen: how can my child get to school independently without crossing the road? Continuous level footways are standard across Copenhagen which has some of the best safety rates per km cycled, particularly for children. In practice this is because not only does the CLX offer greater safety for the pedestrian crossing, but substantial safety benefits There are historic examples of continuous level side junctions in, for example Glasgow, and emerging best practice examples can be found at Leith Walk in Edinburgh, Sauchiehall Street in Glasgow and Broich Road in Crieff.

Figure 32 ***Left: a traffic calming CLX using an attractive buff asphalt in York. Right: use of double give way markings and buff footway colour continuation in Bristol.***

Transport for Greater Manchester has recently an independent report examining the use of non-prescribed zebra crossings at side junctions[25]. This is an appealing low-cost approach, which has its origins in pedestrian crossings in Japan. Of note, is when children use these crossings in Japan, they are encouraged to use little yellow flags. While the TfGM study is of high interest, a major weakness of this study is that it only looked at pedestrian – vehicle interactions and did not observe interactions without pedestrians and impacts on cyclists on the perpendicular carriageway. The language of zebra crossings is well established in the UK, but currently the change of priority is only activated when a pedestrian steps on the zebra. The **treatment of side junctions needs to ensure a mandatory yield each time a vehicle**

[25] TRL Ltd (2021) Non-prescribed zebra crossings at side roads.

enters or leaves a side road to provide road safety for all road users – particularly for children but also for cyclists and motorists on the perpendicular carriageway.

Implications for Practice:

→ Set a national standard for continuous level side junctions in both a raised level and also a road markings specification.

→ Review based on whether the yield on non-prescribed zebra crossings becomes mandatory at all times.

6.4 Legislative Infrastructure

Potential key play legislation includes:

- STREET PLAYGROUNDS BILL HL Deb 31 March 1938 vol 108 cc543-53[26]
- 1984 Road Traffic Regulation Act chapter 27, Part III, sections 29 & 31
- Play Streets using Section 16 of the Road Traffic Regulation (Special Events) Act 1994
- The Home Zones (Scotland) Regulations 2002

Homezones are largely excluded from this report because the original concept is for traffic calming on residential streets. In practice, when only a homezone sign is installed without attractive and material traffic calming they do not provide safe conditions for walking and cycling. It is unclear whether the homezones legal framework provides a basis for time-based play streets in Scotland.

Implications for Practice:

→ Clarify key legislation related to 24/7, and time-based Play Streets

→ Clarify key legislation related to Playing Out, advertising and Chapter 8 training

→ Review legislative framework to embed resulting innovations

6.5 Futureproofing for uptake of ecycling, and escooters

A suite of recent studies conducted by the University of Bristol has found that **ecycling has clinical health benefits for both vulnerable people with health conditions as well as for the general population**[27]. A pilot study in Bristol conducted with participants with type 2 diabetes reported mean journey of 7.5 km (SD 4.2km) or 26.6 minutes (SD = 12.6 minute)[28]. This distance range is in line with the national average in England with 82% of cycling trips under 8 km (5 miles)[29], indicating that ecycling enables more vulnerable users to cycle transport distances. This finding was reflected in an international scoping review of ecycling for transport where most studies reported mean daily distances between 3 km and 11.5 km[30]. This same scoping study identified uptake across different age groups. This is reflected

[26] https://api.parliament.uk/historic-hansard/lords/1938/mar/31/street-playgrounds-bill
[27] Bourne et al. (2018) Health benefits of electrically-assisted cycling: a systematic review.
[28] Cooper et al.(2018) Potential of electric bicycles to improve health of people with Type 2 diabetes: a feasibility study.
[29] Department for Transport (2021) National Travel Survey 2019, Table NTS0308b.
[30] Bourne et al. (2020) The impact of e-cycling on travel behaviour: A scoping review.

in detailed transport statistics from the Netherlands that show that while ecycles are most popular with older people, there is increasing uptake in ages 12 to 49 and ages 50 to 64[31].

Ecycling can also enable more diverse cycle-types such ecargo bikes, family ecycles which transport multiple children horse rider style, or ecycles to assist the pulling a trailer. E-trikes add stability and space for shopping or a dog and may be particularly appealing for an older person accompanying a child. Equally, ecargo bike micro-freight services have an important role to play in reducing the carbon and pollution impact of the white van phenomenon. The "Parcels not Pollution" programme launched by Hammersmith & Fulham currently 1000 deliveries per day[32]. Uptake of ecycling generally increases the importance of segregation between walking and cycling, as an ecyclist poses both perceived and absolute danger to pedestrians – particularly children and older people

In addition, **the uptake of ecycling increases the importance of designing cycle track widths for in-lane speed differential.** This means in general that a cycle track lane in one direction should allow a parent or carer to cycle next to a child, or for a child or slower cyclist to be overtaken by a faster cyclist.

Implications for Practice:

→ Uptake of ecycling underlines the importance of segregation between walking and cycling, particularly for children and older people.

→ Treat inclusive design standards as the standard.

→ Dimension cycle facilities for in-lane speed differential so that children can be overtaken safely.

→ Ensure e-assets for ecycles, escooters, and ecars are placed in the carriageway not the footway.

→ Allocate 20% of cycle parking for inclusive cycle types, and prioritise an additional 10% of cycle parking as dedicated blue-badge inclusive cycle parking.

[31] Netherlands Institute for Transport Policy Analysis (KiM) (2018) Cycling Facts.
[32] https://www.lbhf.gov.uk/articles/news/2020/03/hf-s-eco-cargo-bike-delivery-service-hits-1000-parcels

7 Signage

7.1 Enabling Car Drivers to Do Their Bit

In addition to the potential use of “child mph” signage, the workshop process examined and identified a bundle of signs which could be high impact in delivering road safety and enabling safe walking and cycling for children and young people. There is a varied need for these signs to be improved, rationalised and/or prescribed within the TSRGD. This bundle includes:

- Child mph
- Cycle Priority
- Do No Overtake Cyclists
- Give Space to Cyclists
- Play Street
- Pedestrian Priority
- Road Closed
- Road Open
- Vehicle prohibition sign
- Walking and Cycling Friendly

Q: Are key road signs clear and legible to every vehicle user?

Q: Are key road signs legible to children?

Implications for Practice:

→ Update/prescribe a bundle of key signs related to child road safety.

→ Consider the natural legibility of these signs both for vehicle users and children and young people.

Figure 33 **Is the vehicle prohibition sign to the right clear and obvious? Would a child understand what this means? The “ROAD OPEN” communicates in the positive but is not prescribed. © Blackford Safer Routes**

Figure 34 **Spaces for People installation on Waverly Bridge. The "ROAD AHEAD CLOSED" sign is clear, but also inaccurate as this highly attractive road is open for pedestrians, wheelers and cyclists © Transport Scotland**

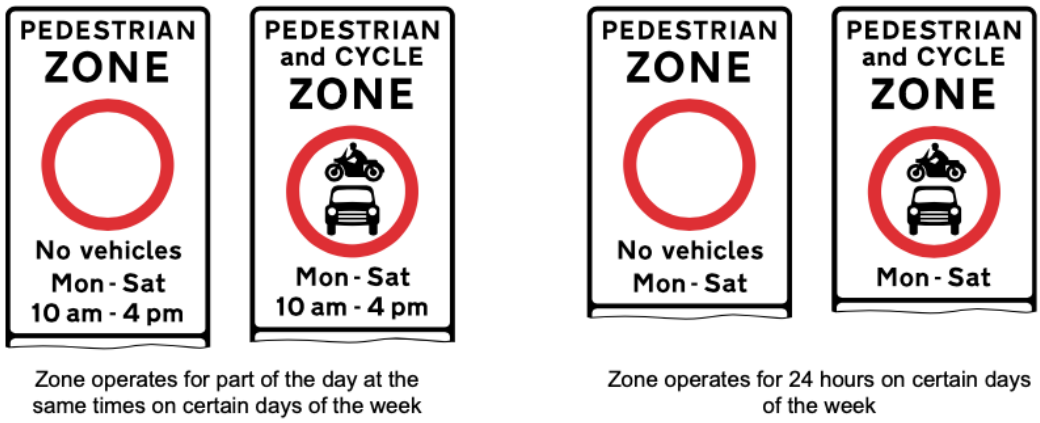

Figure 6-3 Examples of different times of operation for a pedestrian zone

Figure 35 **These signs are in existence in Chapter 3 of the TSRDG. Many European countries express the priority in the positive rather than the prohibition. This is there reinforced by traffic calming and material legibility so that vehicle users can read the road rather than the signage © TSRDG**

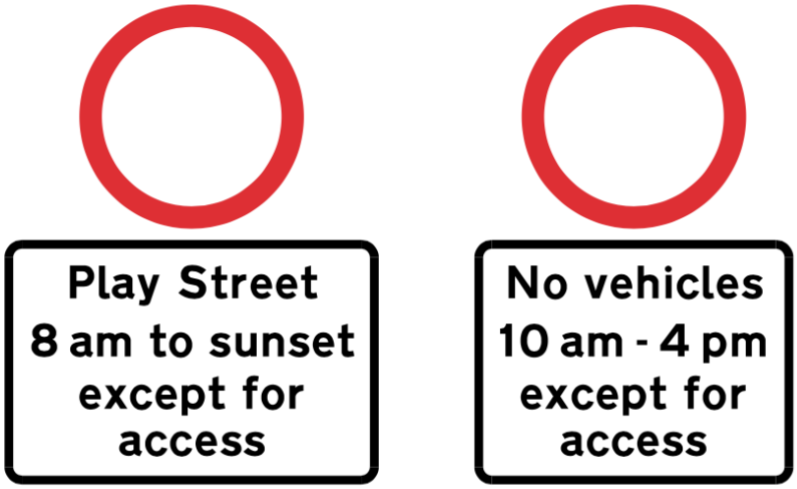

Figure 5-5 Diagram 617 (S3-2-11) All vehicles prohibited (Alternative types)

Figure 36 **These signs don't make the heart sing, and also don't fairly instruct vehicle users what to expect – will there be children playing, skipping, wheeling and doodling in the carriageway? © TSRDG**

Figure 37 **This "Give Cyclists Space" sign is barely visible and also does not sufficiently instruct vehicle users what to do. There is a serious concern that this sign adequately safeguards a child or young person cycling along this quiet and beautiful rural road. © J Read**

An example is the attractive rural road along Glen Nevis, which is a dead-end and an ideal setting for an outing with a child cyclist as a level route about 7 km from Fort William. The road had several "Give Cyclists Space Signs" which are barely legible. In truth it is extremely difficult for vehicle users to judge how far 1.5 m is. The road is 5 m in width, so **a more robust instruction would be for vehicle users to completely drive into the opposite lane while overtaking - otherwise, don't overtake[33].**

[33] This is based on three safe distance comparisons: CyclingUK: 0.75+1.5m = 2.25 m; Child specific: 0.5 drainage assets + 0.3 child dynamic envelope + 0.3 child dynamic envelope + 1.5 = 2.6 m; Child bike trailer: 0.5 drainage assets + 0.3 dynamic envelope + 0.8 trailer + 1.5 = 3.1 m)

Figure 38 **A "Do Not Overtake Cyclists" could be useful to add road safety at pinch points. © CyclingUK**

Figure 39 **Walking and cycling friendly signage used in Perth and Kinross to deliver a network of rural cycling access. From a child and young person perspective, this sign should be linked to a maximum 20 mph speed limit. The walking and cycling friendly road sign would be useful unlocking rural potential. Left: © Rob Purvis. Right © Stirling Active Travel Hub**

Figure 40 **Fun and appealing signage in Fishertown in Nairn, but in practice not a safe environment for a child to cycle freely as there is no traffic calming. With subdimension footways, this beautiful historic setting would lend itself to a pedestrian priority with permitted cycling and access only. © J Read**

Figure 41 **This is a traffic calmed zone in a residential area in Aviemore, with raised tables and chicanes. Twenty is plenty, and in practice this feels like a safer environment for walking and cycling. Room for improvement on the overly wide bell curves. © J Read**

Figure 42 **Pedestrian priority does not mean that taxis and Deliveroo can't make it to the front door. © J Read**

Figure 43 **Vehicle users are able to drive carefully at campsites and supermarket car parks all across Scotland – this should be applicable to residential roads and play streets too. © J Read**

8 Communication

8.1 Preparing Community for the Conversation

It's a difficult conversation, but it's one we need to have. Active travel engagement can generate strong emotional reactions. While any change conversation can generate fear-based responses, the activation of threat systems can be strongly augmented by social media. The human mind has a natural negativity bias which is designed to keep us safe[34]. This negativity bias is augmented by social media which is designed to promote negativity because this generates more interactions, which is the basis of its commercial model. This threat-based tone can disrupt genuine engagement and be highly fatiguing for all participants. The "Child mph" concept could help reset these difficult conversations by activating soothing systems rather than threat systems. In addition to this, launching a national conversation could help remove heat from the coal face of individual projects – after all, increasing walking and cycling particularly for children and young people is a national security and prosperity interest.

Implications for Practice:

→ Use the Child mph concept to launch a national conversation.
→ Use the Child mph concept to frame engagement around soothing systems.
→ Develop a Child mph engagement safety and wellbeing protocol – after all, children use social media too and should be free to engage in transport projects.

Q: What does Child mph mean to the public?

Q: What does Child mph mean to a child?

8.2 Communicating the Harm of Car Dependency

Respecting one another's interests is the basis of our civic society. Asking a person – be they an individual, a company or an industry – to cease harm is not punitive. While the car industry may have no intention to cause harm, there is now a substantial body of data and evidence that suggest car dependency does more harm than good. This is a societal issue which effects every person in Scotland, and the UK. As part of a wider national conversation, it is important to communicate the disbenefits of car dependency honestly, similar to public health approaches to reduce smoking. The car industry infrastructure offers a readymade route for communication, for example: Petrol stations, MOT, Sales points, Parking permits, Traffic updates e.g. radio, Satnav, 24 hr particulate air pollution peak warnings/bans.

Implications for Practice:

→ Communicate the harm of car dependency as a public health approach.
→ Communicate car based particulate air pollution in equivalent cigarettes.
→ Communicate tyre-base microplastics in equivalent rubber ducks.
→ Communicate carbon impacts on full life cycle.
→ Communicate car dependency is as dangerous as smoking due to associated physical inactivity.

[34] Paul Gilbert (2009) The Compassionate Mind.

Figure 44 ***Seventy-seven million rubber ducks being dispersed in to the air, water, animal and human ingestion pathways in Scotland each year - is this just too many rubber ducks?!***

Figure 45 ***Grounds for feeling hopeful - the potential for modal shift is delightful![35].***

[35] Data source: Transport Scotland (2020) Scottish Household Survey. *Table TD4a: [Distance by main mode] Percentage of journeys by road network distance by main mode, 2019.*

9 Data

9.1 Data for Journeys to School

The main two data sources for journeys to school are the Scottish Household Survey (Table 15: [Travel to school] School children in full-time education, usual method of travel, 2019) and the Hands Up Survey. While child physical activity levels and the setting where physical activity occurs are measured in the Scottish Health Survey, this doesn't separate out journeys to school specifically. The Hands Up survey focusses on journeys to school through a simple survey method which delivers a valuable level of information and importantly allows schools and local authorities to track their progress[36]. Potential limitations in the survey methodology include that the survey is not universally responded to, and only captures about 38% of school aged children[37]. As such there may be response bias with schools who are keener on supporting active travel more likely to respond. The lowest response levels are for secondary aged children (46% of Scottish state school roll) and children with special needs (18% of Scottish state school roll) – these are groups with the lowest physical activity levels.

Q: At what age to children make the transition from walking, scooting, or cycling on the footway to scooting or cycling in the carriageway?

Survey Name	Walk	Cycle	Scoot or Skate	School Bus	Bus	Rail	Car	Other
Hands Up	45%	4%	3%	n/a	14%	n/a	24%	10% park & stride
Scottish Household Survey	52%	2%	n/a	14%	5%	0.3%	25%	2%

Table 46 ***Comparison of Modal Share Findings for Main Journey to School Surveys.***

The Scottish Household Survey provides a nationally representative picture and useful disaggregation by age, gender, income, SIMD, and rural/urban context[38]. Data from 2019 shows that **walking is important for children across all ages** and is the largest modal share for children at 52% - this is well above the national modal share of 22%. Walking is particularly important for more deprived children, children with a single parent and children in households without a car. Children in rural areas are less likely to walk, but more likely to use a school bus. **Cycling levels are fundamentally low for children at 2%, but like walking this is above the national modal share of 1%.** There is gender disparity in cycling with girls less likely to cycle than boys (1% vs. 3%), and girls more likely to walk than boys (54% v. 50%). There is a strong inequality profile, with children in the least deprived households four times more likely to cycle than children in the most deprived households. Younger children are more likely to cycle, as are more affluent children and children in households with two or more cars. See *Section 9.1* for the full table.

[36] https://www.sustrans.org.uk/our-blog/projects/uk-wide/scotland/hands-up-scotland-survey/#:~:text=Previous%20survey%20results%20%20%20Hands%20up%20Scotland,Results%20%20...%20%202%20more%20rows%20

[37] Based on reported number of students (405,917) compared total number of children aged 0-18 (1,081,485).

[38] Transport Scotland (2021) Scottish Household Survey (Table 15: [Travel to school]

Implications for Practice:

→ Walking is important for children of all ages and can be built on.
→ Good walking infrastructure is important to enable younger children to scoot, wheel and cycle to school.
→ Delivery of cycling infrastructure needs to cater for children and young people.
→ "Activating" the school bus may be relevant for children in more rural areas.

Q: Do current guidelines, particularly the DMRB, cater for the needs of children? Are walking infrastructure design guidelines sufficiently robust? Are the new Cycling by Design guidelines robust for children? Do they sufficiently future-proof for emerging topics such as uptake of ecycling and escooters which can impact safety for child cyclists?

9.2 Walking Data

The walking environment is where younger children are most likely to walk, scoot and cycle, and both the Scottish Household Survey and Hands Up Survey shows how important walking is for journeys to school for both primary and secondary aged children. Equally, younger people aged 16 to 19 are likely to walk most[39]. A previous project conducted for Living Streets Scotland about walking and older people identified that while walking infrastructure interventions have large impact in terms of generating modal shift local authorities do not routinely collect or use walking data[40]. Walking data is not reported as part of Scottish national traffic statistics. This means that in most instances there is no baseline data to measure interventions against for a "before" and "after" effect.

Traffic is defined as the movement of people and goods – walking as a mode of transport is fundamentally the movement of people. It is important to measure how many walking kilometres are being walked and where these are taking place. As a systemic quick win, local authorities should collect walking data, and walking data should reported as part of national transport statistics, for example in Annual Average Daily Flow (AADF) statistics[41], and Scottish Transport Statistics, for example Chapter 5 – Road Traffic, *Table 5.2 Traffic (vehicle kilometres) on major roads (by class / type) and minor roads (by type) by vehicle type, 2019* and *Table 5.3 Traffic (vehicle kilometres) on major roads, minor roads and all roads by vehicle type*[42].

As an applied example of this, extending free bus travel to under 22s in Scotland from 31st of January 2022 will likely generate additional walking kilometres associated with these journeys. There is currently no baseline to measure this impact against.

Implications for Practice:

→ Collect walking data as part of annual average daily flow statistics.
→ Collect walking data as a standard part of traffic surveys.
→ Include walking in traffic models, including for new developments.
→ Report walking data as part of National Transport Statistics.

[39] http://www.equalityevidence.scot/ data from Scottish Household Survey 2019 Table 25: Frequency of walking in the previous seven days: 2019.
[40] Living Streets Scotland (2021) Our Streets Too – Why Walking Infrastructure is a Priority of Healthy Ageing and Prosperity in Scotland.
[41] https://roadtraffic.dft.gov.uk/#8/56.103/-3.859/basemap-localauthorities-countpoints
[42] Transport Scotland (2021) Scottish Transport Statistics, No. 39 2020 edition

9.3 Cycling Data

Cycling data is collected as part of annual average daily traffic surveys and should be collected as standards as part of traffic surveys. Cycling data is however commonly not included in traffic models which are used to make major investment decisions and to justify the impact of development schemes. Combined with the exclusion of walking data, this is a serious information bias for any model. Traffic models can be run with walking and cycling data, and as a minimum walking and cycling traffic data can easily be included in modal target assumptions for roads and developments.

An additional field of cycle data is cycle parking data. The upcoming ban on pavement parking will likely require vehicle parking strategies, and cycle parking should be at the heart of this. At home, a family with children may struggle to get a cargo bike or cycle trailer through the front door or may not have the space to store cycles in the dining or living room. Safe, secure in-street cycle parking for inclusive cycle types is essential at home, and at school and journey destinations.

Implications for Practice:

→ Include cycling in traffic models, including for new developments.
→ Include cycling parking data as part of parking management strategies.
→ Establish an allowance for safe, secure cycle parking per inhabitant or user.
→ Include a 20% provision for inclusive cycle types such as cargo bikes, cycle trailers, trikes, and adapted cycles.

Q: Can walking and cycling traffic survey data be differentiated for child users?

9.4 Air Pollution Data

Fine particulate air pollution – known as $PM_{2.5}$ – have the most harmful impact on health in the UK and are largely due to the wear and tear on breaks and tyres from motorised vehicle traffic[43]. The World Health Organisation have recently updated guidelines for outdoor air pollution and particularly fine particulate air pollution based on a large evidence review including new evidence since 2005. The new guidelines recognise **the immediate and lifelong impact of fine particulate air pollution on children's health and wellbeing** as exposure to particulate air pollution can reduce lung growth and function, and cause lung infections and asthma[44]. The UK has had a first instance of a child's death being directly attributable to exposure to $PM_{2.5}$ from vehicle traffic. Together this implies that there is an urgent public health duty of care related to particulate air pollution and issuing real-time health warnings for air pollution and associated motorised traffic restrictions should be considered.

Scotland is ahead of the rest of the UK in having already adopted the previous WHO guidelines for $PM_{2.5}$ and also has significantly lower particulate air pollution compared to the rest of the UK. Nonetheless, there are still an estimated 2094 deaths in Scotland each year due to $PM_{2.5}$ air pollution alone[45]. This estimate does not quantify the morbidity and

[43] Royal College of Physicians (2016) Every breath we take: the lifelong impact of air pollution.
[44] WHO (2021) New WHO Global Air Quality Guidelines aim to save millions of lives from air pollution. Available at: https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution.
[45] Public Health England (2014) Estimating Local Mortality Burdens associated with Particulate Air Pollution

immediate health impacts on children. Of equal concern, annual means do not sufficiently reveal the 24-hour peak exposure events. For example, while Glasgow did not exceed the WHO annual mean of 10 µg/m^3 of $PM_{2.5}$ in 2019[46], there were nonetheless over 18 days over the 24-hour mean peak of 15 µg/m3 24-hour mean measured at the Glasgow High Street monitoring station[47], including major multi-day events in February and April. These 24 hours peaks can take place in towns, cities with high vehicle traffic and are by no means restricted to Glasgow. The quality of PM monitors has improved and become more affordable; this is a good moment to review the collection of $PM_{2.5}$ and NO_x air pollution data in the immediate vicinity of schools.

Pollutant	Scotland air quality objectives	New WHO guidelines 2021	UK air quality objectives
$PM_{2.5}$	10 µg/m^3 annual mean	5 µg/m^3 annual mean 15 µg/m^3 24-hour mean	25 µg/m^3 annual mean
NO_2	40 µg/m^3 annual mean 200 µg/m^3 not to be exceeded more than 18 times a year	10 µg/m^3 annual mean 25 µg/m^3 24-hour mean	40 µg/m^3 annual mean 200 µg/m^3 not to be exceeded more than 18 times a year

Table 47 ***Comparison of key Scottish air pollution guidelines with new WHO guidelines.***

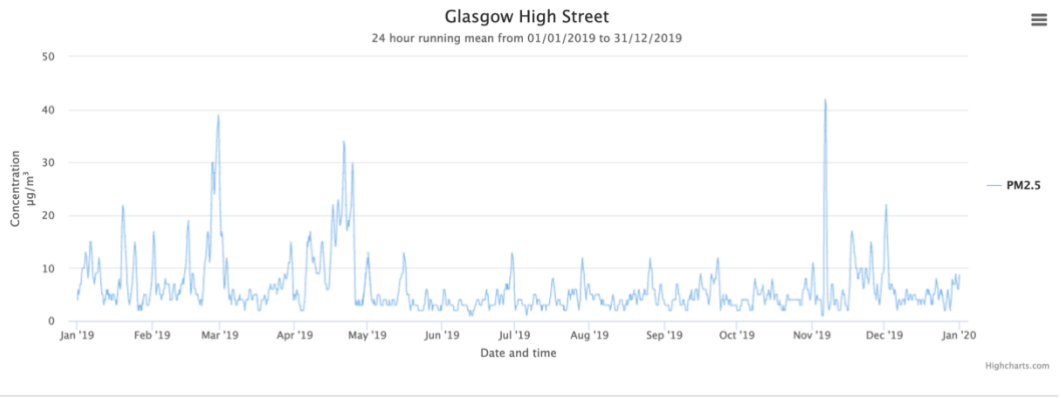

Figure 48 ***PM2.5 data for Glasgow showing 18 days over the new WHO 24-hour value in 2019.***

Implications for Practice:

→ Collect PM2.5 and NO_x data at schools with Real Time Information.
→ Translate PM2.5s into equivalent cigarettes for public communication.
→ Adopt the new WHO standards for 24-hour mean air pollution peaks.
→ Consider issuing health warnings and traffic exclusions during 24-hour peaks.
→ Establish active green corridors to schools e.g. using cycle priority approaches to reduce child air pollution exposure during the school journey.
→ Consider road cleaning programmes using high grade particulate filters.

[46] Glasgow City Council (2020) 2020 Air Quality Annual Progress Report (APR) for Glasgow City Council.
[47] DEFRA (2021) Glasgow High Street, PM2.5 particulate matter (Hourly measured), 24 Hour running mean data supplied by UK-air on 29/11/2021. Available at: https://uk-air.defra.gov.uk/data/data_selector

9.5 Near-miss Data

Near-miss experiences are scary, and a wholly unacceptable experience for children. Near-miss data should be a corner stone of prevention and could prove useful to determine whether near-misses are driven by driver behaviour, linked to a specific location or geographical conditions, and therefore help focus resources. Collecting near-miss data could be a powerful preventative tool and could also underpin a restorative justice approach where drivers are messaged about the distress caused – and made aware that a near-miss occurred.

Q: What is the best way to collect near-miss data?

Implications for Practice:

→ Collect near-miss data.

9.6 Data for Feeling Safe Walking at Night

The Scottish Crime and Justice Survey (SCJS) includes a question about the "Proportion of adults who felt safe walking alone after dark in their local area". There are large differences in feelings of safety between men and women, with 34% of young women aged 16-24 not feeling safe, compared to 23% of men aged 16-24[48]. An additional sensitive analysis was obtained for the SCJS by gender by age by SIMD and urban/rural setting. **More than 49% of women in the 15% most deprived areas of Scotland do not feel safe walking alone at night**, compared to a range between 4% and 11% for men across age groups. Women in urban areas are substantially more likely to not feel safe compared to rural areas, with highest rates of feeling unsafe in with 38% of women aged 16-24 years not feeling safe and 45% of women aged over 60 years not feeling safe. Of note is that men are not more safe walking home alone at night, as this question relates to feelings of safety.

Given that walking is extremely important for children and young people, the lack of feelings of safety walking for many young women is of real concern. The SCJS only includes respondents over age 16, so the perceptions of school aged children are not fully captured.

Implications for Practice:

→ Combine near-misses, experiences of sexual harassment, and feelings of safety walking and cycling alone in a single reporting app which can also be used by children.

[48] Scottish Government (2021) Scottish Crime Survey 2019/2020. *Table 1.05a: QSFDARK: How safe respondent feels walking alone in local area after dark,* with additional sub analysis broken down by gender by age by SIMD and urban/rural setting.

10 Child mph Innovation Project

Child mph Innovation Project

The main recommendation of this proof-of-concept report is to progress to a "child mph" innovation project to shape and identify transport practices which make it easier for local authorities to deliver safe walking and cycling infrastructure for children and young people in Scotland. This could be developed through a selection of local authorities leading and shaping experimental innovation projects which in turn inform and respond to local and national transport practice and policy. As such, the "child mph" is likely a package of measures which would be identified and developed through the project.

The use of "child mph" should be explored both as a means of framing communication to support behaviour change and as an applied speed limit. The three starting questions this project could explore are:

> *1) Does a "child mph" speed limit tell all vehicle users what they need to know to keep children safe and mobile in the road environment?*
>
> *2) Would using a "child mph" help frame a national conversation around the need to reprioritise road space and the wider benefits of this?*
>
> *3) Should a "child mph" be reserved for instances where children are playing in the carriageway?*

Identified Vision

Enable children and young people in Scotland to be safe and free to walk, wheel and cycle for everyday journeys.

Identified Project Aim

To identify and shape potential transport practices which would make it easier for local authorities to deliver safe walking and cycling infrastructure for children and young people in Scotland.

Focus on Children and Young People

Due to steep decline in physical activity from age 12, and the high traffic risk for young people aged 14 to 18 years but also in their early 20s, include a specific focus on secondary aged children and include young people < 24 years.

Innovation Toolbox

Local authorities are well placed to identify the right locations which could work for experimental innovation projects due to their knowledge of road layouts, traffic patterns and local support. Experiences from the delivery of transformation pop-up approaches through the Spaces for People programme have shown the value in using pop-up trials. Using "child mph" in interventions could add additional value to pop-up pilot approaches to frame communication, while allowing for adoption experiences and design fine-tuning

before progressing to capital investment. The following table summarises key child relevant toolbox of approaches identified – **a fundamental assumption is that interventions need to be self-enforcing through traffic calming and attractive, legible materiality**. This table is proposed as a starting parameter to investigate whether the use of a child mph speed limit is more impactful than conventional speed limits:

Tools/Interventions	Children Playing in Carriageway	Child MPH applicable	Alternative Standard Speed Limits	Place or Movement Weighting
Playing Out	Yes	Child mph	5 mph	Place
Play Street 24/7	Yes	Child mph	5 mph	Place
School Street	No	Child mph	10 mph	Place/Movement*
Pedestrian Priority	Maybe?	Child mph	10 mph	Place
Cycle Priority	No	Child mph	10 mph	Movement
CLFs on Residential Streets <3000 vpd	Maybe?	Child mph	10 mph	Place
Walking and Cycling Friendly Road	No	Child mph	20 mph	Movement

Table 49 ***Innovation toolbox comparing potential application of child mph to lower speeds. * Secondary schools, and some primary schools, can be located on transport corridors. CLF = continuous level footway***

Potential Project Outcomes

- Recommendations for design guidance including Cycling by Design, and DMRB.
- Recommendations for signage updates related to the TSRGD.
- Recommendations for data, monitoring and project evaluation improvements.
- Identification of legislative frameworks for scrutiny.
- Excellent case studies for dissemination and knowledge exchange with other local authorities.

Potential Outcome Metrics

- Increase in minutes of physical activity / mileage / modal share of children walking, scooting, wheeling and cycling.
- Increase in child wellbeing in the road environment.
- Following a Vision Zero approach, no correlating increase in KSIs.

11 Climate Context

Scotland is a highly car dependent society with a correspondingly high carbon, transport, environmental and health burden. **Cars are the single largest contributor to the Scotland's carbon footprint[49], at 5.8 Mtons$C0_{2e}$ twice the size of aviation (2.23 Mtons$C0_{2e}$)[50]**. The modal shift potential of car journeys in Scotland is high as most car journeys are short - 28% of car journeys are less than 2 miles (walking distance), and 62% of car journeys less than 5 miles (cycling distance)[51]. In addition to the large impact this modal shift would have on congestion[52], this modal shift potential corresponds to a large potential reduction in carbon. As a high-level assessment, approximately 13% of car mileage falls within the core walking and cycling range of car mileage < 5-mile journeys. This range equates to 0.74 MtonsCO_{2e}, which although it doesn't sound like a big number is about the same size as the carbon footprint of domestic aviation in Scotland (0.69 MtonsCO_{2e}).

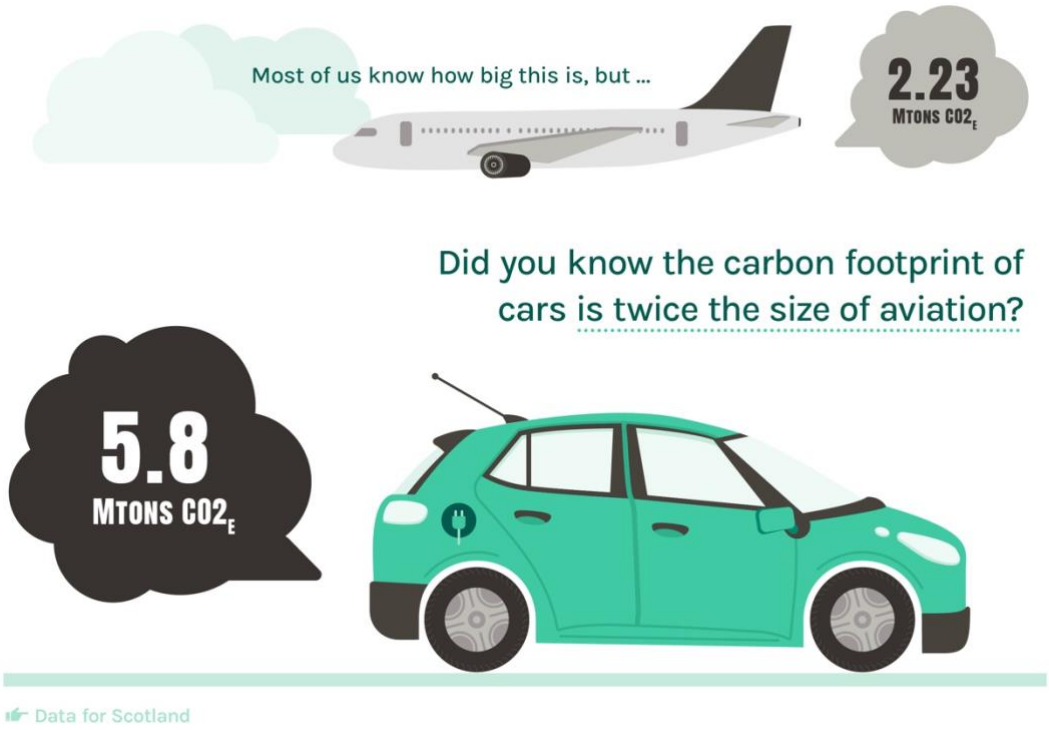

Figure 50 ***The carbon footprint of passenger cars is really big[53].***

[49] BEIS (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019
[50] Transport Scotland (2020) Carbon Account for Transport No. 12: 2020 Edition
[51] Transport Scotland (2020) Scottish Household Survey. *Table TD4a: [Distance by main mode] Percentage of journeys by road network distance by main mode, 2019.*
[52] Transport Scotland (2020) Scottish Household Survey. Table TD10a: [Congestion - reason] Reason for congestion for car / van stages, 2012-2019.
[53] Data source: Transport Scotland (2020) Carbon Account for Transport No. 12: 2020 Edition

Considering a more ambitious range of car mileage for car journeys < 10 miles, which is somewhat less than the current European best practice standard of 20km, approximately 28% of car mileage occurs within this range. This is a substantial carbon footprint equating to 1.6 MtonsCO2e, which is larger than the carbon footprint of international aviation in Scotland (1.52 MtonsCO2e). This quick high-level assessment shows the importance of walking and cycling to deliver Scotland's climate targets, and that equally "activating" public transport to support walking and cycling will unlock major carbon reductions for Scotland.

	Walking and Cycling Sweet Zone < 5 miles	**Walking and Cycling European Best Practice < 10 miles**	**Public Transport Core Range < 25 miles**
Miles per person per year	525	1,173	2,391
Percentage of total annual mileage per person per year	13%	28%	58%
Total MtonsCO_{2e}	0.74	1.6	3.4
Comparison MtonsCO_{2e}	*0.69 – domestic aviation*	*1.52 – international aviation*	*2.23 –domestic and international aviation combined*

Figure 51 ***High level assessment of the potential of walking and cycling to deliver carbon targets[54].***

The large scale of potential impact is in line with a recent study which found that even in European cities with high existing modal share for walking and cycling, increases in active travel resulted in large carbon reductions[55]. The study found an average person cycling 1 trip/day more and driving 1 trip/day less for 200 days a year would decrease mobility-related lifecycle CO2 emissions by about 0.5 tonnes over a year. As a quick per capita estimate for Scotland, this would equate to a 2.7 MtCO2e reduction. Taken together, this quick high level assessment and life cycle study suggest that **the role of walking and cycling, particularly together with public transport, is far more significant in delivering carbon reduction targets than currently reflected in national policy**.

There are a wide range of values for the carbon break-even point of electric vehicles. An independent study which includes full life cycle assessment and real-world values found that the carbon break-even point is over 180,000 kilometres (112,500 miles)[56] – this is not a slashing of carbon or environmental damage as frequently promised in electric car advertising, In addition to the large health and environmental disbenefits, the assumption of transition from a fossil fuel cars to electric cars has a large cost implication for private households. **To replace the current car stock in Scotland with electric cars will cost householders estimated £70 billion to £96 billion[57], placing huge additional pressure on the cost of living in Scotland over the next two decades.**

[54] Own calculations based on a bespoke cut of the Scottish Household Survey (2021) *Miles travelled per person per year by distance travelled and main mode of travel, 2019.*
[55] Brand et al. (2021) The climate change mitigation impacts of active travel: Evidence from a longitudinal panel study in seven European cities. Global Environmental Change, 67. https://doi.org/10.1016/j.gloenvcha.2021.102224
[56] Helmers et al. (2020) Sensitivity Analysis in the Life-Cycle Assessment of Electric vs. Combustion Engine Cars under Approximate Real-World Conditions. *Sustainability* 12, 1241; doi:10.3390/su12031241
[57] Based on replacing 2.5 million cars at an electric car price point ranging from £28,000 to £38,000.

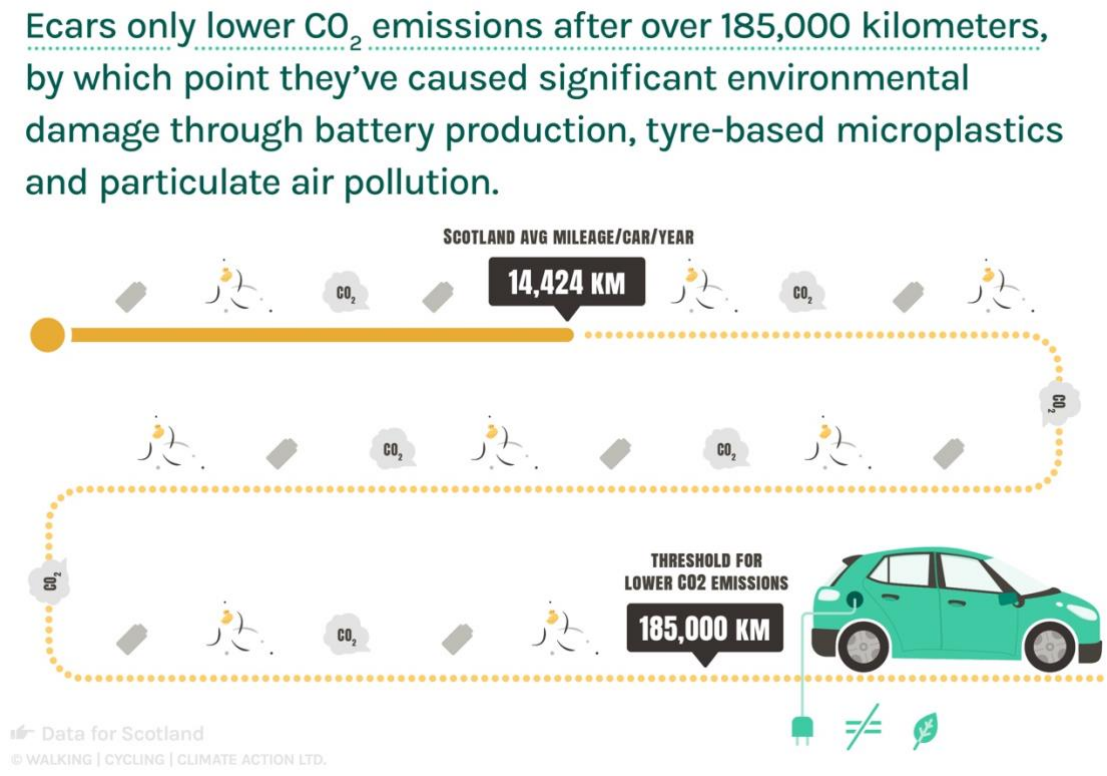

Figure 52 ***A like-for-like replacement of cars with ecars needs careful consideration..***

12 Supporting Information

12.1 Scottish Household Survey

Table 15: [Travel to school] School children in full-time education, usual method of travel, 2019								
	Walking	Car or van	Bicycle	School bus*	Service bus	Rail (inc. Glas U/g)	All other modes	*Sample size (=100%)*
	row %							
All people	51.8	25.1	1.9	14.3	5	0.3	1.7	*1,920*
by gender:								
Man/Boy	50	25	3	14	5	0	2	*980*
Woman/Girl	54	25	1	14	5	0	1	*940*
Identified in another way	**	**	**	**	**	**	**	-
Refused	**	**	**	**	**	**	**	-
by age:								
age 4-5	57	33	3	5	1	0	2	*170*
age 6-7	58	33	0	4	2	0	2	*330*
age 8-9	55	32	3	9	2	0	0	*330*
age 10-11	65	18	3	9	2	0	2	*290*
All 4-11	59	29	2	7	2	0	2	*1,130*
age 12-13	41	19	3	23	12	0	2	*300*
age 14-15	43	19	1	27	9	1	1	*320*
age 16-18	42	25	0	24	7	1	2	*180*
All 12-18	42	20	1	25	10	0	2	*790*
by annual net household income:								
Up to £15,000	66	14	1	9	7	0	3	*140*
£15,000 - £20,000	54	17	1	18	7	0	2	*180*
£20,000 - £25,000	63	14	1	13	6	0	2	*200*
£25,000 - £30,000	52	24	1	16	6	0	1	*190*
£30,000 - £40,000	44	31	2	16	5	1	2	*380*
£40,000 - £50,000	48	28	3	16	3	0	2	*310*
over £50,000 p.a.	51	30	2	13	4	0	1	*490*
by Scottish Index of Multiple Deprivation:								
1 - Most Deprived	63	19	1	9	7	0	2	*380*
2	55	25	1	12	4	0	2	*360*
3	48	24	1	23	3	0	1	*390*
4	41	33	2	18	4	0	2	*400*
5 - Least Deprived	51	26	4	11	7	0	1	*390*
by urban/rural:								
Large urban areas	54	26	2	6	10	0	2	*550*
Other urban	60	24	2	11	3	0	1	*690*
Accessible small towns	55	20	1	19	1	0	3	*170*
Remote small towns	68	26	4	0	0	1	1	*100*
Accessible rural	29	27	2	32	5	0	4	*220*
Remote rural	27	27	1	41	2	1	0	*180*
by number of cars:								
None	74	5	1	7	10	0	3	*290*
One	56	24	1	12	5	0	1	*700*
Two +	41	32	3	18	3	0	2	*930*
Household type								
Single parent	62	18	2	10	6	0	2	*400*
Small family	49	28	2	15	4	0	1	*900*
Large family	50	26	2	15	5	0	2	*500*
Large adult	39	25	0	29	4	1	2	*90*

Differences of particular interest marked in yellow.

12.2 Summary of Implications for Practice

The following starting points have been identified as potential impact pathways to explore embedding better delivery of walking and cycling for children and young people in everyday transport practice and policy:

Data

1) *Disaggregate results for primary and secondary aged children.*
2) *Collect walking data as part of annual average daily flow statistics.*
3) *Collect walking data as a standard part of traffic surveys.*
4) *Include walking and cycling in traffic models, including for new developments.*
5) *Report walking data as part of National Transport Statistics.*
6) *Include cycling parking data as part of parking management strategies.*
7) *Review Scot-Tag for the full potential of carbon reduction through walking and cycling, using real world value for cars and ecars.*
8) *Explore how data for children and young people can be meaningfully disaggregated for gender, deprivation, BAME and Disability.*
9) *Report KSIs per mile walked or cycled for children and young people.*
10) *Collect near-miss data.*
11) *Collect PM2.5 and NO_x data at schools with Real Time Information.*

Innovation & Practice

1) *Include a focus on secondary aged children, and young people < 24 years.*
2) *Good walking infrastructure is important to enable younger children to scoot, wheel and cycle to school, while maintaining quality for older people.*
3) *Delivery of cycling infrastructure needs to cater for children's needs specifically.*
4) *Uptake of ecycling underlines the importance of segregation between walking and cycling, particularly for children and older people.*
5) *Treat inclusive design standards as the national standard.*
6) *Dimension cycle facilities for in-lane speed differential so that children can be overtaken.*
7) *Establish an allowance for safe, secure cycle parking per inhabitant or building occupant.*
8) *Allocate 20% of cycle parking for inclusive cycle types and prioritise an additional 10% of cycle parking as dedicated blue-badge inclusive cycle parking.*
9) *Combine near-misses, sexual harassment, and feelings of safety walking and cycling alone in a single reporting app which can also be used by children.*
10) *"Activating" the school bus may be relevant for children in more rural areas.*
11) *Update/prescribe a bundle of key signs related to child road safety.*
12) *Consider the natural legibility of signs for vehicle users and children and young people.*
13) *Set a national standard for continuous level side junctions in both a raised level and also a less expensive road markings specification.*
14) *Review whether the yield on non-prescribed zebra crossings becomes mandatory.*
15) *Ensure assets for ecycles, escooters and ecars are placed in the carriageway.*
16) *Prioritise delivery of segregated walking and cycling infrastructure which meets the needs of children and young people.*
17) *Where segregated tracks are not viable, explore transformational road space approaches such as laid out in the **Innovation Toolbox.***

18) *Include children from age 11, and young people < 24 years in interim road safety targets.*
19) *Consider issuing health warnings and traffic exclusions during 24-hour $PM_{2.5}$ peaks.*
20) *Establish active green corridors to schools e.g. using cycle priority approaches to reduce child air pollution exposure and increase exposure to nature during the school journey.*
21) *Consider road cleaning programmes using high grade particulate filters.*

Legislation

1) *Clarify key legislation related to 24/7, and time-based Play Streets.*
2) *Clarify key legislation related to Playing Out, advertising and Chapter 8 training.*
3) *Review legislative framework to embed resulting innovations.*
4) *Adopt the new WHO standards for 24-hour mean air pollution peaks.*

Communication

1) *Use the Child MPH to launch a national conversation.*
2) *Explore use of Child MPH to communicate to vehicle drivers their duty of care towards children and young people in the road environment, as part of a safe systems approach.*
3) *Translate PM2.5s into equivalent cigarettes for public communication.*
4) *Use the Child MPH to frame engagement around caring systems.*
5) *Develop a Child MPH engagement safety and wellbeing protocol – after all, children use social media too and should be free to engage in transport projects.*