

Behaviour change interventions to encourage uptake of e-bike shared mobility in Cornwall

CAST report for Cornwall Council



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About CAST

Led by the University of Bath, the UK Centre for Climate Change and Social Transformations (CAST) is a collaboration between Bath, Cardiff, Manchester, York, and East Anglia universities, and the charity Climate Outreach. The Centre aims to be a global hub for understanding the profound changes required to address climate change. We research and develop the social transformations needed to produce a low-carbon and sustainable society. Our experts include psychologists, sociologists, political scientists, engineers and organisational specialists working across multiple scales (individual, community, organisational, city-region, national and global) to identify and experiment with various routes to achieving lasting change. CAST is funded by the Economic and Social Research Council (ESRC). For further details on CAST see: <https://cast.ac.uk/>

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Prosser, A., et al. (2022). Developing an evidence-based toolkit for car reduction.

[CAST Report on Pen Portraits Project Main report web.pdf \(dropbox.com\)](#)

Summary

Cornwall Council is working with researchers from the Centre for Climate Change and Social Transformations ([CAST](#)) to develop recommendations for encouraging low-carbon behaviours among residents and Council employees, including the uptake of active travel (i.e., walking, wheeling, or cycling). This report presents the findings of a study which trialled two behaviour change interventions to encourage people to use active modes; 151 residents and 14 Council staff took part. The two interventions were: 1) free [Beryl bikes](#) credits for one month, so people gain experience of using the e-bike share scheme on a trial basis, and 2) the 'Pen portraits' visioning tool, which uses evidence-based narratives to motivate people to consider how they could reduce car use in their daily lives. The study also explored participants' views on active travel, the benefits of using Beryl bikes, and various policies which could reduce travel-related carbon emissions.

During the study, uptake of Beryl bikes increased from 7% to 31% for residents, and from 29% to 71% for Council staff. Commuting and leisure or exercise were the most common journey purposes, although the bikes were also used as a component of multimodal travel. Beryl bikes encouraged mode shift for short journeys (1 – 2 miles), with 28% of Beryl bike journeys substituting private car use, resulting in estimated carbon emission savings of 96 – 626 g CO₂ per journey. Despite these positive findings, the interventions had only partial success in motivating mode shift. Relative to the control group, more people in each of the three intervention groups used a Beryl bike (Control group = 21% of residents used Beryl, compared to: the visioning tool = 31%; Beryl bike credits = 37%; and Beryl bike credits plus the visioning tool = 36%). However, these differences are not statistically significant.

Participants reported strong agreement that Beryl bikes provide a range of practical benefits such as reduced concern around bike maintenance and theft, and avoiding traffic congestion and parking difficulties. They also considered co-benefits to be important, for example reducing carbon footprint, providing exercise, and improving mental health. Encouragingly, Beryl bikes were effective at re-engaging non-cyclists; hiring a bike encouraged one in three residents to try cycling again after a break. However, some people experienced barriers to using Beryl bikes, notably cost, unavailability of bikes in the parking bays, and road safety concerns.

In terms of interest in changing travel behaviours, a high proportion of residents (61%) and Council staff (79%) would like to reduce their car use. There is keen interest in owning an e-bike; one in six residents already owns an e-bike, and one in five is considering buying one in the next 12 months. Some individuals are less confident in their cycling ability, including older people, women, and those with a longstanding health condition, and so initiatives to encourage active travel should ensure mode shift options are available that are feasible and accessible.

Our findings indicate strong public support for travel policies that reduce carbon emissions but also improve the health and wellbeing of people in Cornwall, such as 20 mph speed limits and Low Traffic Neighbourhoods. There is moderate support for the introduction of a Workplace Parking Levy, whereby employers who provide workplace car parking pay a fee, which is then invested in improving public transport and active travel infrastructure. Public transport that is affordable, frequent, and reliable, and increasing the network of cycle paths and footpaths are key priorities for the participants.

Recommendations include supporting mode shift for commuting by increasing Beryl bike availability near workplaces and public transport hubs, and working with employers to develop travel plans. Public consultation could explore the potential for 'test and learn' pilots of the policies presented above.

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1 Introduction and methods

As part of their broader activities directed at achieving net zero, Cornwall Council commissioned the Centre for Climate Change and Social Transformations (CAST) to help them develop recommendations for encouraging low-carbon behaviours. This project focuses on motivating behaviour change among Cornwall residents and it runs in parallel with ongoing work to embed carbon-neutral thinking and behaviours across the Council's workforce¹. The core aims of this project are to identify areas for intervention and engagement with residents, and to provide an evidence base to support the Council's climate policies and service delivery.

There are three components of this mixed-method study. Previous components comprise: 1) quantitative and qualitative insights from an online survey of Cornwall residents to understand their perceptions of climate change and their willingness to adopt low-carbon behaviours², and 2) in-depth qualitative findings from focus groups which explored residents' travel behaviours and their views on modal shift options. The third component is a targeted intervention to encourage low-carbon travel behaviour among residents and Council staff (this report). These research activities were co-designed with members of Cornwall Council's Carbon Neutral Cornwall team, the Wellbeing and Public Health team, and Connectivity and Transport Policy team.

This intervention study explored ways to encourage the uptake of [Beryl bikes](#), an e-bike shared mobility scheme operating in Cornwall and other locations in the UK. Beryl bikes were rolled out in Falmouth and Penryn in September 2022, Penzance in December 2022, and Truro, Newquay, and St Austell in March 2023. The Council's aim for the scheme is "supporting residents to make more healthy and sustainable choices about how they travel", particularly for shorter journeys where mode shift is more feasible, and for frequent journeys such as commuting³.

¹ See previous CAST reports on engagement with Council staff:

1) Whitmarsh, L., et al. (2021). Cornwall Council Behaviour Change & Engagement Programme - Phase 1 Report to Cornwall Council.

2) Player, L., et al. (2022). Exploring Green Travel in Cornwall - Focus Group Findings.

3) Toy, S., et al. (2023). *CAST Briefing 18*, [Motivating low-carbon behaviours in the workforce – Insights from Cornwall Council](#).

² See previous CAST report on engagement with residents in Cornwall:

Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#). CAST report for Cornwall Council.

³ Council news, 22nd February 2023: [Cornwall's e-bikers rack up the miles as cycle share scheme expands to Penzance - Cornwall Council](#)

1.1 Research objectives

The research objectives were therefore:

1. To trial two interventions for encouraging the uptake of Beryl bikes and other forms of active travel in Cornwall (see section 8)
2. To understand public perceptions of Beryl bikes, as well as barriers to adoption (see sections 2, 4 and 6)
3. To understand the nature and context of Beryl bike use - journey frequency, distance, purpose, and multimodal travel (see section 5.1)
4. To identify whether mode shift has occurred and, if so, to estimate the carbon emission reduction from using Beryl bikes (see section 5.2)
5. To evaluate users' satisfaction with Beryl bikes (see section 5.3)
6. To understand public opinion on Council policies for reducing travel-related carbon emissions (see section 9)

1.2 Existing research on the uptake of e-bike shared mobility

A review of the academic literature on e-bikes and bike share schemes revealed four main themes, one of which is the attributes which motivate adoption. Some authors highlight cost savings and convenience relative to using a car, a desire for physical exercise, and reduced concern around bike theft as key motivations⁴. Perceived ease of use, perceived usefulness, and the positive opinions of others also encourages uptake⁵. Other key factors include a high population density and the proximity of parking bays to public transport hubs, sports centres, and bike trails⁶. The assisted power to cycle up steep hills, travel longer distances⁷, and overcome health difficulties or low fitness levels is important for some users, which suggests e-bike share may play a role in making active travel more inclusive⁸. Investigating

⁴ 1) Teixeira, J. F., et al. (2023). Factors influencing modal shift to bike sharing: Evidence from a travel survey conducted during COVID-19. *Journal of Transport Geography*, 111, 103651, <https://doi.org/10.1016/j.jtrangeo.2023.103651>.

2) Bartling, H. (2023). Bike share and user motivation: exploring trip substitution choices among bike share users in a North American city. *International Journal of Sustainable Transportation*, 17:8, 845-854, [10.1080/15568318.2022.2113577](https://doi.org/10.1080/15568318.2022.2113577).

3) CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://www.como.org.uk/document/bike-share-annual-report-uk-2022).

⁵ Li, R., et al. (2022). The Factors Influencing Resident's Intentions on E-Bike Sharing Usage in China. *Sustainability*, 14(9): 5013, <https://doi.org/10.3390/su14095013>.

⁶ He, Y., et al. (2019). Factors Influencing Electric Bike Share Ridership: Analysis of Park City, Utah. *Transportation Research Record*, 2673(5), 12-22. <https://doi.org/10.1177/0361198119838981>.

⁷ 1) Julio, R., & Monzon, A. (2022). Long term assessment of a successful e-bike-sharing system. Key drivers and impact on travel behaviour. *Case Studies on Transport Policy*, 10(2), 1299-1313, <https://doi.org/10.1016/j.cstp.2022.04.019>.

2) Bieliński, T., et al. (2021). Electric bike-sharing services mode substitution for driving, public transit, and cycling. *Transportation Research Part D: Transport and Environment*, 96, 102883, <https://doi.org/10.1016/j.trd.2021.102883>.

⁸ CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://www.como.org.uk/document/bike-share-annual-report-uk-2022).

user profiles, students are typical early adopters but e-bike share is increasingly used by educated middle-aged workers⁹. E-bike share schemes encourage active travel among people aged 55 years or older¹⁰. Men are more likely to use bike share than women¹¹, although e-bike sharing motivates women to make trips who would otherwise use a car¹². Some authors find road safety concerns and inconvenience are important barriers to adoption¹³.

A second important theme is the purpose of e-bike share journeys and identifying mode shift opportunities. One study finds a large proportion of dockless e-bike trips are for commuting and that the availability of the e-bikes and public transport services are key determinants of demand. The distances travelled by e-bike are comparable with the distances for public transport and taxi journeys¹⁴. Another study found awareness of e-bike share does not necessarily influence commuting behaviour¹⁵. In terms of mode shift, one study finds e-bike sharing primarily substitutes public transport rather than car, and e-bikes are often used for the first or last mile of journeys¹⁶. In contrast, two studies identify high car substitution rates of 37%¹⁷ and 28%¹⁸. Some authors find mode shift varies depending on the journey distance or purpose; for trips of less than one mile, shared e-bike is more likely to

⁹ Julio, R., & Monzon, A. (2022). Long term assessment of a successful e-bike-sharing system. Key drivers and impact on travel behaviour. *Case Studies on Transport Policy*, 10(2), 1299-1313, <https://doi.org/10.1016/j.cstp.2022.04.019>.

¹⁰ Fukushige, T., et al. (2021). Factors influencing dock-less E-bike-share mode substitution: Evidence from Sacramento, California. *Transportation Research Part D: Transport and Environment*, 99, 102990, <https://doi.org/10.1016/j.trd.2021.102990>.

¹¹ 1) Barbour, N., et al. (2019). A statistical analysis of bike sharing usage and its potential as an auto-trip substitute. *Journal of Transport & Health*, 12, 253-262, <https://doi.org/10.1016/j.jth.2019.02.004>.

2) CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://www.como.org.uk).

¹² Fukushige, T., et al. (2021). Factors influencing dock-less E-bike-share mode substitution: Evidence from Sacramento, California. *Transportation Research Part D: Transport and Environment*, 99, 102990, <https://doi.org/10.1016/j.trd.2021.102990>.

¹³ Fishman, E., et al. (2014). Barriers to bikesharing: an analysis from Melbourne and Brisbane. *Journal of Transport Geography*, 41, 325-337. <https://doi.org/10.1016/j.jtrangeo.2014.08.005>.

¹⁴ Guidon, S., et al. (2019). Electric Bicycle-Sharing: A New Competitor in the Urban Transportation Market? An Empirical Analysis of Transaction Data. *Transportation Research Record*, 2673(4), 15-26. <https://doi.org/10.1177/0361198119836762>.

¹⁵ Handy, S. L., & Fitch, D. T. (2022). Can an e-bike share system increase awareness and consideration of e-bikes as a commute mode? Results from a natural experiment. *International Journal of Sustainable Transportation*, 16:1, 34-44, [10.1080/15568318.2020.1847370](https://doi.org/10.1080/15568318.2020.1847370).

¹⁶ Bieliński, T., et al. (2021). Electric bike-sharing services mode substitution for driving, public transit, and cycling. *Transportation Research Part D: Transport and Environment*, 96, 102883, <https://doi.org/10.1016/j.trd.2021.102883>.

¹⁷ CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://www.como.org.uk).

¹⁸ Fukushige, T., et al. (2023). Estimating Vehicle-miles traveled reduced from Dock-less E-bike-share: Evidence from Sacramento, California. *Transportation Research Part D: Transport and Environment*, 117, 103671, <https://doi.org/10.1016/j.trd.2023.103671>.

substitute walking, whereas for longer journeys or non-commute trips, shared e-bike is more likely to substitute car use¹⁹.

A third key theme is the quantification of potential emission reduction due to mode shift. Several studies find significant emission savings from using personal bikes²⁰ or e-bikes²¹, relative to other travel modes. Other authors focus specifically on e-bike share and find emission reduction of up to 75%²², or 108-120 g CO₂ km²³.

Finally, a limited number of studies trialled interventions to encourage mode shift and their findings are promising. The loan of an e-bike for two weeks resulted in participants' habitual association with car use weakening significantly, both for participants who bought an e-bike after the trial and those who did not²⁴. A similar study found car use for commuting decreased from 88% before the pilot (a e-bike loan for eight weeks), to 63% three months after the pilot. E-bike use increased from 2% to 18% in the same time period²⁵. A third study found the loan of an e-bike for 2 - 4 weeks is unlikely to influence those who regularly cycle using a conventional bike, but it is effective at shifting people away from motorised transport²⁶.

¹⁹ Fukushima, T., et al. (2021). Factors influencing dock-less E-bike-share mode substitution: Evidence from Sacramento, California. *Transportation Research Part D: Transport and Environment*, 99, 102990, <https://doi.org/10.1016/j.trd.2021.102990>.

²⁰ Brand, C., et al. (2021). The climate change mitigation effects of daily active travel in cities. *Transportation Research Part D: Transport and Environment*, 93, 102764, <https://doi.org/10.1016/j.trd.2021.102764>.

²¹ 1) Stot, S. (2020). [How green is cycling? Riding, walking, ebikes and driving ranked - BikeRadar](https://www.bikeradar.com/news/how-green-is-cycling-riding-walking-ebikes-and-driving-ranked).

2) Philips, I., et al. (2022). E-bikes and their capability to reduce car CO₂ emissions. *Transport Policy*, 116, 11-23, <https://doi.org/10.1016/j.tranpol.2021.11.019>.

3) McQueen, M., et al. (2020). The E-Bike Potential: Estimating regional e-bike impacts on greenhouse gas emissions. *Transportation Research Part D: Transport and Environment*, 87, 102482, <https://doi.org/10.1016/j.trd.2020.102482>.

4) Brand, C., et al. (2022). Chapter Eleven - Cycling, climate change and air pollution. In: E. Heinen & T. Götschi (eds.), *Advances in Transport Policy and Planning*. Academic Press, 10, 235-264, <https://doi.org/10.1016/bs.atpp.2022.04.010>

5) Winslott Hiselius, L., & Svensson, Å. (2017). E-bike use in Sweden – CO₂ effects due to modal change and municipal promotion strategies. *Journal of Cleaner Production*, 141, 818-824, <https://doi.org/10.1016/j.jclepro.2016.09.141>.

6) Bucher, D., et al. (2019). Energy and greenhouse gas emission reduction potentials resulting from different commuter electric bicycle adoption scenarios in Switzerland. *Renewable and Sustainable Energy Reviews*, 114, 109298, <https://doi.org/10.1016/j.rser.2019.109298>.

²² Zhou, Y., et al. (2023). Mode substitution and carbon emission impacts of electric bike sharing systems. *Sustainable Cities and Society*, 89, 104312, <https://doi.org/10.1016/j.scs.2022.104312>.

²³ Li, Q., et al. (2023). Do shared E-bikes reduce urban carbon emissions? *Journal of Transport Geography*, 112, 103697, <https://doi.org/10.1016/j.jtrangeo.2023.103697>.

²⁴ Moser, C., et al. (2018). [E-bike trials' potential to promote sustained changes in car owners mobility habits - IOPscience](https://doi.org/10.1016/j.envresl.2018.04.025). *Environmental Research Letters*, 13(4), 044025.

²⁵ Ton, D., & Duives, D. (2021). Understanding long-term changes in commuter mode use of a pilot featuring free e-bike trials. *Transport Policy*, 105, 134-144, <https://doi.org/10.1016/j.tranpol.2021.03.010>.

²⁶ Fyhri, A., et al. (2017). A push to cycling - exploring the e-bike's role in overcoming barriers to bicycle use with a survey and an intervention study. *International Journal of Sustainable Transportation*, 11, 681-695, <https://doi.org/10.1080/15568318.2017.1302526>.

As a general observation, there is extensive literature on the attributes which motivate buying an e-bike, the characteristics of e-bike owners, and the potential health benefits²⁷. The literature on (conventional) bike share schemes is also comprehensive and focuses on user segments, journey purposes, and the potential for mode shift²⁸. The literature on e-bike shared mobility is emerging and the only previous studies in the UK context are a case study by Devon County Council²⁹ and an annual survey conducted by the charity Collaborative Mobility UK (CoMoUK)³⁰. The most recent CoMoUK survey presents findings from 2,824 e-bike and bike share users and is a very useful reference for perceptions of e-bike share and how it is used. The CoMoUK survey differs from this study in three key ways: 1) CoMoUK presents findings for bike share and e-bike share combined, whereas this study focuses on e-bike share; 2) the CoMoUK study comprises data primarily from bike share schemes in large UK cities, whereas this study focuses on towns in Cornwall which have much smaller populations; and 3) the CoMoUK survey is not an intervention study.

1.3 Study design

Two interventions were trialled in this study to investigate their impact on the travel behaviours and perceptions of residents and Council staff. The two interventions were:

1. **Free Beryl bike credits for one month.** This intervention removes cost as an initial barrier and gives people direct experience of using Beryl bikes on a trial basis.
2. The **'Pen portraits' visioning tool**³¹, adapted for the Cornish context. This visioning tool presents stories of six evidence-based characters who have successfully reduced their car use and the study participants select the character they most identify with. The intervention encourages people to consider how they could reduce car use in

²⁷ For example: 1) Jones, T., et al., (2016). Motives, perceptions and experiences of electric bicycle owners and implications for health, wellbeing and mobility. *Journal of Transport Geography*, 53, 41-49, <https://doi.org/10.1016/j.jtrangeo.2016.04.006>.

2) de Haas, M., et al. (2022) E-bike user groups and substitution effects: evidence from longitudinal travel data in the Netherlands. *Transportation*, 49, 815-840, <https://doi.org/10.1007/s11116-021-10195-3>

²⁸ For example: 1) Winters, M., et al. (2019). Who are the 'super-users' of public bike share? An analysis of public bike share members in Vancouver, BC. *Preventive Medicine Reports*, 15, 100946, <https://doi.org/10.1016/j.pmedr.2019.100946>.

2) Biehl, A., et al. (2019). Utilizing multi-stage behavior change theory to model the process of bike share adoption. *Transport Policy*, 77, 30-45, <https://doi.org/10.1016/j.tranpol.2019.02.001>.

²⁹ Thomas, A., & Devon County Council, 2019. Lessons learnt from the first fully electric bike share scheme in the UK – a case study of Exeter's co-bikes. [Alex Thomas TPM 2019 Best Paper- Lessons learnt from the first fully electric bike share scheme in the UK.pdf \(tps.org.uk\)](#)

³⁰ CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](#)

³¹ Prosser, A., et al. (2022). Developing an evidence-based toolkit for car reduction. [CAST Report on Pen Portraits Project Main report web.pdf \(dropbox.com\)](#). This toolkit was developed in collaboration with the Scottish Government and [Climate Outreach](#) to understand and develop evidence-based messages to build awareness of and engage with some key audiences around visions of transitions to lower-carbon transport lifestyles in Scotland.

their daily lives and highlights potential co-benefits and positive lifestyle outcomes. The visioning tool can be found in appendix 11.1.

Residents were randomly allocated to one of four interventions groups, shown in Table 1. Council employees who registered for a promotion to receive free Beryl bike credits were invited to participate in this study and so they parallel intervention group C. The quantitative findings for residents and Council staff are presented separately in this report to inform the Council’s Green Travel Plan for staff, although the qualitative findings have been merged in the interests of brevity.

Table 1, Study design - the four intervention groups

	Visioning tool: NO	Visioning tool: YES
e-bike credits: NO	A. control group – no intervention (n = 44)*	B. visioning tool only (n = 36)
e-bike credits: YES	C. e-bike credits only (n = 38) Parallel study with Council staff (n = 14)	D. e-bike credits + visioning tool (n = 33)

* 50 residents were allocated to each intervention group in the pre-intervention survey. The ‘n’ shown above indicates the number of residents in each intervention group that completed the study³².

The study participants were asked to complete a series of data collection activities:

1. A **pre-intervention survey** to measure current travel behaviours, perceptions of active travel and Beryl bikes, views on Council policy, and sociodemographic characteristics (Appendix 11.1)
2. A **weekly travel diary** for four weeks to measure Beryl bike journey frequency, distance, purpose, and mode shift (Appendix 11.2)
3. A **post-intervention survey** to measure any changes in perceptions or travel behaviours, and users’ satisfaction with Beryl bikes (Appendix 11.3)

These data collection tools were developed by adapting questions from existing bike share studies. Where precedent questions were unavailable, bespoke questions were designed to explore particular themes of interest. Aggregated, anonymised travel data from Beryl bikes provided further insights on journey frequency and distance.

³² The sample sizes were diminished by a relatively high drop-out rate, which is an inherent risk when conducting longitudinal studies. Of the 198 residents who started the study, 151 completed all of the activities, which is a drop-out rate of 23.7%. Of the 27 Council staff who started the study, 14 completed it, which is a drop-out rate of 48.1%.

1.4 Study participants

The data collection tools were designed and tested in April 2023, and the pre-intervention survey was launched to residents on 15th May 2023. It was promoted via several Council communication channels such as the Council website and resident newsletters. Participation was incentivised through a £25 gift voucher for each resident who completed the study. Council staff were recruited on a rolling basis through Beryl communication channels when they registered for the Council's promotion of free Beryl bike credits. Staff participation was incentivised through entry into a prize draw (4 x £50 gift vouchers). The study was closed after ten weeks on 31st July 2023. Following a process of data cleaning and quality checks, 151 residents and 14 Council staff were included in the final dataset. Analysis was conducted on completed responses – participants that completed the pre-intervention and post-intervention surveys, as well as the four weekly travel diaries.

The resident sample is predominantly female (59.6%), 37.1% are male and 2.0% are non-binary. The Council staff sample is similar; 57.1% are female, 35.7% are male, and 7.1% are non-binary. The youngest resident participant in the study is 16 years old, the oldest is 76 years old, and the mean age is 46.5 years. The youngest Council staff participant is 30 years old, the oldest is 59 years old, and the mean age is 41.1 years. Most people identified their ethnicity as 'White British/White Cornish' (91.4% residents; 100% Council staff). One in six residents (16.6%) and one in seven Council staff (14.3%) stated they have a long-standing illness, injury or disability that limits their normal day-to-day activities. Table 2 shows the level of education for the sample. Most residents (62.3%) and Council staff (71.5%) have an undergraduate degree or higher.

Table 2, Highest level of education achieved so far

Level of education	Residents (n = 151)		Council staff (n = 14)	
	Frequency	%	Frequency	%
No formal qualifications	3	2.0	0	0.0
GCSE or O-level	15	9.9	2	14.3
A-level	16	10.6	1	7.1
Undergraduate degree (e.g., Bachelor's)	56	37.1	6	42.9
Postgraduate degree (e.g., Master's, PhD)	38	25.2	4	28.6
Vocational qualification	11	7.3	1	7.1
Other	5	3.3	0	0.0
Prefer not to say	7	4.6	0	0.0

Employment status is shown in Table 3. Most resident participants are employed (full or part time) or self-employed, although a sizeable proportion is retired (11.3%).

Table 3, Employment status

Employment status*	Residents (n = 151)		Council staff (n = 14)	
	Frequency	%	Frequency	%
Employed full time (30+ hrs/wk)	74	49.0	13	92.9
Employed part time (less than 30 hrs/wk)	27	17.9	1	7.1
Self-employed	15	9.9	0	0.0
Unemployed	1	0.7	0	0.0
Looking after home / family	7	4.6	0	0.0
Studying	4	2.6	0	0.0
Retired	17	11.3	0	0.0
Other	2	1.3	0	0.0
Prefer not to say	4	2.6	0	0.0

* Participants were asked: 'Which option best describes your employment status?', accepting that multiple options are possible for some individuals.

Data for household combined income reveals 19.9% of resident households earn £48,000 - £63,999 per year, whereas 42.9% of Council staff households earn £64,000 - £95,999 (Table 4). Almost one in four resident households (23.1%) earns less than £26,000 per year. The relatively large proportion of participants in the higher income brackets suggests this sample is not representative of Cornwall in terms of income.

Table 4, Household combined income (before tax deductions)

Income bracket	Residents (n = 151)		Council staff (n = 14)	
	Frequency	%	Frequency	%
Less than £6,000	4	2.6	0	0.0
£6,000 - £12,999	11	7.3	0	0.0
£13,000 - £18,999	10	6.6	0	0.0
£19,000 - £25,999	10	6.6	1	7.1
£26,000 - £31,999	13	8.6	2	14.3
£32,000 - £47,999	24	15.9	2	14.3
£48,000 - £63,999	30	19.9	1	7.1
£64,000 - £95,999	28	18.5	6	42.9
More than £96,000	6	4.0	2	14.3
Prefer not to say	15	9.9	0	0.0

In terms of household occupancy, 19.7% of residents live in single person households, 61.9% have two adults, and 18.4% have three or more adults living at home. One in three (35.4%) residents are families with children under 18 living at home and the mean household size is 2.75 people. For Council staff, 14.3% live in single person households, 78.6% have two adults, and 7.1% have three or more adults living at home. Most staff participants (69.2%) are families with children living at home and the mean household size is 3.38 people. For property size, 4.0% of residents live in one bedroom properties, 26.5% have two bedrooms, 43.0% have three bedrooms, and 26.5% have four or more bedrooms. For Council staff, 21.4% live in two bedroom properties, 35.7% have three bedrooms, and 42.9% have four or more bedrooms. Figure 1 shows the type of property the participants live in.

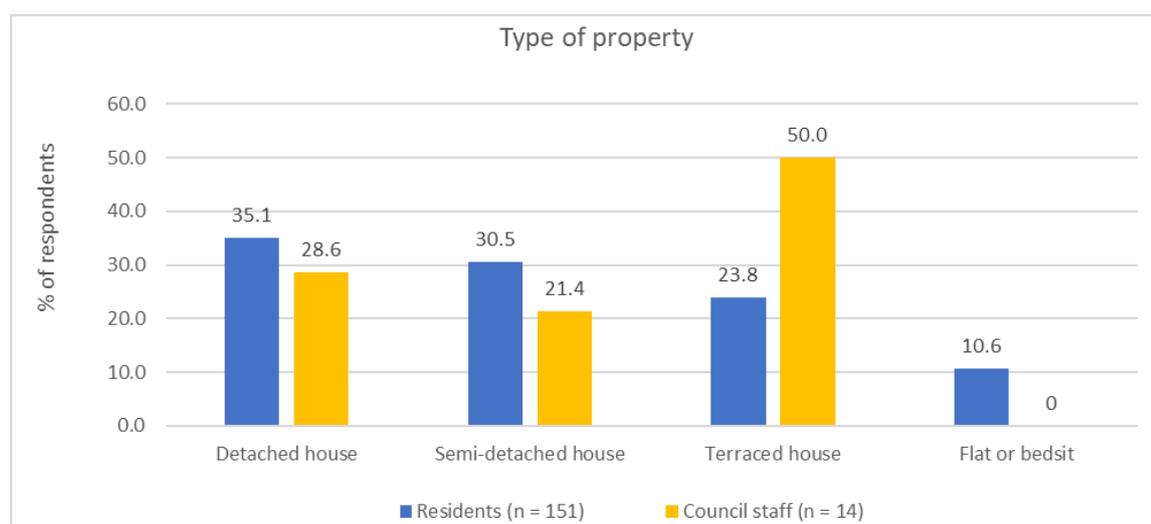


Figure 1, Type of property the participants live in

The location where someone lives can be an important factor in their choice of travel mode, as rural areas typically have more limited access to local amenities and public transport services, compared to urban areas. Table 5 shows a fairly even split between participants who live in rural areas (countryside, villages and small towns) and those who live in urban areas (large towns or city).

Table 5, Description of the area where participants live

	Residents (n = 151) (%)	Council staff (n = 14) (%)
Countryside or small village	21.2	7.1
Large village or small town	31.1	42.9
Suburbs of large town or city	32.5	42.9
Centre of large town or city	15.2	7.1

Table 6 shows most participants live in a postcode area where Beryl bikes are located. However, anyone aged 16 or over could take part in the study, provided they lived, worked or studied in one of the towns or city where Beryl bikes are available and would therefore have regular access to the bikes. Participants who work or study in Truro, Falmouth, Penryn, Newquay, St Austell or Penzance, but do not necessarily live there, account for the other postcode areas in Table 6. TR1 (Truro), TR7 (Newquay) and TR11 (Falmouth) are the postcode areas with the highest frequency of respondents.

Table 6, Participants' postcode areas

Postcode area	Residents (n = 151)		Council staff (n = 14)	
	Frequency	%	Frequency	%
PL24	2	1.3	0	0.0
PL25	14	9.3	1	7.1
PL26	6	4.0	0	0.0
PL27	1	0.7	0	0.0
PL31	1	0.7	0	0.0
TR1	39	25.8	5	35.7
TR2	5	3.3	0	0.0
TR3	5	3.3	0	0.0
TR4	5	3.3	0	0.0
TR5	1	0.7	1	7.1
TR7	17	11.3	4	28.6
TR8	6	4.0	0	0.0
TR10	10	6.6	1	7.1
TR11	17	11.3	1	7.1
TR14	2	1.3	0	0.0
TR15	1	0.7	0	0.0
TR16	1	0.7	0	0.0
TR18	12	7.9	0	0.0
TR19	2	1.3	0	0.0
TR20	1	0.7	0	0.0
TR27	3	2.0	1	7.1

Climate concern

Environmental values are another factor which can affect an individual's choice of travel mode. Participants were therefore asked about their level of concern about climate change and air pollution. A high proportion of residents (64.2%, represented in the blue bars in Figure 2) and Council staff (71.5%, represented in the yellow bars) stated they are very or extremely worried about climate change. This level of concern is similar to the results of

recent CAST surveys of residents³³ and Council staff³⁴, but notably higher than a national level study which found 46% of people are very or extremely worried³⁵.

Levels of concern about localised air pollution are much lower, with 35.7% of residents and 14.2% of Council staff stating they are very or extremely worried about this issue. This aligns with previous research that identified limited public awareness of air pollution and the health implications³⁶.

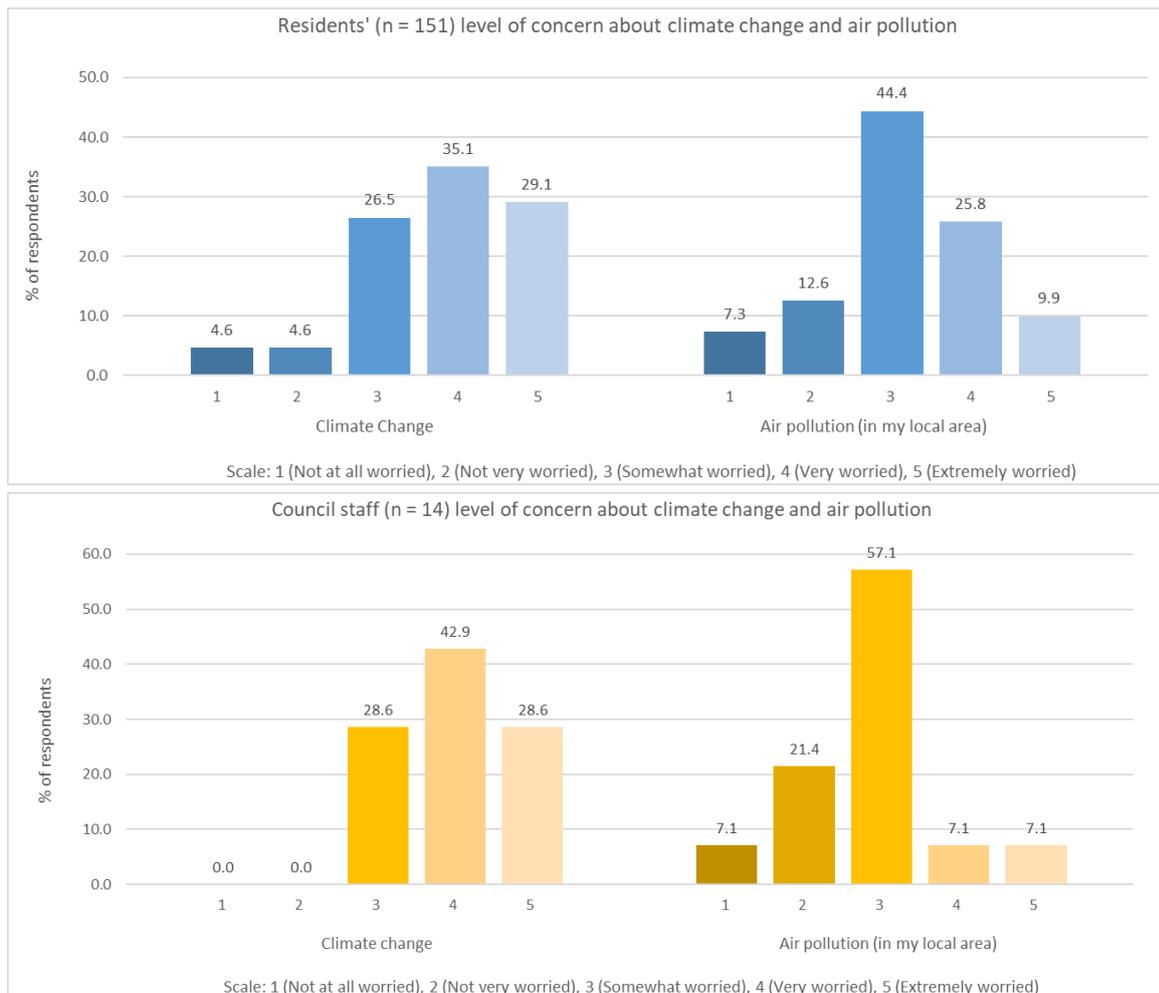


Figure 2, Participants' level of concern about climate change and localised air pollution

³³ Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#). CAST report for Cornwall Council.

³⁴ Whitmarsh, L., et al. (2021). Cornwall Council Behaviour Change & Engagement Programme Phase 1 - CAST survey of Council staff.

³⁵ Demski, C., et al. (2022). Public worry about climate change and energy security in the cost-of-living crisis. *CAST Briefing 17*, [CAST-Briefing-17.pdf](#).

³⁶ Kelly, F. J., & Fussell, J. C. (2015). Air pollution and public health: emerging hazards and improved understanding of risk. *Environmental Geochemistry and Health*, 37, 631–649. <https://doi.org/10.1007/s10653-015-9720-1>.

The majority of residents (80.7%) and Council staff (71.4%) believe addressing climate change requires a high or extremely high level of urgency (Figure 3). Again, this is similar to the levels observed in previous surveys of residents³³ and Council staff³⁴, but markedly higher than findings at the national level (55%)³⁷.

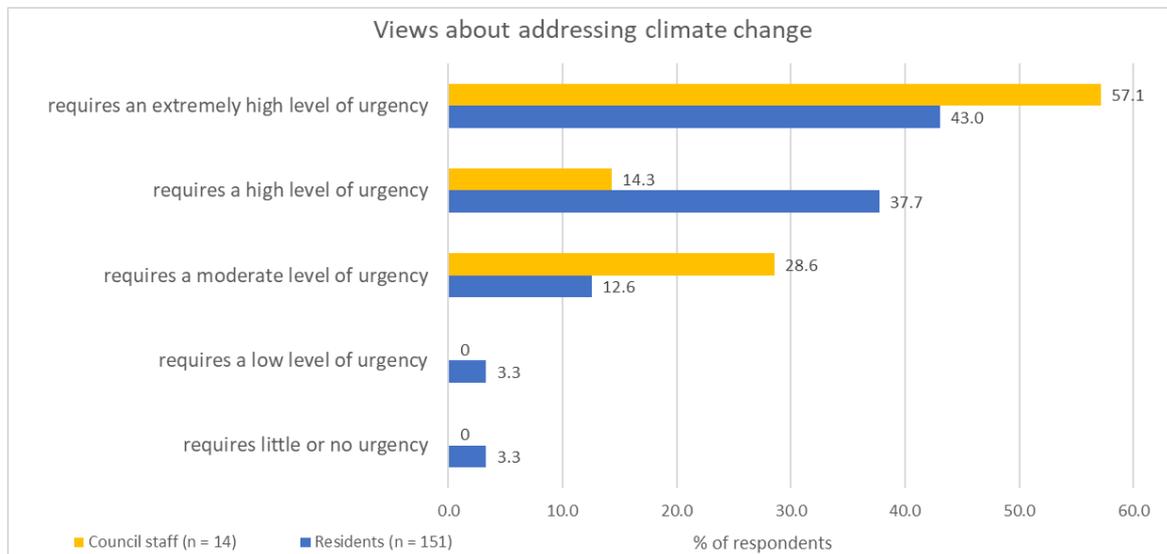


Figure 3, Participants' perceived level of urgency to address climate change

Statistical analysis

Much of the data presented in this report is based on descriptive statistics of the entire samples of residents and Council staff. The sociodemographic characteristics described in this section, together with the four intervention groups, form the basis of inferential statistical analysis. This is used to explore differences between sub-groups of the resident sample (e.g., perceptions of younger people vs older people) and to measure change within groups (e.g., altered travel behaviours of people in the four intervention groups over the study period). The statistical tests used were: independent-samples t-test, Welch t-test, paired samples t-test, Chi-square test, Fisher's exact test, and two-way mixed ANOVA. The sample size for Council staff is too small to conduct between-groups statistical analysis.

³⁷ Steenjes, K., et al. (2021). Public perceptions of climate change and policy action in the UK, China, Sweden and Brazil. *CAST Briefing 10*, [01112021-Briefing-10-final.pdf](https://www.cast.ac.uk/publications/01112021-Briefing-10-final.pdf) (cast.ac.uk).

2 Perceptions of mode shift to active travel

There are many factors which can influence travel behaviour for everyday journeys. These include personal factors such as vehicle ownership or cycling confidence, and contextual factors such as the availability of public transport services or active travel infrastructure. This section presents findings on the context of e-bike share adoption, including the perceived barriers to active travel.

Vehicle ownership

Car is the dominant mode of travel in Cornwall³⁸ and 3.39 billion vehicle miles were travelled on Cornish roads (excluding the Isles of Scilly) in 2022³⁹. Car ownership is therefore a key factor in understanding mode shift. Table 7 reveals the majority of residents in this study (86.1%) own a vehicle and almost half (48.3%) have two or more vehicles in their household. Similarly, most Council staff (92.9%) own a vehicle and over three quarters (76.9%) have two or more vehicles in their household. A minority of residents (13.9%) and Council staff (7.1%) do not own a vehicle.

Table 7, Participants' vehicle ownership

Sample group	Own or have regular access to a vehicle (%)	Own two or more vehicles in their household (%)	Own an electric vehicle (%)	Own a hybrid vehicle (%)	Member of a car-share scheme (%)	Do not own a vehicle (%)
Residents	86.1	48.3	5.3	4.6	1.3	13.9
Council staff	92.9	76.9	7.1	7.1	7.1	7.1

These samples of residents and Council employees have higher levels of vehicle ownership than the England average (78%), as well as higher levels of multiple vehicle households than the England average (33%)⁴⁰. This likely reflects a greater dependency on cars in rural areas. For residents, a higher proportion of car owners (32.3%) than non-car owners (19.0%) used a Beryl bike during this study, but the difference is not statistically significant (Fisher's exact test).

³⁸ Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#). CAST report for Cornwall Council.

³⁹ Department for Transport (2022). [Road traffic statistics - Local authority: Cornwall excluding Isles of Scilly \(dft.gov.uk\)](#).

⁴⁰ Department for Transport (2022). [National Travel Survey 2021: Household car availability and trends in car trips - GOV.UK \(www.gov.uk\)](#).

Participants' driving intentions

Participants were presented with the four statements in Table 8 and asked which statement best describes their current car driving. A relatively high proportion of residents (60.9%) and Council staff (78.6%) would like to reduce their vehicle use – a positive finding for encouraging mode shift away from private cars in Cornwall. Nevertheless, a sizeable minority (17.9%) of residents are not interested in reducing their vehicle use. Considering whether driving intentions might be relevant to the uptake of Beryl bikes, a higher proportion of residents who are interested in reducing their car use rode a Beryl bike during this study (38.0%) than those who are not interested in reducing their car use (22.2%). However, this difference is not statistically significant (Fisher's exact test).

Table 8, Participants' driving intentions

Driving intention	Residents (%)	Council staff (%)
I drive, and am not interested in reducing my car/van use	17.9	7.1
I drive, but would like to reduce my car/van use	60.9	78.6
I do not drive, but would like to start doing so	6.0	0.0
I do not drive, and have no interest in doing so	10.6	0.0
Don't know / None of the above	4.6	14.3

Commute distance

The choice of travel mode for commuting is likely affected by how far people have to travel. Participants were therefore asked about the distance to their place of work or study (Figure 4). Over two-thirds of residents in this study commute (70.9%) and some commute distances are very far, reflecting Cornwall's rural dispersed communities. However, 42.1% of residents that commute, and 33.3% of Council staff, travel three miles or less (indicated by the green bars in Figure 4). Encouraging a switch to active travel is, unsurprisingly, more feasible for people with shorter journeys, while taking road safety and individual ability into consideration. A higher proportion of residents with short commute distances (i.e., 3 miles or less; 35.7%) used a Beryl bike during this study than residents with longer commute distances (i.e., 4 miles or more; 30.0%). However, this difference is not statistically significant (Fisher's exact test).

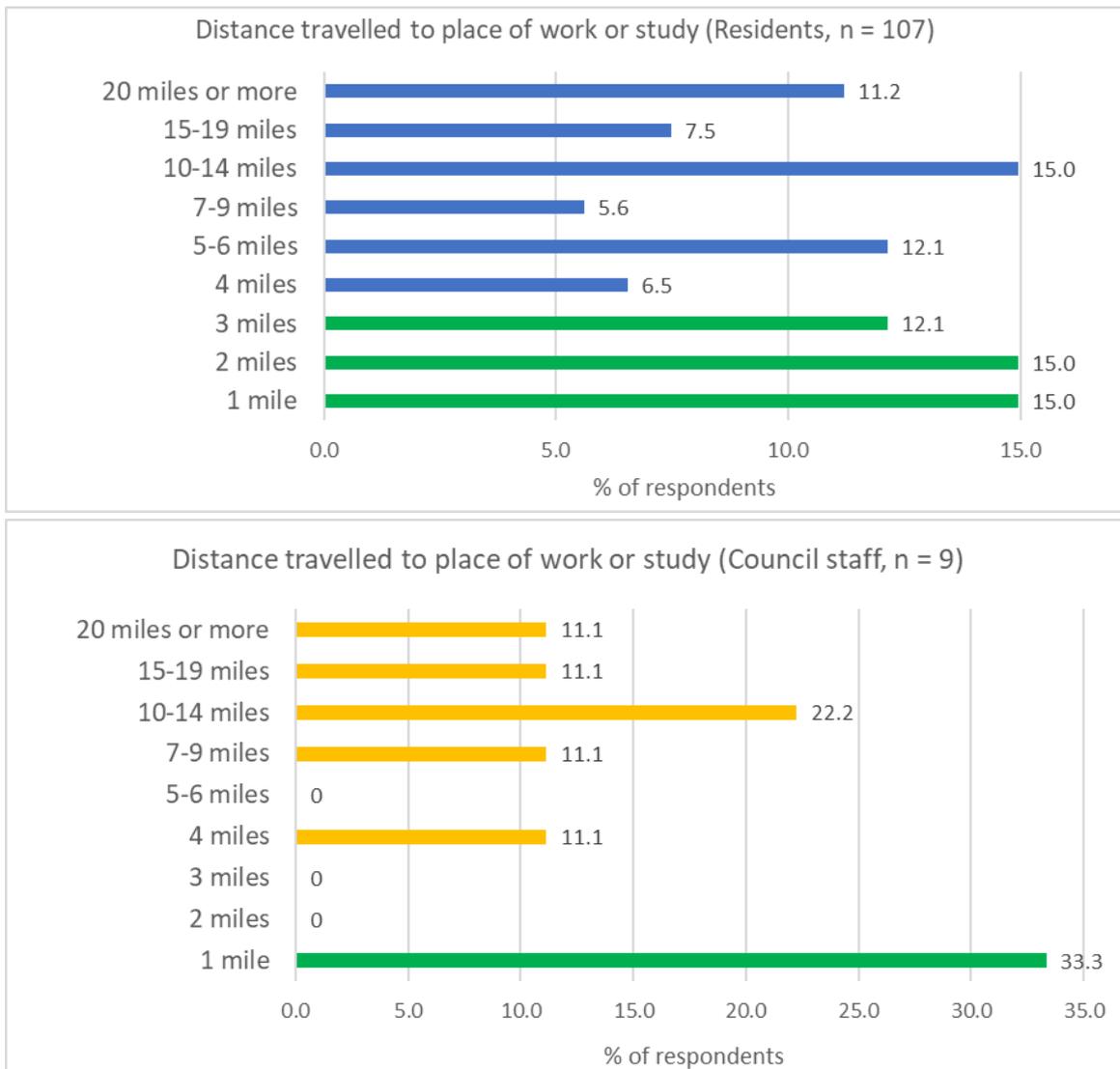


Figure 4, Distance travelled to place of work or study by residents and Council staff (green indicates short commutes)

Bicycle ownership

Owning a bicycle is one factor which could influence an individual's uptake of e-bike shared mobility. Participants were therefore asked about their current bike ownership and the results are presented in Table 9. Most Council staff (85.7%) and just over half of residents (53.6%) own a bicycle that is in good working order. One in six residents owns an e-bike, which is somewhat higher than a previous study of Cornwall residents⁴¹. A higher proportion of bike owners (33.3%) than non-bike owners (27.1%) used a Beryl bike during this study, but the difference is not statistically significant (Fisher's exact test).

⁴¹ Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#). CAST report for Cornwall Council. The previous study found 7.0% of residents own an e-bike, compared to 15.9% in this study. However, the samples may not be directly comparable.

Table 9, Participants' bicycle ownership

	Residents* (n = 151) (%)	Council staff (n = 14) (%)
I own a conventional pedal bike	45.0	85.7
I used to own a bike but I got rid of it	27.8	7.1
I own an e-bike	15.9	0
I have never owned a bike	7.3	0
I own a bike but it is in disrepair	6.7	7.1
I can't ride a bike	4.6	0
Other	1.4	14.3

* Participants could select multiple options and so the columns do not total 100%.

Barriers to the uptake of active travel

Participants were presented with five potential barriers to active travel and asked to what extent these barriers prevent them from walking/wheeling or cycling as a main mode of travel (Figure 5). The high mean scores (i.e., close to 3) indicate that concerns about road safety and a lack of walking and cycling infrastructure are significant barriers to the wider uptake of active travel in Cornwall. The majority of residents and Council staff are confident in their cycling ability. One in seven residents (13.9%) and one in fourteen Council staff (7.1%) stated that walking or cycling as a main mode of travel is not feasible due to a long-standing illness, injury, or disability.

Participants who have access to a car, older people (aged 60+), and those who do not own a bicycle perceive their lack of cycling confidence or competence to be a barrier. People who would like to reduce their car use are deterred by road safety concerns and a lack of active travel infrastructure. Women perceive all four barriers to be more of a deterrent to their uptake of active travel, compared to men. There were no statistically significant differences based on other grouping variables such as living in an urban or rural area, or concern about climate change or air pollution⁴².

⁴² Independent samples t-tests and Welch t-tests revealed (for the resident sample):

- 1) An independent samples t-test revealed people who own or have regular access to a car perceive a lack of cycling confidence/competence to be more of a barrier to active travel (2.37 ± 1.34) than people without access to a car (1.74 ± 1.14), a statistically significant difference of .63 (95% CI, .06 to 1.20), $t(136) = 2.181, p = .031$
- 2) A Welch t-test revealed people aged 60 or over perceive a lack of cycling confidence/competence to be more of a barrier to active travel (2.36 ± 1.41) than younger people (1.72 ± 1.11), a statistically significant difference of .64 (95% CI, .03 to 1.25), $t(30) = 2.124, p = .042$
- 3) A Welch t-test revealed people who do not own a bicycle perceive a lack of cycling confidence/competence to be more of a barrier to active travel (2.33 ± 1.33) than people who own a bicycle ($1.43 \pm .88$), a statistically significant difference of .89 (95% CI, .51 to 1.29), $t(99) = 4.562, p = .001$
- 4) An independent samples t-test revealed people who would like to reduce their car use perceive a lack of active travel infrastructure to be more of a barrier to active travel (2.96 ± 1.08) than those who are not interested in

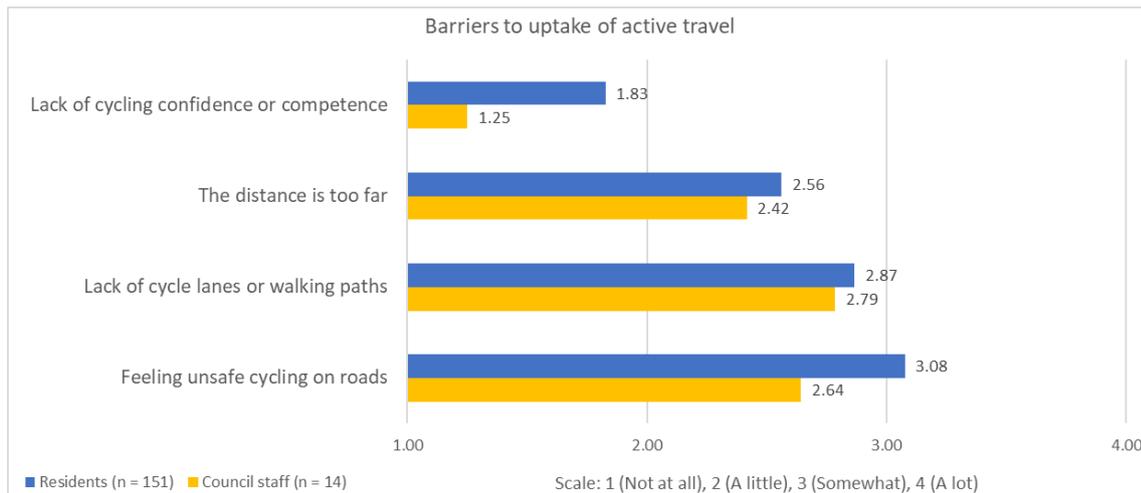


Figure 5, Means scores for the relative importance of four barriers which prevent participants from using active travel

These barriers were also a prominent theme in the qualitative feedback. Table 10 shows one in three participants expressed concerns about road safety, usually in the context of cycling but some described feeling unsafe when walking on roads, as people in rural areas experience a lack of footpaths or blocked access to existing footpaths. These safety concerns are directly related to the foremost structural barrier in Figure 5 – a lack of cycle lanes and walking paths that are separated from traffic. Participants’ feedback on the barriers to the uptake of Beryl bikes, as opposed to active travel in general, is presented in section 6.

reducing their car use (2.31 ± 1.19), a statistically significant difference of .65 (95% CI, .16 to 1.13), $t(113) = 2.634, p = .010$

5) An independent samples t-test revealed people who would like to reduce their car use perceive road safety to be more of a barrier to active travel (3.13 ± 1.04) than those who are not interested in reducing their car use (2.56 ± 1.23), a statistically significant difference of .57 (95% CI, .09 to 1.05), $t(114) = 2.348, p = .021$

6) An independent samples t-test revealed women perceive a lack of active travel infrastructure to be more of a barrier to active travel (3.04 ± 1.09) than men (2.54 ± 1.13), a statistically significant difference of .50 (95% CI, .12 to .89), $t(135) = 2.588, p = .011$

7) An independent samples t-test revealed women perceive road safety to be more of a barrier to active travel (3.29 ± 1.01) than men (2.69 ± 1.11), a statistically significant difference of .61 (95% CI, .247 to .971), $t(137) = 3.330, p = .001$

8) A Welch t-test revealed that women perceive a lack of cycling confidence/competence to be more of barrier to active travel (2.30 ± 1.28) than men ($1.13 \pm .48$), a statistically significant difference of 1.17 (95% CI, .86 to 1.48), $t(108) = 7.422, p = .001$

9) An independent samples t-test revealed women perceive distance to be more of a barrier to active travel (2.81 ± 1.06) than men (2.15 ± 1.05), a statistically significant difference of .66 (95% CI, .29 to 1.03), $t(130) = 3.516, p = .001$

Table 10, Qualitative feedback on the barriers to uptake of active travel in Cornwall

Theme	Example quote	Prevalence
Concern about road safety	"The roads are too dangerous to cycle on."	53
Long distances or steep hills	"Not all of us can cycle or walk up the steep hills in the city."	9
Low cycling confidence	"With my low ability I'm also worried the bikes will be too heavy for me getting on/off/crashing."	2

Council staff's willingness to use low-carbon modes of travel

Council staff were asked about their willingness to use various low-carbon modes of travel (Figure 6). This question included a 'can't do this' option to identify individuals who do not consider particular travel options to be feasible for their situation, as they may face practical constraints (e.g., their job role necessitates the use of a car) or personal constraints (e.g., they have a health condition). This is distinct from 'don't want to/won't do this', which represents an active decision to not change travel mode, even though it may be a realistic option for their situation. This question was presented to Council staff only; for residents, please see a previous study⁴³.

Figure 6 shows one in three Council employees do not consider using a bike for commuting or work-related travel to be feasible, although half of the respondents are thinking about using a bike for these journeys. Using public transport as a main mode of travel is considered less practicable, with 64.3% stating they *can't do this* or *won't do this*. These findings are comparable with previous research which revealed a strong interest in active travel, but only a moderate interest in using public transport⁴³.

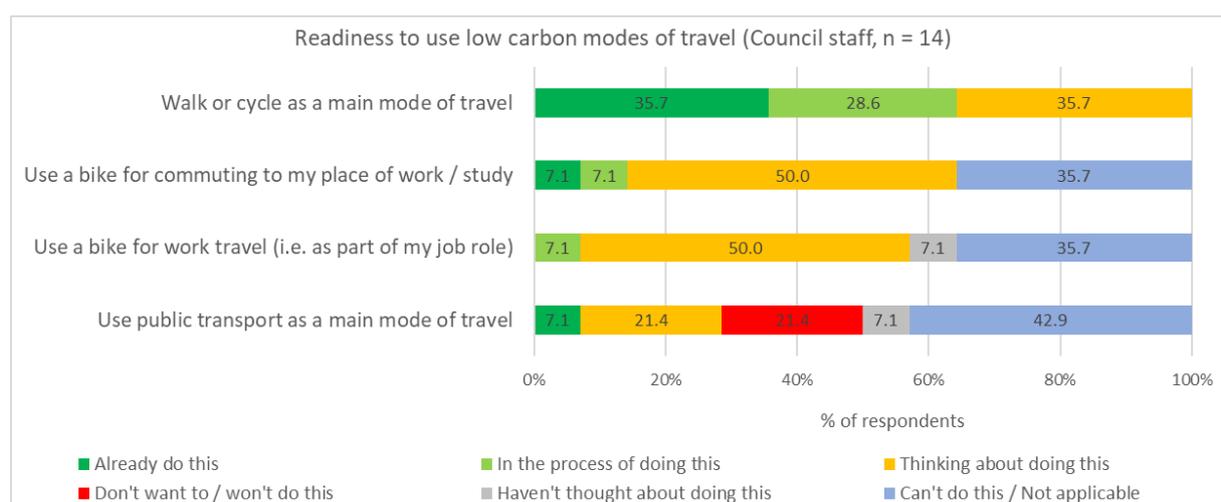


Figure 6, Council staff's willingness to use low-carbon modes of travel

⁴³ For residents' willingness to use low-carbon travel modes, see: Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#). CAST report for Cornwall Council.

3 Perceptions of owning and using e-bikes

This section describes participants' views on owning an e-bike. These perceptions were explored to inform the Council's broader active travel strategy, and because ownership of an e-bike (or indeed a conventional bike) is one contextual factor which could influence an individual's use of e-bike share⁴⁴. Using Beryl bikes and a personal e-bike are not mutually exclusive, and some people may use both, depending on their journey purpose.

Intention to buy an e-bike

One in six residents already owns an e-bike (Table 9). Figure 7 shows one in five residents is considering buying an e-bike in the next 12 months (i.e., 'somewhat likely' or 'very likely'), which is similar to findings from a previous study⁴⁵. Comparing intention before and after the intervention, there is no statistically significant difference in residents' propensity to buy an e-bike, nor in Beryl users' propensity to buy an e-bike (paired samples t-tests). Over half of Council staff respondents indicated they are considering buying an e-bike in the pre-intervention survey, although this dropped markedly in the post-intervention survey. It is not clear whether this due to a more negative perception of e-bikes, or because they prefer to hire a Beryl bike.

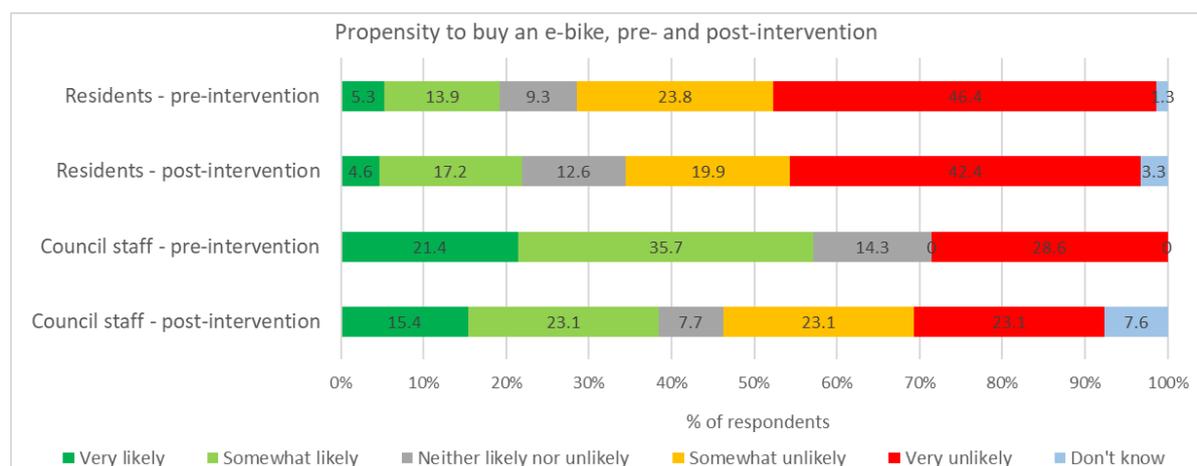


Figure 7, Participants' propensity to buy an e-bike in the next 12 months

Practical considerations for e-bike ownership

This study investigated some potential reasons why the respondents may or may not be considering buying an e-bike. E-bikes are relatively expensive and Figure 8 indicates that the initial cost of buying an e-bike is a barrier for some residents and Council staff. Residents on

⁴⁴ This study established that people who own a bike or e-bike do not have a higher propensity for e-bike share uptake – see section 2, p.21.

⁴⁵ Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#) CAST report for Cornwall Council.

lower incomes do not consider e-bikes to be as affordable as those on higher incomes⁴⁶. Storage space for an e-bike at home is not a constraint for the majority of residents, although some Council staff indicated they do not have space. Residents have concerns about e-bike theft, although these could be mitigated by the provision of secure bike storage in town centres and workplaces (see qualitative feedback, section 9.2).

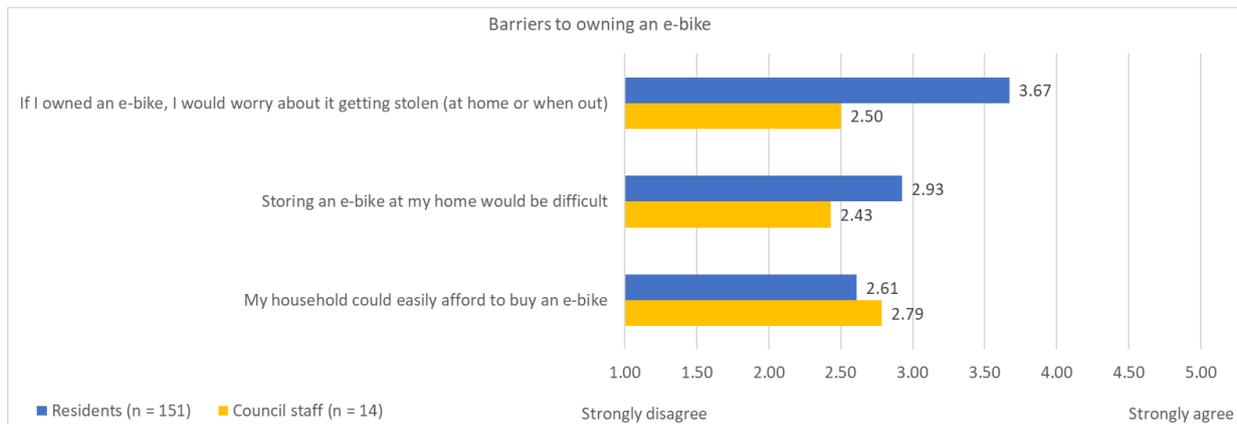


Figure 8, Mean scores for the relative importance of three barriers to owning an e-bike

Fewer participants believe e-bikes are sufficiently affordable to buy one for everyone in the household (Figure 9). This is important because many bike journeys, particularly for leisure or exercise, are made with family members. The upfront cost could conceivably limit e-bike use to journeys that are typically made individually, for example commuting.

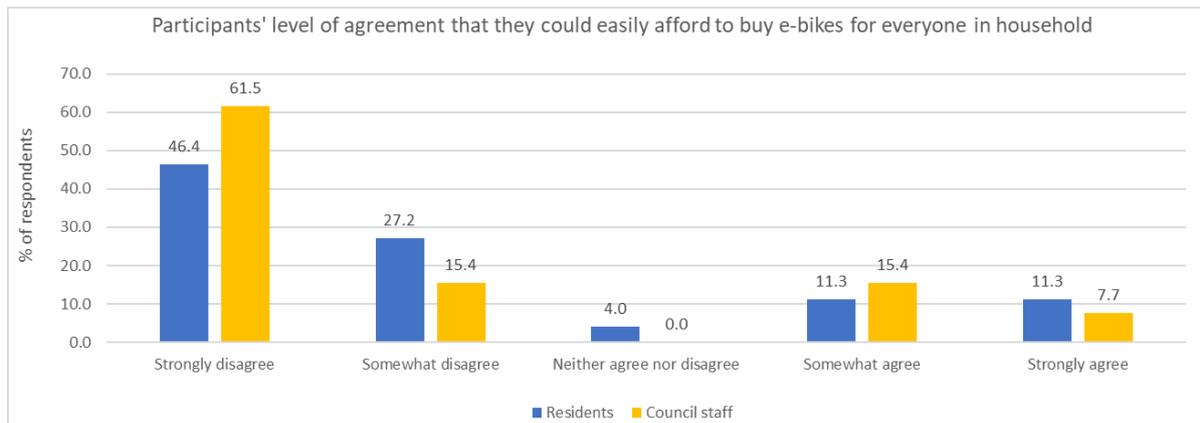


Figure 9, Affordability of e-bikes for everyone in the household

⁴⁶ An independent samples t-test revealed residents on lower incomes (a combined household income of less than £26,000 per year, before tax deductions) have a lower level of agreement that their household could easily afford to buy an e-bike (2.06 ± 1.32), compared to those on higher incomes (2.83 ± 1.43), a statistically significant difference of .77 (95% CI, .22 to 1.13), $t(132) = 2.768, p = .006$

Ability, identity, and social influence

Participants were asked three questions about whether using an e-bike is consistent with their ability and self-identity. All of the mean scores are above 3 in Figure 10, suggesting strong agreement among residents and in particular Council staff that they feel able to ride an e-bike, that family members would be supportive, and that they see themselves as someone who would regularly use an e-bike. Most residents (60.9%) and Council staff (71.4%) know someone who frequently uses an e-bike and so they may receive recommendations from people in their social network. These findings suggest self-efficacy and social influence would positively influence e-bike adoption, although there is some variation in participants' perceptions. Women and people with a longstanding health condition feel less confident they would be able to ride an e-bike. Older people (aged 60+) reported lower agreement than younger people for all three aspects. Residents with children feel more able to ride an e-bike and see themselves as someone who might regularly ride an e-bike⁴⁷. There were no statistically significant differences for other grouping variables such as education level or concern about climate change.

⁴⁷ Independent samples t-tests and Welch t-tests revealed (for the resident sample):

1) A Welch t-test revealed women would find it less easy to ride an e-bike (3.71 ± 1.23) compared than men (4.46 ± 1.02), a statistically significant difference of .76 (95% CI, .37 to 1.15), $t(130) = 3.824$, $p = .001$

2) A Welch t-test revealed people with a longstanding health condition would find it less easy to ride an e-bike (3.13 ± 1.51) compared those without a health condition (4.20 ± 1.15), a statistically significant difference of 1.07 (95% CI, .41 to 1.75), $t(28) = 3.296$, $p = .003$

3) A Welch t-test revealed people aged 60 or over would find it less easy to ride an e-bike (3.43 ± 1.55) compared younger people (4.15 ± 1.15), a statistically significant difference of .72 (95% CI, .87 to 1.36), $t(34) = 2.308$, $p = .027$

4) A Welch t-test revealed people aged 60 or over would receive less support for riding an e-bike from people who are important to them (3.54 ± 1.30) compared younger people ($4.17 \pm .99$), a statistically significant difference of .64 (95% CI, .81 to 1.19), $t(32) = 2.333$, $p = .026$

5) An independent samples t-test revealed people aged 60 or over are less likely to see themselves as someone who would ride an e-bike (2.41 ± 1.35) compared younger people (3.48 ± 1.38), a statistically significant difference of 1.07 (95% CI, .50 to 1.64), $t(141) = 3.731$, $p = .001$

6) A Welch t-test revealed people with children living at home would find it easier to ride an e-bike ($4.29 \pm .98$) than those without children living at home (3.82 ± 1.39), a statistically significant difference of .47 (95% CI, .08 to .86), $t(139) = 2.387$, $p = .018$

7) An independent samples t-test revealed people with children living at home are more likely to see themselves as someone who would ride an e-bike (3.68 ± 1.31) than those without children living at home (3.02 ± 1.45), a statistically significant difference of .66 (95% CI, .18 to 1.14), $t(143) = 2.718$, $p = .007$

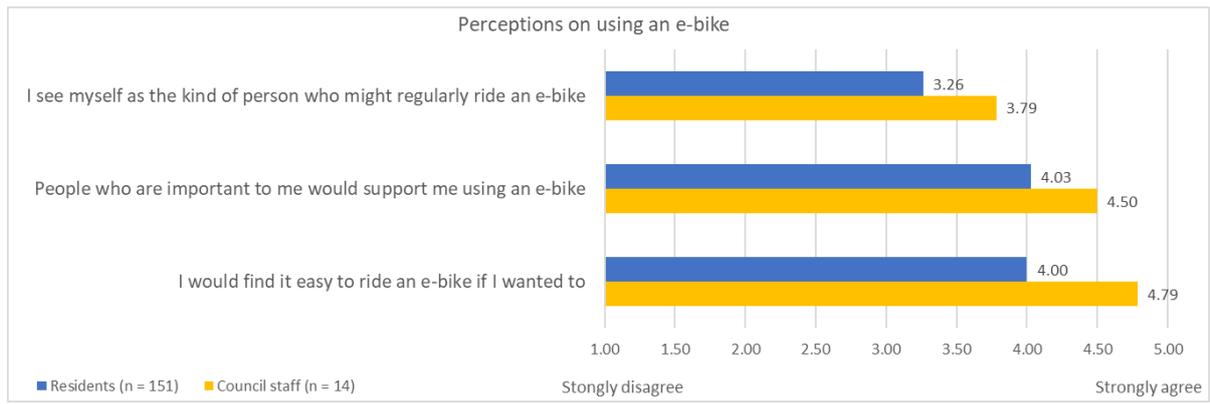


Figure 10, Mean scores for participants' perceptions of using an e-bike

4 Perceptions of Beryl bikes/e-bike shared mobility

This section describes participants' views on Beryl bikes, including how they find out about the scheme, their proximity to the parking bays, and which attributes of e-bike sharing appeal to them.

Information sources

Not surprisingly, an important factor in the adoption of Beryl bikes is how people first hear about the scheme. Table 11 reveals that direct observation – seeing someone using a Beryl bike, or seeing a parking bay – is the most important way of becoming initially aware of Beryl bikes. For Council employees, the Council's promotion of free credits was a key information source. Less than one in ten participants heard about Beryl bikes through social media, local news coverage, or from a friend or family member.

Table 11, Information sources for participants' initial awareness of Beryl bikes in Cornwall

Information source	Residents (%)	Council staff (%)
I saw a Beryl bike parking bay / someone riding a Beryl bike	61.6	28.6
Council promotion of free Beryl bike credits	N/A	42.9
Advert on social media / the internet	9.3	0.0
Coverage on TV / radio / newspapers / news websites	8.6	7.1
A friend, family member, or colleague told me	6.0	7.1
Taking part in this study	6.0	0.0
Other (please specify)	4.0	0.0
Council website or newsletters	2.6	14.3
I can't remember	1.3	0.0
A local notice or flyer promoting Beryl bikes	0.7	0.0

Access to Beryl bikes

Participants were asked in which towns or city they are most likely to use Beryl bikes (they could select multiple locations). Truro and Falmouth were the most frequently selected locations (Table 12).

Table 12, Locations where participants are most likely to use Beryl bikes

	Residents* (%)	Council staff (%)
Truro	41.7	64.3
Falmouth	28.5	21.4
Newquay	19.2	28.6
Penryn	15.2	21.4
St Austell	15.2	7.1
Penzance	12.6	28.6
Not applicable	15.9	0.0

* Participants could select multiple options and so the columns do not total 100%.

Participants were then asked about the proximity of Beryl bike parking bays to their home, place of work or education, and public transport hubs such as a train station or bus station (Table 13). There is good coverage of parking bays near participants' homes, with 56.3% of residents and 85.7% of Council staff reporting a parking bay within walking distance. There is currently less coverage close to public transport hubs or participants' places of work or education.

Table 13, Accessibility of Beryl bikes

Proximity of Beryl bike parking bays	Yes (%)	No (%)	Don't know / N/A (%)
Percentage of residents			
Beryl bike parking bay within walking distance of home	56.3	27.8	15.9
Beryl bike parking bay within walking distance of your place of work or education	31.1	28.5	40.4
Beryl bike parking bay within walking distance of key public transport hubs (if you use public transport)	37.7	6.0	56.3
Percentage of Council staff			
Beryl bike parking bay within walking distance of home	85.7	14.3	0.0
Beryl bike parking bay within walking distance of your place of work or education	71.4	7.1	21.5
Beryl bike parking bay within walking distance of key public transport hubs (if you use public transport)	22.2	0.0	77.8

Attributes of Beryl bikes

This study measured participants' perceptions of 15 attributes of Beryl bikes to understand which aspects of using e-bike shared mobility may appeal to them. Participants were asked to indicate their level of agreement that using Beryl bikes would help them personally by providing these benefits. Ten of the attributes were adapted from the CoMoUK annual survey, and five additional attributes were included to explore specific aspects of e-bike share (rather than bike share⁴⁸). Perceptions were measured in the pre-intervention and post-intervention surveys to identify any changes over the study period.

The post-intervention survey findings are presented in Figure 11 for residents and Figure 12 for Council staff, and the highest ranked attributes are located at the top of the charts. Figure 11 shows practical attributes are important, for example, *trying an e-bike before buying one* is the highest ranked attribute, with 62.3% of residents stating they 'somewhat agree' or 'strongly agree' that Beryl bikes provides this benefit (i.e., the green segments in each bar). There is also broad agreement among residents that using Beryl bikes *reduces concerns around maintaining a bike* (59.6%) and *bike theft* (57.7%), and *avoids traffic congestion and parking difficulties* (51.0%). For context, around three quarters of the CoMoUK survey respondents agree that bike share provides these benefits⁴⁹.

Figure 11 reveals co-benefits are also important; 57.6% of residents believe that using Beryl bikes will *reduce their carbon footprint*, and there is strong agreement that Beryl bikes provide *exercise* (54.3%) and *mental health benefits* (49.0%). The lowest ranked attribute is *cost* (17.9%), as Beryl bikes are considered expensive to use. Physical exercise and mental health benefits are ranked somewhat higher in the CoMoUK survey, although cost is also the lowest ranked attribute.

Residents tend to rank the attributes slightly higher in the post-intervention survey, relative to the pre-intervention survey (10 out of 15 attributes were ranked higher in the post-intervention survey). Beryl bike users tend to rank the attributes higher in the post-intervention survey (9 out of 15 attributes were ranked higher in the post-intervention survey), which could indicate an enhanced perception of Beryl bikes following direct experience of using them. However, none of the differences are statistically significant

⁴⁸ CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://como.org.uk). Additional attributes included in this Cornwall study: *It will help me reduce my carbon footprint ; It will enable me to cycle with friends / family as a group ; I will be able to cycle longer distances ; I can avoid fatigue or getting sweaty before work or socialising ; I can try an e-bike before I decide whether to buy one*. The CoMoUK survey explores the latter three attributes, but using a different question wording.

⁴⁹ There is stronger agreement in the CoMoUK survey that bike share provides these benefits, compared to the findings in this study. However, this Cornwall study included a 'not applicable' option (i.e., participants who do not own a car could select N/A to the question: *I will be able to use my car less*). This resulted in somewhat lower levels of agreement in this study; if the 'not applicable' responses are removed from the data, the findings between this Cornwall study and CoMoUK are much closer.

(paired samples t-tests) and so there is no clear evidence of a change in their views over the study period. Council staff reported stronger agreement than residents for all attributes, although the small sample size for Council staff limits our ability to make comparisons between the two groups.

Between-groups analysis revealed Beryl bike users tend to rate the benefits higher than non-users (for 10 out of 15 attributes), although only one difference is statistically significant; Beryl bike users reported stronger agreement that using the bikes would make their trips easier. People living in rural areas and those on lower incomes reported stronger agreement that using Beryl bikes would enable them to use their car less, and avoid traffic congestion and parking difficulties. People living in rural areas also reported stronger agreement that using the bikes would connect them to places not served by public transport, enable them to try an e-bike before deciding whether to buy one, and provide exercise and mental health benefits. People on lower incomes reported stronger agreement that Beryl bikes would make their trips easier and avoid fatigue before work or socialising. Finally, car owners reported weaker agreement that using Beryl bikes would reduce their carbon footprint, compared to those who do not own a car⁵⁰. There were no statistically significant differences in the level of

⁵⁰ Independent samples t-tests and Welch t-tests revealed (for the resident sample, using data from the post-intervention survey):

1) An independent samples t-test revealed Beryl bike users have stronger agreement that Beryl bikes will make their trip easier (3.35 ± 1.25), compared to non-users (2.80 ± 1.20), a statistically significant difference of 0.55 (95% CI, 0.10 to 1.01), $t(132) = 2.411, p = .017$

2) A Welch t-test revealed people living in rural areas (countryside or small village, or large village or small town) have stronger agreement that using Beryl bikes will enable them to use their car less ($3.60 \pm .90$), compared to people living in urban areas (suburbs of large town or city, or centre of large town or city; 2.95 ± 1.24), a statistically significant difference of 0.65 (95% CI, .26 to 1.05), $t(98) = 3.270, p = .001$

3) An independent samples t-test revealed people living in rural areas have stronger agreement that using Beryl bikes will enable them to avoid traffic congestion and parking difficulties (3.74 ± 1.04), compared to people living in urban areas (3.27 ± 1.14), a statistically significant difference of 0.47 (95% CI, 0.09 to 0.85), $t(130) = 2.461, p = .015$

4) A Welch t-test revealed people on lower incomes (a combined household income of less than £26,000 per year, before tax deductions) have stronger agreement that using Beryl bikes will enable them to use their car less ($3.88 \pm .77$), compared to people on higher incomes (3.12 ± 1.18), a statistically significant difference of 0.77 (95% CI, 0.37 to 1.16), $t(64) = 3.876, p = .001$

5) A Welch t-test revealed people on lower incomes have stronger agreement that using Beryl bikes will enable them to avoid traffic congestion and parking difficulties ($3.86 \pm .76$), compared to people on higher incomes (3.41 ± 1.22), a statistically significant difference of 0.45 (95% CI, 0.06 to 0.83), $t(73) = 2.326, p = .023$

6) An independent samples t-test revealed people living in rural areas have stronger agreement that using Beryl bikes will connect them to places not served by public transport (3.45 ± 1.16), compared to people living in urban areas (2.98 ± 1.34), a statistically significant difference of 0.47 (95% CI, 0.04 to 0.89), $t(131) = 2.160, p = .033$

7) An independent samples t-test revealed people living in rural areas have stronger agreement that using Beryl bikes will enable them to try an e-bike before deciding whether to buy one ($4.10 \pm .97$), compared to people living in urban areas (3.66 ± 1.17), a statistically significant difference of 0.44 (95% CI, 0.07 to 0.81), $t(128) = 2.330, p = .021$

8) A Welch t-test revealed people living in rural areas have stronger agreement that using Beryl bikes will provide exercise ($3.78 \pm .98$), compared to people living in urban areas (3.33 ± 1.27), a statistically significant difference of 0.45 (95% CI, 0.06 to 0.84), $t(115) = 2.277, p = .025$

agreement based on other grouping variables such as gender, education level, owning a bike, driving intention, and concern about climate change or air pollution (independent samples t-tests).

Some participants offered their views on Beryl bikes in the qualitative feedback (Table 14). Those that approve of the scheme focus on how the bikes make journeys quicker and are a useful addition to existing transport options. Those that disapprove emphasise the cost to taxpayers and question whether Cornish towns need e-bike share. Qualitative findings on the barriers to uptake of Beryl bikes and ways to improve the scheme are presented in section 6.

Table 14, Participants' views on the Beryl bike scheme

Theme	Example quote	Prevalence
Approve of Beryl bikes	"Beryl bikes are a great idea..."	15
Disapprove of Beryl bikes	"There aren't any population centres in Cornwall big enough to warrant using a Beryl bike."	9

9) An independent samples t-test revealed people living in rural areas have stronger agreement that using Beryl bikes will provide mental health benefits (3.81 ± 1.00), compared to people living in urban areas (3.19 ± 1.16), a statistically significant difference of 0.62 (95% CI, 0.25 to 0.98), $t(133) = 3.303, p = .001$

10) An independent samples t-test revealed people on lower incomes have stronger agreement that using Beryl bikes will make their trips easier (3.41 ± 1.21), compared to people on higher incomes (2.86 ± 1.24), a statistically significant difference of 0.55 (95% CI, 0.03 to 1.07), $t(121) = 2.106, p = .037$

11) An independent samples t-test revealed people on lower incomes have stronger agreement that using Beryl bikes will enable them to avoid fatigue or getting sweaty before work or socialising (3.64 ± 1.16), compared to people on higher incomes (3.11 ± 1.16), a statistically significant difference of 0.53 (95% CI, 0.04 to 1.03), $t(118) = 2.130, p = .035$

12) An independent samples t-test revealed people who own or have regular access to a car have weaker agreement that using Beryl bikes will reduce their carbon footprint (3.60 ± 1.22), compared to those who do not own a car (4.22 ± 1.06), a statistically significant difference of 0.62 (95% CI, 0.02 to 1.22), $t(132) = 2.042, p = .043$

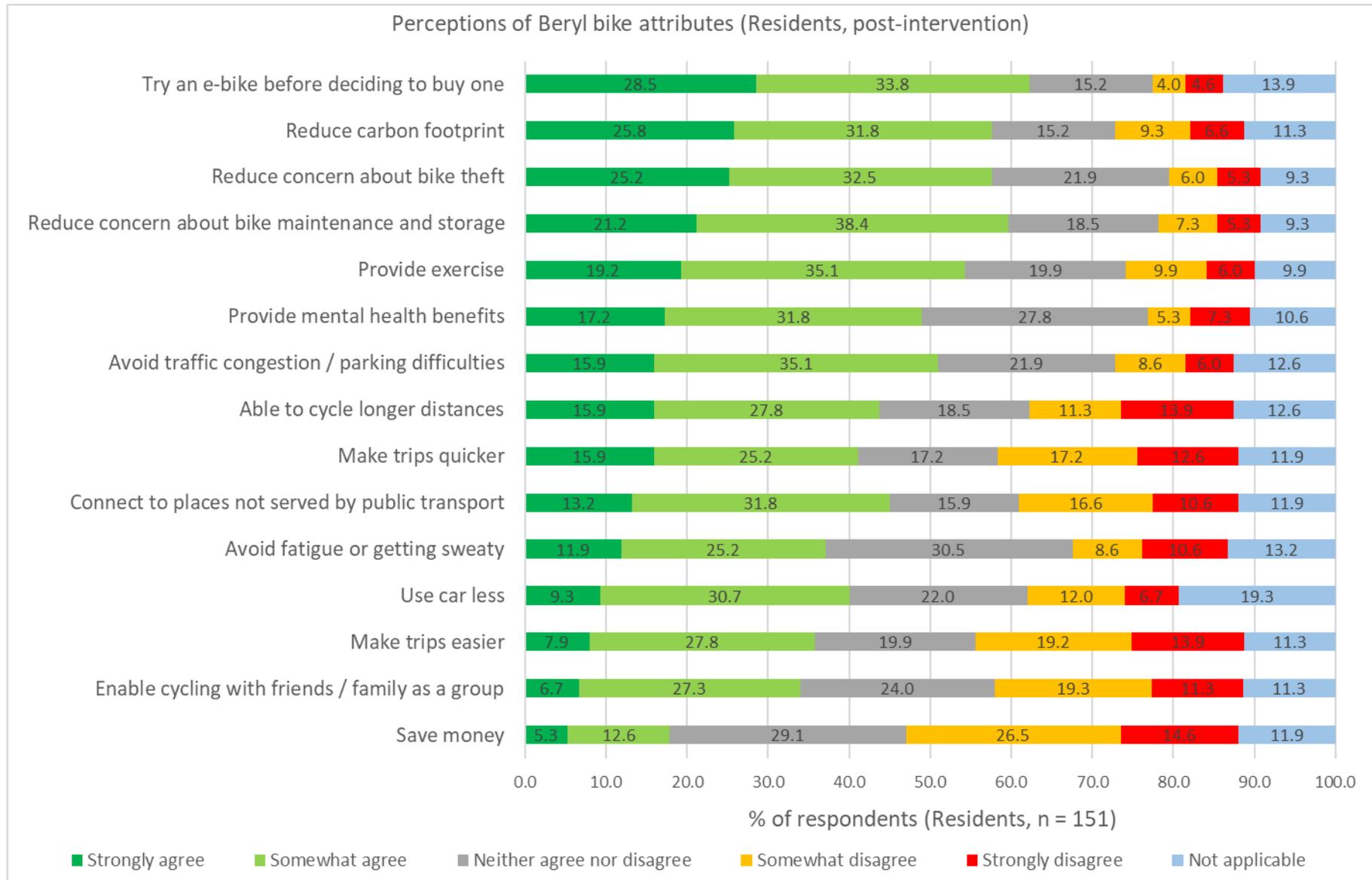


Figure 11, Residents' perceptions of Beryl bike attributes (post-intervention)

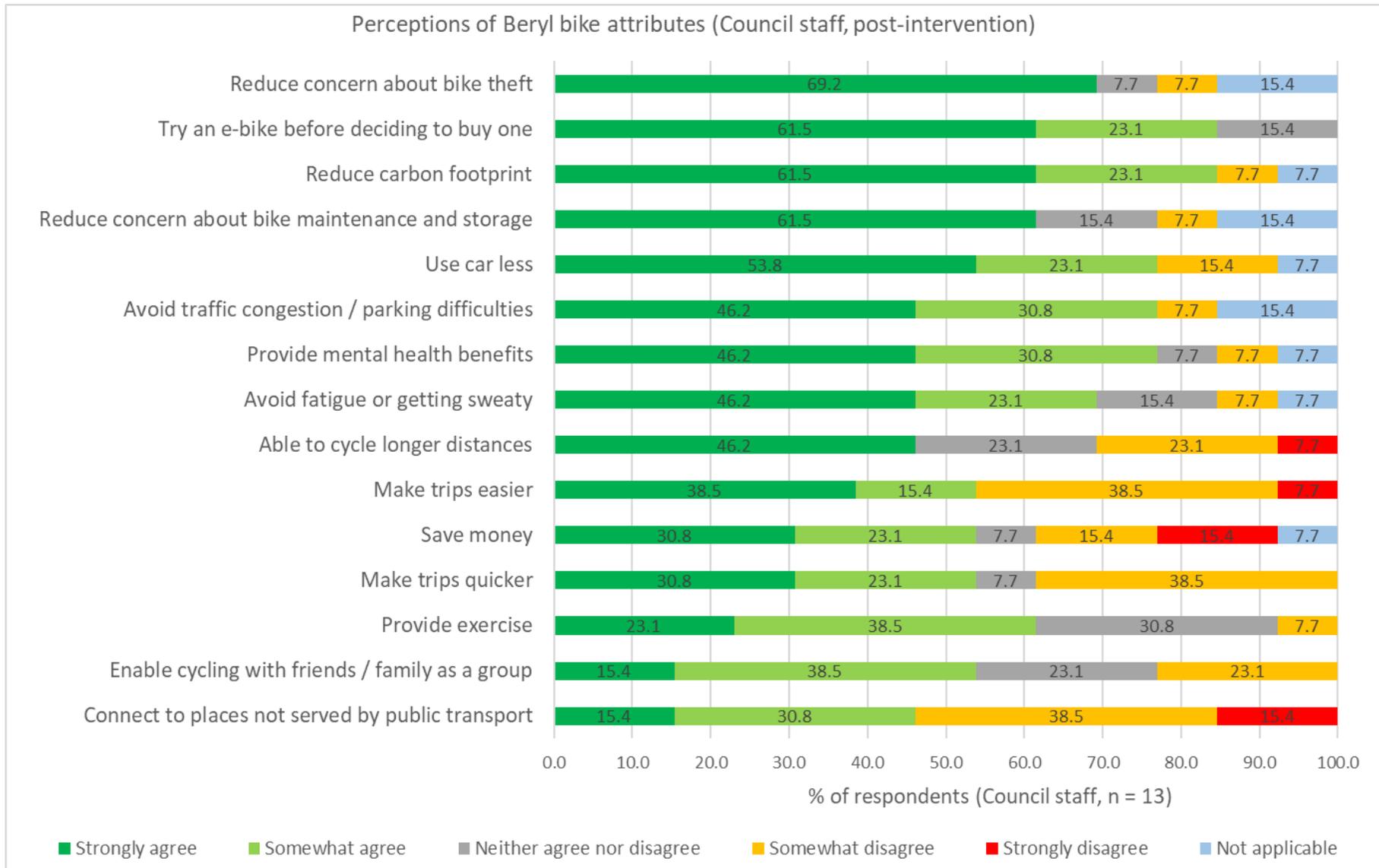


Figure 12, Council staff's perceptions of Beryl bike attributes (post-intervention)

5 Use of Beryl bikes during the study

This section describes participants' use of Beryl bikes during the study. Findings are presented on the adoption of Beryl bikes, the average journey frequency and distance, the journey purposes, multimodal travel, and mode shift. These results are used to estimate the carbon emission reduction from Beryl bike substitution of private car journeys. Participants' feedback on their experience of using Beryl bikes is also presented.

5.1 Beryl bike journey frequency, distance, purpose, and multimodal travel

Adoption of Beryl bikes before and after the study

A minority of residents (6.6%) had used Beryl bikes in Cornwall prior to this study and 11.3% had used a bike share scheme in another location. Council staff had more previous experience; 28.6% had used Beryl bikes in Cornwall and 21.4% had used a bike share scheme in another location. Of the 165 participants who completed the data collection activities, 46 residents and 10 Council staff used a Beryl bike during this study - this equates to 30.5% of residents and 71.4% of Council staff. This increase in uptake suggests that participation in this study motivated some participants to adopt Beryl bikes (the effectiveness of the interventions is discussed in section 8). The characteristics of Beryl bike users are shown in Table 15 and they resemble the broader study sample: a relatively young mean age, although 13.0% of Beryl users are aged 60 or over; a minority have a longstanding health condition; and most own a bicycle and a car and so have multiple travel options.

Table 15, Characteristics of Beryl bike users

Beryl bike users	Residents (n = 46)		Council staff (n = 10)	
	Frequency	%	Frequency	%
<i>Gender:</i>				
Female	23	51.1	4	40.0
Male	21	46.7	5	50.0
Non-binary	-	-	1	10.0
None of the above	1	2.2	-	-
<i>Ethnicity:</i>				
White British / White				
Cornish	40	88.9	10	100.0
Asian / Asian British	3	6.7	-	-
Other ethnic group	2	4.4	-	-
Have a longstanding health condition	6	13.6	2	20.0
Have children living at home	19	41.3	7	70.0
Live in an urban area (Suburbs or centre of a large town or city)	24	52.2	8	80.0
Bike owner	27	58.7	8	80.0
Car owner	42	91.3	9	90.0
Mean age (in years)	44.1 years		39.5 years	

Journey frequency and distance

Participants who reported using a Beryl bike in the weekly travel diary were asked about their journey frequency and distance. Anonymised, aggregated data on frequency and distance was also available from Beryl bikes. Table 16 presents the mean distances for the two samples and two data sets, resulting in a range of 2.06 – 3.21 km per journey⁵¹ (or 1.28 – 1.99 miles per journey). Beryl bikes are therefore used primarily for short journeys, although longer journeys of 4 or 5 km were not uncommon. For residents and Council staff, the reported distances are slightly longer than the observed distances from Beryl bike data, although the two data sets are not directly comparable because they comprise different sample sizes and study period durations. Nevertheless, the range of 2.06 – 3.21 km per journey provides a useful indication, and is consistent with other studies⁵².

⁵¹ A range is provided, rather than a single mean distance, because: a) there are two participants groups in this study, residents and Council staff, and b) two different data sets, the travel diaries (reported data) and Beryl bike data (observed data).

⁵² Fukushige et al. (2021) conducted a study of dock-less e-bike share in the US and identified a mean distance range of 2.39 – 2.99 km (or 1.49 – 1.86 miles). These journey distances are based on participants' reported data. Zhou et al. (2023) found a mean journey distance of 2.67 km (or 1.66 miles) in their study in of e-bike share in China, using observed data from the service provider. See references below:

Table 16 also shows relatively infrequent use of Beryl bikes during study period, with the mean number of journeys ranging from 0.8 – 1.5 per rider per week. This suggests many participants were trialling Beryl bikes and that using e-bike share was not yet embedded in their daily travel routine. This is not surprising, given the majority had not used Beryl bikes before and the scheme had only recently been introduced in three of the locations.

Table 16, Mean number of journeys, and mean distance per journey

Group	Mean no. journeys per rider over the study period	Mean no. journeys per rider per week	Mean distance (km) per journey
Residents (reported data, n = 41, over 4 weeks)	3.2	0.8	3.21*
Residents (observed data, n = 34, over 10 weeks)	8.5	0.8	2.99
Council (reported data, n = 10, over 4 weeks)	6.0	1.5	2.43
Council (observed data, n = 9, over 10 weeks)	9.1	0.9	2.06

* Five outliers were removed, because they reported very long journey distances, relative to the rest of the resident sample and to the Council staff sample. The mean distance with these outliers included is 5.52 km per journey; removing them produces a mean of 3.21 km per journey, as presented above. The mean journey frequency with these outliers included is 1.3 journeys per rider per week and 5.2 journeys per rider over the study period; removing them produces a mean of 0.8 journeys per week and 3.2 journeys over the study period, as presented above. Reflecting the removal of these outliers, the number of residents who reported using a Beryl bike is presented as 41 in Table 16, rather than 46.

Journey purpose

Journey purpose was investigated to understand how using a Beryl bike may fit with the participants' daily activities and travel needs. Anyone who used a Beryl bike was asked to indicate the purpose(s) of their Beryl bike journeys during that particular week (participants could select multiple options). Figure 13 shows that *leisure or exercise* and *commuting* were

Fukushige, T., et al. (2021). Factors influencing dock-less E-bike-share mode substitution: Evidence from Sacramento, California. *Transportation Research Part D: Transport and Environment*, 99, 102990, <https://doi.org/10.1016/j.trd.2021.102990>.

Zhou, Y., et al. (2023). Mode substitution and carbon emission impacts of electric bike sharing systems. *Sustainable Cities and Society*, 89, 104312, <https://doi.org/10.1016/j.scs.2022.104312>.

the most commonly reported journey purposes for both residents and Council staff. Commuting was also the most common journey purpose in the CoMoUK study⁵³.

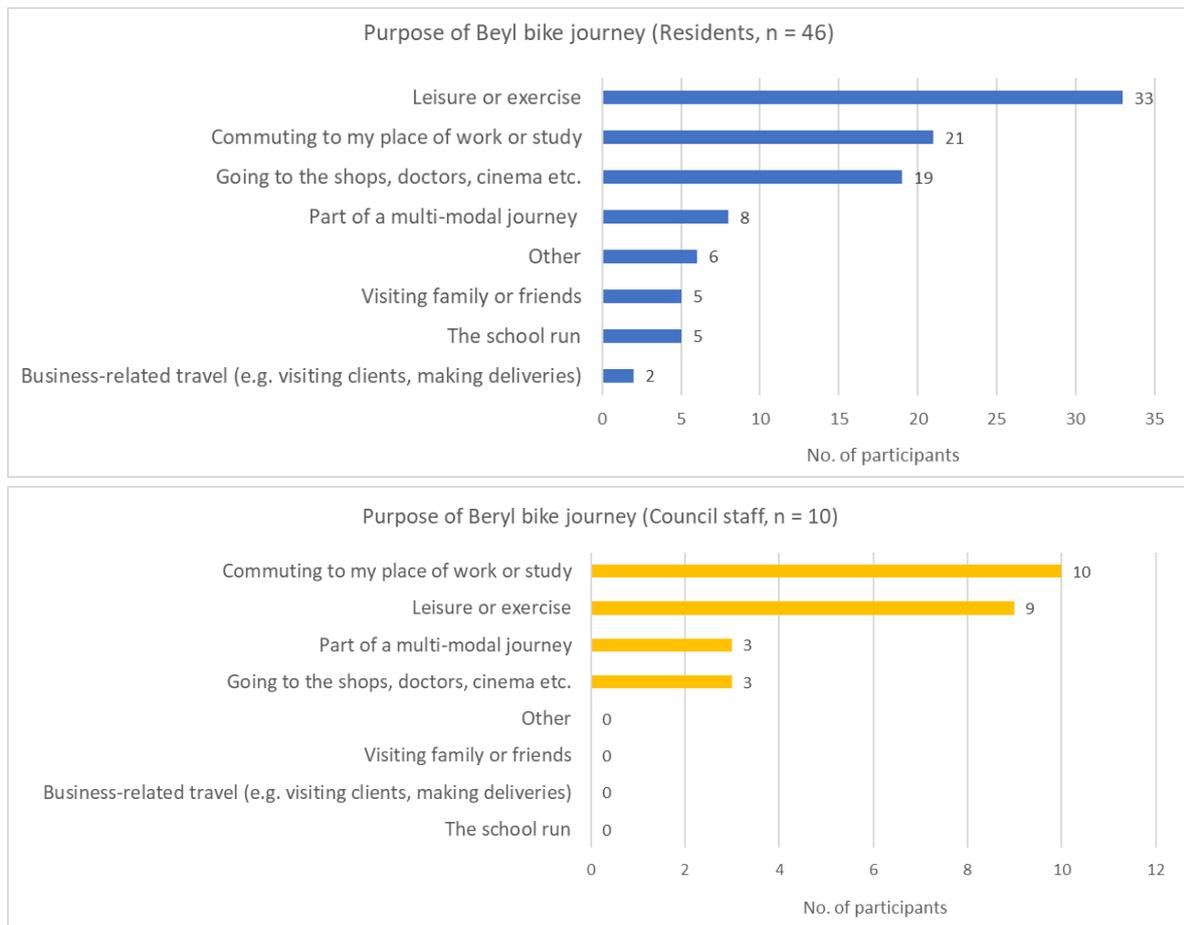


Figure 13, Purpose of Beryl bike journeys

Multimodal travel

Figure 13 shows eight residents and three Council staff used Beryl bikes as a component of multimodal travel. Participants who used a Beryl bike for a multimodal journey were asked which travel modes they combined with Beryl bikes. Table 17 shows *car* (as a driver and as a passenger) and *bus* were the most common responses.

⁵³ CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://como.org.uk).

Table 17, Travel modes combined with Beryl bikes in multimodal journeys

Mode of travel combined with Beryl bike	Residents' no. of multimodal journeys (n = 8)	Council staff's no. of multimodal journeys (n = 3)
Car / van as a driver	5	3
Bus	5	0
Car / van as a passenger	4	2
Train	2	2
Other	3	0
Taxi	0	0
E-scooter / scooter / motorcycle	0	0

Encouraging mode shift away from private car use requires making the alternatives reliable, attractive and flexible⁵⁴. Many people in Cornwall live in rural areas and so require either a car or public transport to access towns and local services, and this is a clear barrier to shifting to active travel. However, the findings in Table 17 suggest Beryl bikes can be combined with other travel modes, whereby a Beryl bike is used for the segment of the journey within the town (i.e., the first or last mile⁵⁵). Reducing traffic congestion in towns has societal benefits such as reduced journey times and lower levels of air pollution and noise pollution. There are also physical and mental health benefits for the individuals that use active travel (see section 4).

Beryl bike parking bays are already located near bus and train stations in the six Cornish towns/city to enable integration with public transport. There may be scope for expanding the 'park and e-bike ride' model, with car parks located on the outskirts of larger towns and shared mobility e-bikes provided. The Tregurra and Langarth Park and Ride locations in Truro, both of which have Beryl parking bays, provide interesting case sites. Both of these approaches, 'Park and e-bike ride' and integrating Beryl bikes with public transport hubs, offer opportunities to reduce car use that are attractive and flexible, and may be especially relevant for particular journey purposes such as commuting.

⁵⁴ Powell, D., & James, E. (2023). How public engagement can support reducing car use: A briefing for policy makers and communicators. [CAST Briefing 21](#).

⁵⁵ Bieliński, T., et al. (2021). Electric bike-sharing services mode substitution for driving, public transit, and cycling. *Transportation Research Part D: Transport and Environment*, 96, 102883, <https://doi.org/10.1016/j.trd.2021.102883>. They found e-bike share is often a component of multimodal journeys for the first and last mile.

5.2 Mode shift and estimating carbon emission reduction

Evidence of mode shift

One objective of this study was to explore whether using Beryl bikes could reduce travel-related carbon emissions in Cornwall. Addressing this question requires empirical data on which travel modes were substituted for a Beryl bike and this was recorded in the weekly travel diary. Participants who used a Beryl bike were asked which mode of transport they would have typically used for their journey(s) before they started using Beryl bikes. Figure 14 reveals *walking* and *using my own vehicle* were the most commonly substituted travel modes. These findings are comparable with evidence of mode shift identified in other studies, although shared e-bike substitution for public transport is more prominent in areas with high population densities⁵⁶.

⁵⁶ 1) Fukushige, T., et al. (2021). Factors influencing dock-less E-bike-share mode substitution: Evidence from Sacramento, California. *Transportation Research Part D: Transport and Environment*, 99, 102990, <https://doi.org/10.1016/j.trd.2021.102990>. E-bike share primarily substitutes for walking and car in Sacramento.
2) Bieliński, T., et al. (2021). Electric bike-sharing services mode substitution for driving, public transit, and cycling. *Transportation Research Part D: Transport and Environment*, 96, 102883, <https://doi.org/10.1016/j.trd.2021.102883>. They found e-bike share primarily substitutes for public transport in the Gdańsk region, which has over one million people.
3) CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://como.org.uk). For bike share, including e-bike share, car substitution was 37%, followed by public transport 24%, walking 15% and personal bicycle 10%. London, Birmingham, Leicester and Manchester are among the cities included in this study.

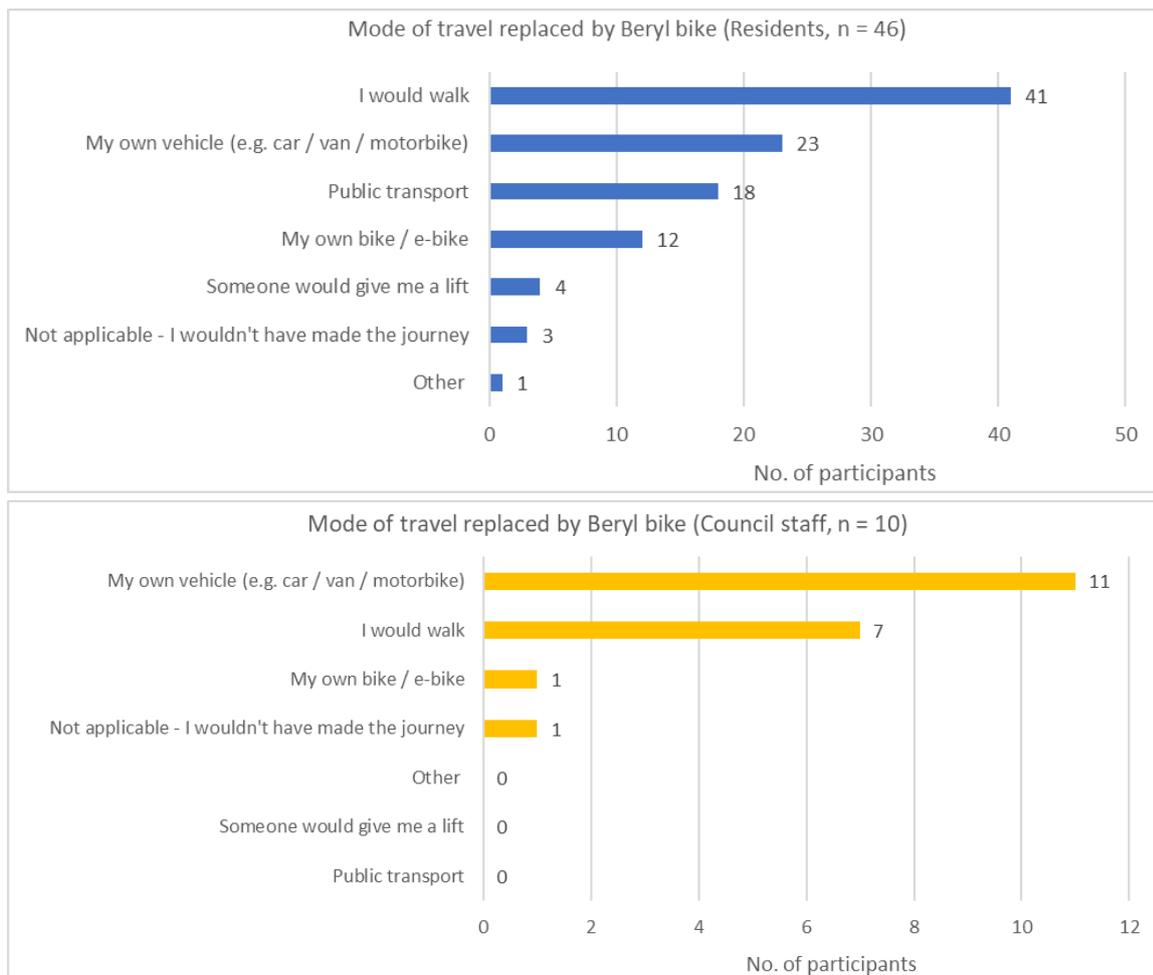


Figure 14, Mode of travel replaced by Beryl bike

Figure 14 requires some interpretation to estimate the potential emission reduction from using e-bike shared mobility. Where a Beryl bike was used for a journey that would not have otherwise occurred, there is no assumption of emission reduction⁵⁷, although evidence of e-bike share inducing trips is encouraging because it indicates wider engagement with active travel. Where Beryl bikes substituted for another form of active travel, such as walking or riding your own bicycle, there is no assumption of emission reduction⁵⁸. The remaining travel

⁵⁷ The frequency of induced e-bike trips was low in this study, only 3.3% of shared e-bike journeys (Figure 14). Given the power required to charge the battery, induced e-bike trips constitute an increase in carbon emissions of 0.04 – 0.61 kg CO₂e per person per year, for the participants in this study. A key determinant of the extent of this increase is whether the electricity was generated from renewable energy sources or fossil fuels. Ultimately, the uptake of active travel is considered a positive behavioural outcome which could lead to mode shift from motorised transport if active travel becomes habitual.

⁵⁸ In this study, 39.3% of shared e-bike journeys substituted walking and 10.7% substituted using own bike or e-bike. Using a shared e-bike is more emission intensive walking or riding your own conventional bicycle. There are currently very few studies comparing the emission intensity of private e-bikes vs e-bike shared mobility; see: Brand et al. (2022), referenced below. Considering substitution for all modes shown in Figure 14, including active modes, e-bike shared mobility could reduce emissions by up to 17.3 kg CO₂e per person per year, but it could also increase emissions by 9.6 kg CO₂e per person per year, primarily due to the increase associated with substituting walking (which is assumed to have zero emissions, excluding the emissions associated with infrastructure provision and dietary intake). Given these wide uncertainty ranges, the calculation below focuses

modes in Figure 14 are *driving my own vehicle, someone giving me a lift, and using public transport*. These modes vary in their emission intensity, but they each entail more carbon emissions per journey than using a Beryl bike (with the possible exception of using public transport⁵⁹). Combining the reported mode shift for residents and Council staff in Figure 14, we find 27.9% of Beryl bike journeys substituted for private car use, 14.8% for public transport, and 3.3% for lift sharing during the study period.

Estimating emission reduction

This section presents an estimate of the emission reduction due to mode shift, from single occupancy car to Beryl bike. Quantifying emission reduction is complex for several reasons: different vehicles emit different levels of CO₂ per km (depending on the model, fuel type, age, and maintenance of the vehicle), road conditions and topography vary, and driver behaviour in terms of fuel efficiency also varies. Furthermore, different studies apply different system boundaries when conducting their Life Cycle Analysis, such as including or excluding the emissions from vehicle manufacture. It is therefore very difficult to provide a precise figure for reduction of CO₂ equivalent per km (CO₂e per km), which can be attributed to mode shift, in an intervention study in real world settings. The calculation below combines empirical data collected in this study with existing Life Cycle Analysis literature to provide an emission reduction *range*⁶⁰, rather than a single emission reduction *figure*. The actual emission reduction due to mode shift in this study likely falls within this range or uncertainty space.

The following assumptions were applied in this quantification:

- Most households in Cornwall own a petrol or diesel car powered only by an internal combustion engine (ICE), rather than a hybrid or electric vehicle⁶¹. The carbon emissions from a petrol or diesel ICE car are therefore used as the baseline in this calculation.

on mode shift from private car to e-bike shared mobility, rather than between active travel modes. The wider evidence base indicates considerable emission savings from private car substitution for short journeys (see section 1.2).

⁵⁹ Brand, C., et al. (2022). Chapter Eleven - Cycling, climate change and air pollution. In: E. Heinen & T. Götschi (eds.), *Advances in Transport Policy and Planning*. Academic Press, 10, 235-264, <https://doi.org/10.1016/bs.atpp.2022.04.010>. They find using a Metro or urban train has lower emissions than using e-bike shared mobility. However, e-bike share has a lower emission intensity than using an ICE bus or electric bus.

⁶⁰ This methodology to provide a range for emission reduction/increase has been used in other studies, for example: Wilson, C., et al. (2020). [Potential Climate Benefits of Digital Consumer Innovations](#). *Annual Review of Environment and Resources*, 45, 113-144.

⁶¹ In this study, 79.5% of residents and 85.7% of Council staff own a petrol or diesel car. This is comparable with a previous study of Cornwall residents, which found 80.0% own a petrol or diesel car. See: Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#). CAST report for Cornwall Council.

- The emissions from using an ICE car in Cornwall are assumed to be comparable with the emissions from ICE vehicles used in the studies and government sources referenced below.
- The emissions from using a Beryl bike in Cornwall are assumed to be comparable with the emissions from using e-bikes or e-bike shared mobility in the studies referenced below.
- Beryl bike journeys are assumed to substitute a single occupancy car journey. There were few cases of Beryl bikes substituting for lift share (see Figure 14).

Quantification of mode shift emission reduction, single occupancy car to Beryl bike:

- Petrol/diesel cars have an emission intensity between **122.1 – 210.5** g CO₂ per km⁶².
- E-bikes and e-bike share have an emission intensity between **14.8 – 74.0** g CO_{2e} per km⁶³.
- If e-bike substitutes a car journey, the difference in emission intensity between petrol/diesel cars and e-bikes provides an emission reduction range of **48.1 – 195.7** g CO_{2e} per km⁶⁴.

⁶² These articles were used to provide the petrol/diesel car emission intensity range:

1) European Parliament (2019).

<https://www.europarl.europa.eu/news/en/headlines/society/20190313STO31218/co2-emissions-from-cars-facts-and-figures-infographics>. They estimate **122.1** g CO₂ per km for passenger cars.

2) Department for Transport (2023). [Journey emission comparisons: October 2023: interactive dashboard \(dft.gov.uk\)](https://www.dft.gov.uk/journey-emission-comparisons-october-2023-interactive-dashboard). Emissions vary depending on the journey, but a short journey from Sunderland to Newcastle (14.3 miles, or 23.0 km) would equate to **139.6** g CO₂ per km for an average petrol car and **140.9** g CO₂ per km for an average diesel car.

3) NimbleFins (2023). [Average CO2 Emissions per Car in the UK | NimbleFins](https://www.nimblefins.com/average-co2-emissions-per-car-in-the-uk). They estimate **138.4** g CO₂ per km for the average car.

4) O'Driscoll, R., et al. (2018). Real world CO₂ and NO_x emissions from 149 Euro 5 and 6 diesel, gasoline and hybrid passenger cars. *Science of The Total Environment*, 621, 282-290, <https://doi.org/10.1016/j.scitotenv.2017.11.271>. They found, for urban driving, **210.5** g CO₂ per km for an average petrol car and **170.2** g CO₂ per km for an average diesel car.

⁶³ These articles were used to provide the e-bike emission intensity range:

1) Stot, S. (2020). [How green is cycling? Riding, walking, ebikes and driving ranked - BikeRadar](https://www.bikeradar.com/news/2020/07/20/how-green-is-cycling-riding-walking-ebikes-and-driving-ranked-bikeradar/). *Bike Radar* [online]. He estimates **14.8** g CO_{2e} per km for private e-bikes.

2) Zhou, Y., et al. (2023). Mode substitution and carbon emission impacts of electric bike sharing systems. *Sustainable Cities and Society*, 89, 104312, <https://doi.org/10.1016/j.scs.2022.104312>. They estimate **19.47** g CO_{2e} per km for e-bike shared mobility.

3) Philips, I., et al. (2022). E-bikes and their capability to reduce car CO₂ emissions. *Transport Policy*, 116, 11-23, <https://doi.org/10.1016/j.tranpol.2021.11.019>. They estimate **22.0** g CO_{2e} per km for private e-bikes.

4) Brand, C., et al. (2022). Chapter Eleven - Cycling, climate change and air pollution. In: E. Heinen & T. Götschi (eds.), *Advances in Transport Policy and Planning*. Academic Press, 10, 235-264, <https://doi.org/10.1016/bs.atpp.2022.04.010>. They estimate between **15.0 – 25.0** g CO_{2e} per km for private e-bikes (excluding the emissions associated with providing infrastructure such as roads and cycle paths). They estimate the emissions from a shared e-bike system can be as high as **74.0** g CO_{2e} per km (excluding the infrastructure component), although this will vary depending on whether or not the bikes require collection and redistribution. This is based on analysis by OECD/ITF 2020. Good to Go? Assessing the Environmental Performance of New Mobility, <https://www.itf-oecd.org/good-go-assessing-environmental-performance-new-mobility>. Paris: International Transport Forum, OECD Publishing.

⁶⁴ The *per km* emission reduction range is calculated by: 1) subtracting the highest emission per km of e-bikes/e-bike share from the lowest emission per km for petrol/diesel cars (i.e., low estimate = 122.1 - 74.0 = **48.1** g CO_{2e}

- In this study, the average distance of a Beryl bike journey was between 2.0 – 3.2 km. Multiplying these distances by the emission reduction per km provides an emission reduction range of **96.2 – 626.2 g CO₂e per journey**⁶⁵.
- In this study, the participants made, on average, between 0.8 – 1.5 Beryl bike journeys per week. Multiplying the weekly journey frequency by 52 weeks equals 41.6 – 78.0 Beryl bike journeys per person per year. Multiplying the number of annual journeys by the emission reduction per journey equals 4001.9 – 48846.7 g CO₂e per person per year (for the scenario of 100% private car substitution⁶⁶).
- In this study, 27.9% of Beryl bike journeys substituted for private car use. Multiplying the emission reduction per person per year by .279 equals 1116.5 – 13628.2 g CO₂e *per person per year*.
- Thus, for the participants in this study, the annual emission reduction due to mode shift from single occupancy car to Beryl bike is **1.1 – 13.6 kg CO₂e per person per year**.
- For context, 13.6 kg CO₂e per person per year is equivalent to 1.2% of the annual travel carbon footprint of a Cornwall resident⁶⁷.

Interpreting these calculations

The carbon emissions per km of an e-bike journey, relative to the emissions per km of an ICE car journey, are considerably lower. This sizeable emission saving per journey, combined with health co-benefits such as increased physical exercise and a reduction in air pollution, is why Cornwall Council and other local authorities are particularly interested in mode shift for short journeys. The annual emission reduction due to mode shift in the above calculation is modest, but this is due to the relative infrequency of Beryl bike journeys made by the participants in this study. This infrequency of journeys should be viewed in the context that

per km), and 2) subtracting the lowest emission per km of e-bikes/e-bike share from the highest emission per km for petrol/diesel cars (i.e., high estimate = 210.5 - 14.8 = **195.7 g CO₂e per km**).

This is broadly similar to Li et al. (2023), who found an emission reduction range of **108 – 120 g CO₂e per km** for e-bike shared mobility, compared to car journeys. See: Li, Q., et al. (2023). Do shared E-bikes reduce urban carbon emissions? *Journal of Transport Geography*, 112, 103697, <https://doi.org/10.1016/j.jtrangeo.2023.103697>.

⁶⁵ The *per journey* emission reduction range is calculated by: 1) multiplying the low estimate emission reduction by the short average distance (i.e., 48.1 g CO₂e per km * 2.0 km = **96.2 g CO₂e per journey**), and 2) the high estimate emission reduction by the long average distance (i.e., 195.7 g CO₂e per km * 3.2 km = **626.2 g CO₂e per journey**)

⁶⁶ The *per person per year* emission reduction range is calculated by: 1) multiplying the low annual frequency by the low emission reduction per journey (i.e., low estimate = 41.6 annual journeys * 96.20 g CO₂e per journey = 4001.9 g CO₂e per person per year), and 2) multiplying the high annual frequency by the high emission reduction per journey (i.e., high estimate = 78.0 annual journeys * 626.24 g CO₂e per journey = 48846.7 g CO₂e per person per year). This maximum range would reflect 100% Beryl bike substitution for car.

⁶⁷ 13.6 kg CO₂e per person per year is 1.2% of the combined annual road and rail transport emissions of a Cornwall resident (road transport emissions is 23% of the total carbon footprint of a Cornwall resident, whereas rail transport accounts for 0.75%; see Cornwall Sector emissions: [The Carbon Neutral Challenge - Cornwall Council](#)). The carbon emissions from aviation (1.5% of the total carbon footprint) and marine navigation (1.75%) are excluded from this calculation, as e-bike shared mobility cannot substitute for these travel modes. This calculation assumes the carbon footprint of the average Cornwall resident is identical to the UK per capita carbon footprint of 4.7 tonnes of CO₂ per year, see: [United Kingdom: CO2 Country Profile - Our World in Data](#).

most participants were trying Beryl bikes for the first time and so using e-bike shared mobility was not yet embedded in their daily travel behaviour. The uptake of bike/e-bike share in the UK and elsewhere⁶⁸ would indicate that, for many people, using shared mobility does become habitual and a regularly used travel option. Comparing the above calculation with other studies, CoMoUK estimates mode shift emission savings to be 71 kg CO₂e per person per year (bike share and e-bike share users combined), whereas a pilot in Sweden found a much higher reduction of 272 – 394 kg CO₂e per person per year (private e-bike users)⁶⁹.

5.3 Users' satisfaction with Beryl bikes

This section presents users' feedback on their experience of Beryl bikes. Those who used a Beryl bike during the study were presented with 14 aspects of Beryl bikes and asked to rate their level of satisfaction (Figure 15). This question was adapted from the CoMoUK survey and some additional aspects were included⁷⁰.

Overall, Beryl bike users reported a high level of satisfaction with the digital components, as indicated by the high mean scores (i.e., above 4) in Figure 15. A high proportion of residents were either somewhat satisfied or very satisfied with the *registration process* (79.4%), the *Beryl app ease of use* (76.5%), and the *bike locking / unlocking process* (73.5%). Most Council staff (90.0 – 100.0%) were also satisfied with these digital components. In the CoMoUK survey, over 70% stated they are fairly or very satisfied with the digital aspects.

The majority of residents were also satisfied with physical features of the bikes such as *comfort* (88.2%), *brakes* (85.3%), and *lights* (75.0%). Council staff reported similar levels of satisfaction (between 80.0 – 100.0%). This is slightly higher than the CoMoUK survey, where two thirds of respondents are fairly or very satisfied with physical features. Residents and Council staff both highlighted *cost*, *the location of the parking bays*, and *the unavailability of bikes in the parking bays* as the aspects they are least satisfied with; these issues are discussed in section 6.

⁶⁸ Galatoulas, N.-F., et al., (2020). Spatio-Temporal Trends of E-Bike Sharing System Deployment: A Review in Europe, North America and Asia. *Sustainability*, 2020, 12(11):4611, <https://doi.org/10.3390/su12114611>.

⁶⁹ Winslott Hiselius, L., & Svensson, Å, (2017). E-bike use in Sweden – CO₂ effects due to modal change and municipal promotion strategies. *Journal of Cleaner Production*, 141, 818-824, <https://doi.org/10.1016/j.jclepro.2016.09.141>.

⁷⁰ CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](#). The CoMoUK survey did not include questions on: *the bike locking / unlocking process* ; *the bike battery charge* ; *availability of bikes in parking bays*.

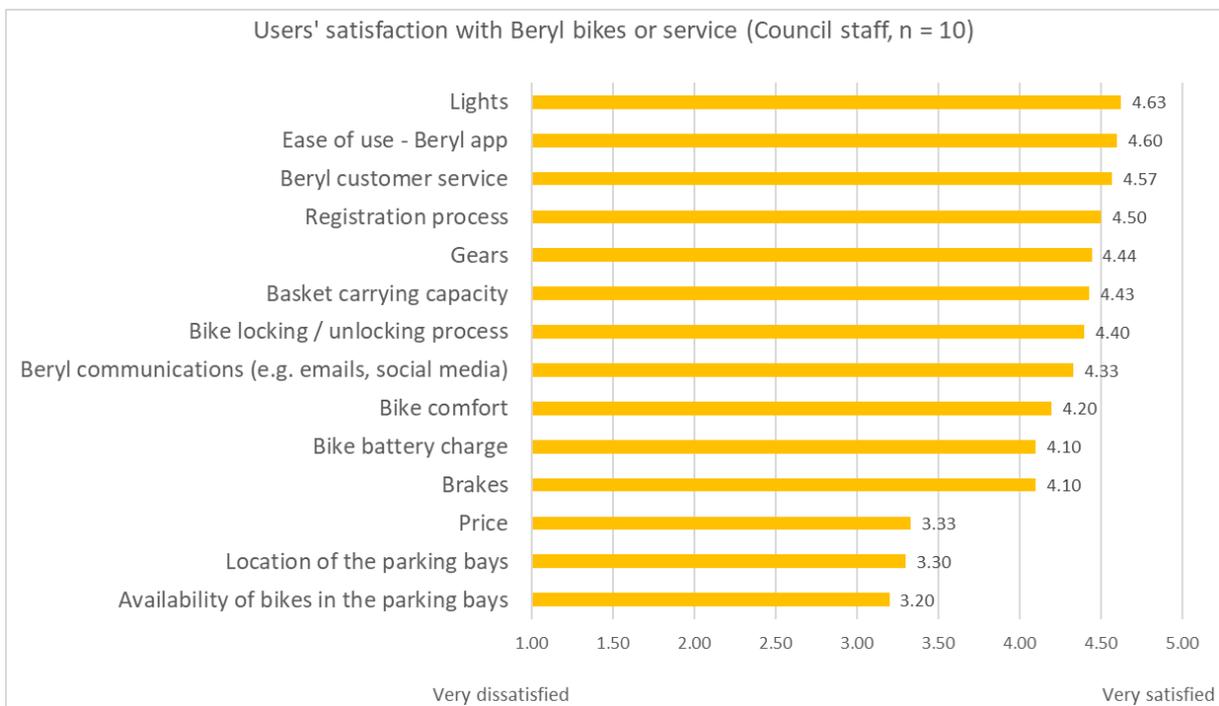
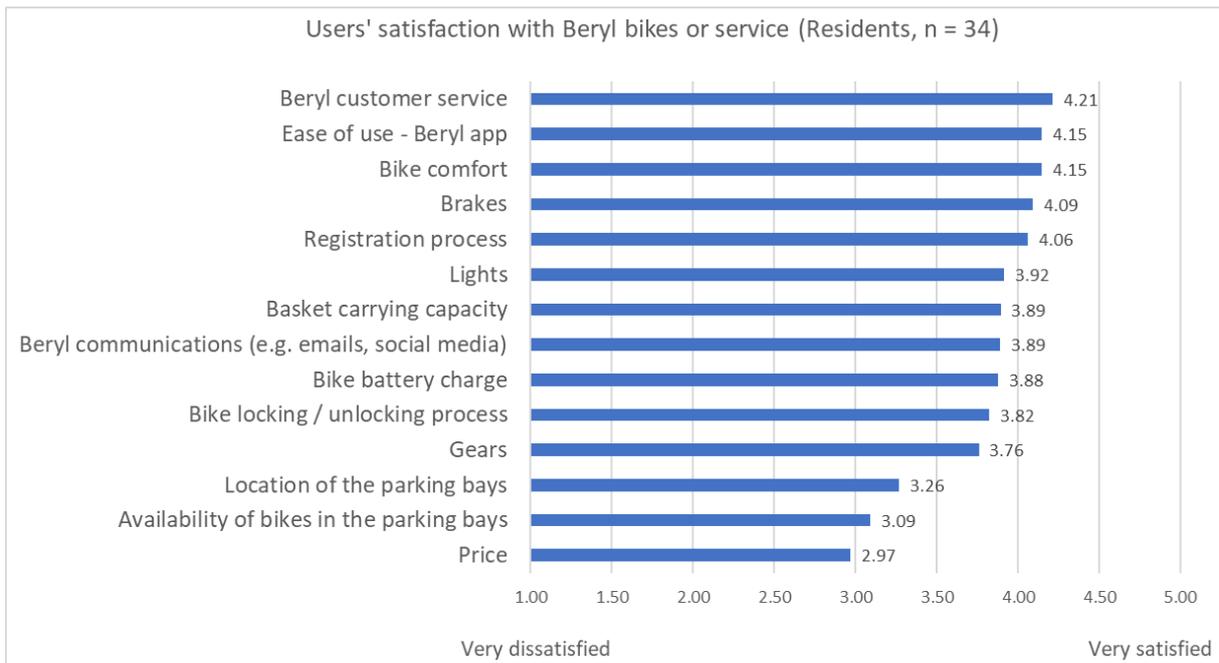


Figure 15, Mean scores of participants' level of satisfaction with Beryl bikes

6 Barriers to the uptake of Beryl bikes

This section describes the barriers to the uptake of Beryl bikes. Identifying these barriers and, where possible, removing them is crucial to motivating Beryl bike adoption. Participants were presented with nine potential barriers in the post-intervention survey and asked which are the three main barriers to people using Beryl bikes in Cornwall. Table 18 shows *road safety concerns, cost, and the location of the parking bays* were the most frequently selected barriers. There is no statistically significant difference in the perception of cost between people on lower incomes and people on higher incomes (Fisher's exact test).

Table 18, Barriers to the uptake of Beryl bikes

Barriers to Beryl bike uptake	Residents (n = 150) (%)	Council staff (n = 13) (%)
Personal safety / busy roads / lack of safe cycling routes	74.0	61.5
Cost of using Beryl bikes	54.7	61.5
Location of parking bays	37.3	53.8
Lack of cycling confidence or competence	37.3	23.1
Long distances / steep hills	34.0	15.4
Lack of availability of bikes in parking bays	24.7	46.2
Lack of awareness about Beryl bikes	23.3	15.4
Beryl bike reliability / battery charge	10.7	7.7
Beryl bike design / comfort	4.0	15.4

These findings can be triangulated with data from the weekly travel diary; any participants who did not use a Beryl bike in a particular week were asked to indicate the reasons why not, from a list of 12 (participants could select multiple reasons). Figure 16 shows the most common reasons were *not needing to use a Beryl bike that week* and *a preference for using their own bike or walking*. However, *safety concerns* and *cost* again emerged as key deterrents, along with *a lack of cycling confidence* and the *unavailability of bikes in the parking bays*. In the CoMoUK survey⁷¹, availability/bike locations was the most important barrier, followed by safety concerns and cost.

⁷¹ CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://como.org.uk).

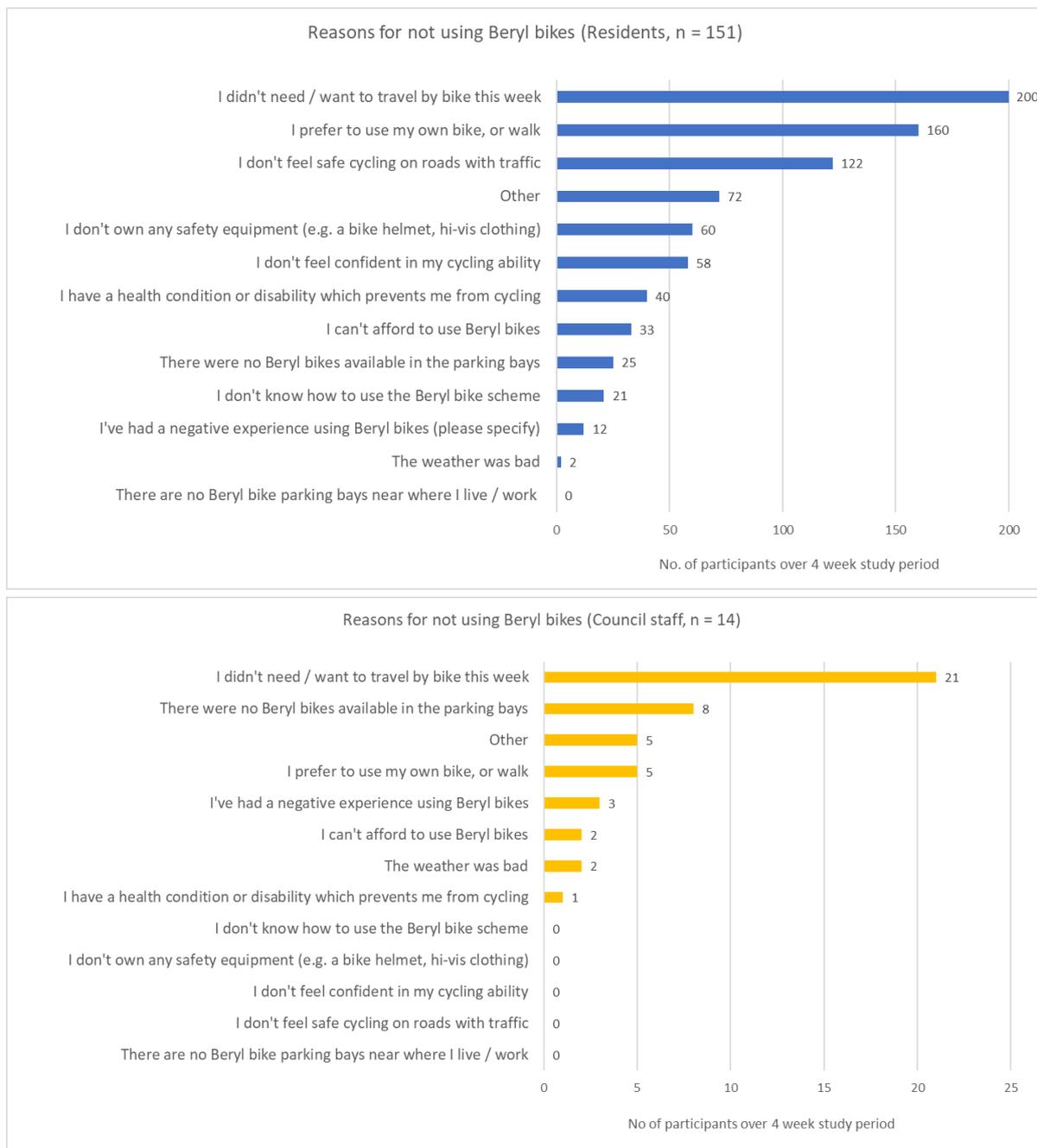


Figure 16, Participants' reasons for not using a Beryl bike during the study period

Participants also provided qualitative feedback on their experience of Beryl bikes (Table 19), with some describing how they could not depend on finding a bike when they wanted to use one. Others described Beryl bikes as expensive both in terms of the unlocking fee and the cost per minute, when compared with alternative travel options. Other negative experiences include bikes that had been vandalised, are under-powered for the steeper hills in Cornwall, or have insufficient battery charge.

Some of these barriers could potentially be addressed by the Council and its partners, for example bike-ability programmes to increase cycling competence among adults⁷², regular monitoring of battery charge and bike distribution, or increasing the number of Beryl bikes overall⁷³. However, perceptions of high cost are more difficult to resolve because there are many expenses related to car ownership, but these are infrequent and so the actual per journey cost of using a car may be less obvious for people to make an accurate comparison. Moreover, establishing an e-bike shared mobility scheme requires considerable upfront investment and Beryl as a service provider will need a financial return to operate⁷⁴.

The qualitative findings revealed other reasons for not using a Beryl bike which do not relate to a negative experience of using the scheme (Table 20). For instance, a Beryl bike may not be suitable for particular journey purpose such as when people need to transport passengers or bulky items, or do a big food shop. For work-related travel, some participants were uncertain if they could cycle to their destination on time. These qualitative insights reveal that daily activities and responsibilities can play an important role in people's choice of travel mode, even if they support using Beryl bikes. Journey purpose and context are therefore important determinants of using bike share, in addition to *cost*, *convenience* and *road safety concerns* as key predictors identified in previous studies⁷⁵.

Finally, participants provided a range of useful suggestions for improving Beryl bikes (Table 21). Overall, this feedback is indicative of the increasing popularity of Beryl bikes because the most frequent recommendations relate to expanding the scheme - by providing more bikes, installing more parking bays in the existing towns, and rolling out Beryl bikes in other towns and villages. Additional suggestions include more information about how the scheme works, allowing a short pause in the journey without being required to park the bike in a bay, providing a helmet with the bike, and catering for families by adding child seats or providing smaller bikes.

⁷² See: [Active Cornwall – Working together for active, healthy and happy lives](#) ; [Cycling | The Cornwall Bicycle Project Cic | England](#) ; [Cycle Training for Everyone - Deliver Safer Training | Bikeability](#)

⁷³ Since this study was conducted, Cornwall Council and Beryl have increased the number of available bikes.

⁷⁴ Cornwall Live news, 3rd May 2023: [Beryl Bikes firm providing Cornwall cycles makes £4 million loss - Cornwall Live](#)

⁷⁵ Bartling, H. (2023). Bike share and user motivation: exploring trip substitution choices among bike share users in a North American city. *International Journal of Sustainable Transportation*, 17:8, 845-854, [10.1080/15568318.2022.2113577](https://doi.org/10.1080/15568318.2022.2113577).

Also see: Fishman, E., et al., (2014). Barriers to bikesharing: an analysis from Melbourne and Brisbane. *Journal of Transport Geography*, 41, 325-337, <https://doi.org/10.1016/j.jtrangeo.2014.08.005>.

Table 19, Negative experiences of using Beryl bikes

Theme	Example quote	Prevalence
No Beryl bikes available in parking bay	"There were no bikes available in several places this week."	22
Beryl bikes are expensive	"Lower prices for both unlocking and per mile."	17
Beryl bikes are mis-used, vandalised or abandoned	"I have come across several abandoned Beryl bikes in tight lanes which also doesn't help with brand image."	15
Beryl bikes are difficult to use or uncomfortable	"The seat adjuster would be impossible for mum or anyone with arthritis to use. It's very stiff."	7
Beryl bikes are not powerful enough for steep hills	"OK on flat and gentle hills, but struggle on 'Cornish Hill'."	6
Low battery charge	"...many of them are consistently out of charge."	4
Beryl app did not work or no internet connection	"I went to use one, but they wouldn't work. I tried 4 bikes, scanned all their QR codes but none worked."	4

Table 20, Reasons for not using Beryl bikes that do not relate to a negative experience of Beryl

Theme	Example quote	Prevalence
Away on holiday or for work	"I was out of the county on holiday."	18
Prefer to use other active modes	"I will try a beryl bike, but I have my own e bike and I like walking."	14
Injury or illness	"Had a back injury so unable to do much this week unfortunately."	8
Beryl bikes are not suitable for carrying bags or equipment	"Not realistic to do supermarket shopping on a bike."	7
A car is required to transport passengers	"Not suitable as have to take passengers and dog."	5
Prefer to use public transport	"I took a bus for longer journeys and walked everywhere else."	4
Do not own a smart phone or averse to using apps	"I think people are also a bit reluctant to use an app to try a Beryl bike for the first time."	4
Did not need or want to use Beryl bikes	"No short journeys this week."	4
Journeys were time sensitive	"All required journeys this week were either time sensitive..."	3
Uncertainty on how Beryl works	"There are no instructions on how to use one for a return journey."	1

Table 21, Suggestions for improving the Beryl bike scheme

Theme	Example quote	Prevalence
Provide more bikes and parking bays	"Increase availability of bikes and parking bays."	51
Publicity on how to use Beryl	"...helpful to have an information board at the Beryl Bike Bays, not everyone is tech savvy and not everyone understands what the scheme is about."	16
Expand Beryl scheme to more towns and villages	"Beryl bikes in more towns, Hayle and St Ives."	12
Adapt bikes and provide smaller bikes to enable travel with children	"Put some child seats on."	9
Provide safety equipment with Beryl bike	"A locked helmet with the bike. New concept but worth a look."	7
Allow Beryl bikes to travel 'out of zone'	"I found that it doesn't enable me to travel "out of zone" which is what I had hoped to use it for..."	5
Allow a pause in Beryl use for quick return journeys	"Allowing a pause time for a shop or club would encourage further uptake."	4
Provide trikes and cargo bikes to cater for users with varying needs	"If there were some 3-wheel bikes they might be of use to disabled people."	4
Allow bikes to be left outside of parking bays	"Enable bikes to be left at chosen destination rather than restricted to a parking zone."	3
Provide Beryl trial sessions	"Giving people a free taster session is great because once people have used [one] I think they would appreciate the convenience and benefits."	3
Provide training on how to ride a Beryl bike	"I need teaching how to use them and cycle training even though I'm a pensioner!"	3
Allow multiple Beryl bikes to be unlocked on one account	"Allow more than one bike to be unlocked on one account."	1
Incentivise longer Beryl journeys	"Rewards or discounts for the more distance you travel rather than per hour cost."	1
Employers provide corporate accounts to use Beryl	"Cornwall Council should provide a 'corporate account' so staff can use the bikes and Council pay for work journeys."	1

7 Social influence and neighbourhood effects

This section describes social influences and potential neighbourhood effects which may affect Beryl bike adoption. Recommendations from people in your social networks and the visibility of people engaging in a particular behaviour can be important drivers of behaviour change⁷⁶.

Social influence

Almost half (45.0%) of resident participants recommended Beryl bikes to someone they know and they spoke to 4.1 people on average. Most (92.3%) Council staff recommended Beryl bikes, to an average of 5.6 people. This willingness to suggest Beryl bikes to friends and colleagues implies people are generally supportive of the scheme, even if they have not used a Beryl bike themselves⁷⁷. In terms of receiving information, 23.8% of residents and 38.5% of Council employees have received a recommendation about Beryl bikes from someone else. Residents and Council staff have received, on average, a recommendation from 1.8 people.

Potential neighbourhood effects

Figure 17 shows participants' awareness of people using Beryl bikes in their town or neighbourhood increased over the study period, both for residents and Council staff. The increase in residents' agreement that '*It's becoming more common for people in my town to use Beryl bikes*' is statistically significant⁷⁸ (the blue bars on the left of Figure 17). Seven participants provided qualitative feedback on this increased visibility, for example: "Whilst walking a little more this week, I noticed more Beryl bikes out and about. It's nice to see they are being used."

⁷⁶ Vrain, E., et al. (2022). Social influence in the adoption of digital consumer innovations for climate change. *Energy Policy*, 162, 112800. <https://doi.org/10.1016/j.enpol.2022.112800>.

⁷⁷ The proportion of participants who have recommended Beryl bikes is higher than the proportion who have used a Beryl bike; 30.5% of residents and 71.4% of Council staff used a Beryl bike during this study.

⁷⁸ A paired samples t-test revealed residents' level of agreement that '*It's becoming more common for people in my town to use Beryl bikes*' increased in the post-intervention survey (3.64 ± 1.12), compared to the pre-intervention survey (3.36 ± 1.15), a statistically significant increase of 0.28 (95% CI, 0.003 to 0.554), $t(150) = 1.995$, $p = .048$. The remaining between-groups differences in Figure 17 are not statistically significant.

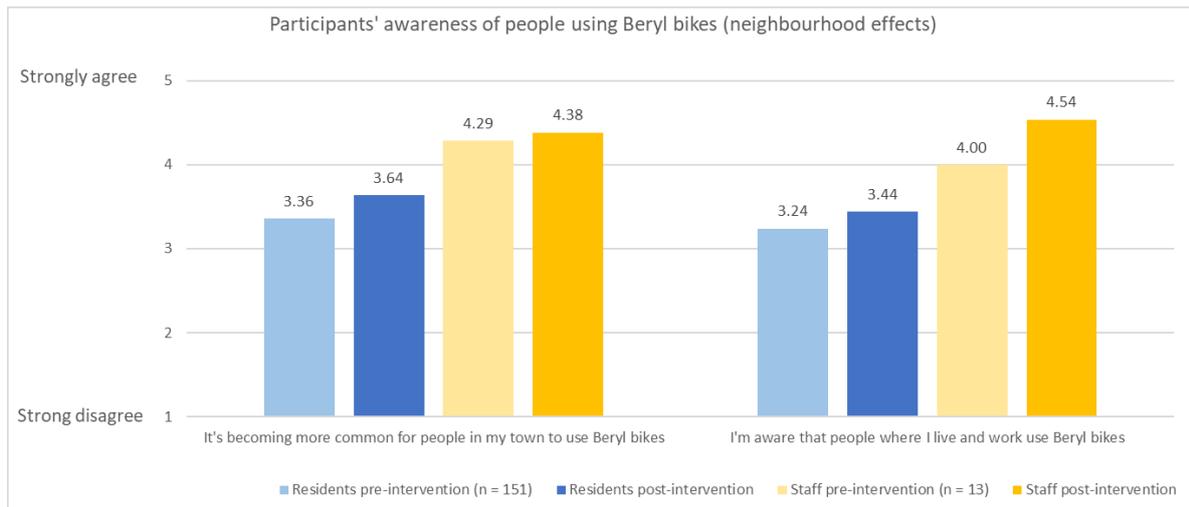


Figure 17, Mean scores of participants' awareness of people using Beryl bikes (pre- and post-intervention survey)

8 Effectiveness of the behaviour change interventions

This section presents findings on how effective the two interventions were in encouraging the uptake of Beryl bikes and active travel. Various indicators were used: the adoption of Beryl bikes, journey frequency and duration using active modes, frequency of car use for short journeys, and levels of physical activity over the study period.

8.1 Use of Beryl bikes by each intervention group

Overall, nearly one-third of residents (30.5%; $n = 46$) used a Beryl bike during this study. Figure 18 shows the proportion of each intervention group that used a Beryl bike during the study⁷⁹. Relative to the control group (A) that did not receive an intervention, a higher proportion of residents in each of the three intervention groups (B, C, D) used a Beryl bike. This finding would suggest that both intervention 1 (free Beryl bike credits for one month) and intervention 2 (the Pen portraits visioning tool) were effective in encouraging uptake of Beryl bikes. However, a Chi-square test revealed no statistically significant difference in the uptake of Beryl bikes between the four intervention groups. This lack of statistical significance is likely due to the low statistical power of relatively small sample sizes⁸⁰. The data was further explored by combining intervention groups to boost sample sizes, but again, no statistically significant differences were found⁸¹.

Council staff represent a separate sample⁸² for intervention group C and so the findings are not shown in Figure 18. Of the Council employees who completed the data collection activities, 71.4% used a Beryl bike during the study ($n = 10$). This sample may not be representative of the Council workforce as these individuals chose to register for the promotion to receive free Beryl bike credits and so have a discernible interest in active travel. Nevertheless, this high rate of uptake among employees is encouraging. Further analysis revealed a statistically significant difference in uptake between residents and Council staff⁸³.

⁷⁹ Percentages of each intervention group are presented, rather than the number of participants in each group. This is because there is an unequal number of participants in each group, due to varying drop-out rates during the study. Participants were randomly assigned to one of the four intervention groups in the pre-intervention survey, with 50 participants in each group.

⁸⁰ As mentioned earlier, the sample sizes were diminished by a relatively high drop-out rate, which is an inherent risk when conducting longitudinal studies. Of the 198 residents who started the study, 151 completed it, which is a drop-out rate of 23.7%. Of the 27 Council staff who started the study, 14 completed all of the activities, which is a drop-out rate of 48.1%.

⁸¹ Fisher's exact tests revealed no statistically significant differences in the uptake of Beryl bikes between:

- 1) those who received free Beryl bike credits (groups C + D) and those who did not (groups A + B)
- 2) those who received the visioning tool (groups B + D) and those that did not (groups A + C)
- 3) those who received an intervention of any kind (groups B + C + D) and those who did not (group A)

⁸² Council staff did not receive the Pen portraits visioning tool and were not allocated to the control group; they only received free Beryl bike credits (i.e., allocation to group C). Therefore, we cannot conduct between-groups statistical analysis to assess the effectiveness of the two interventions for the Council staff sample.

⁸³ A greater proportion of Council employees (71.4%) used a Beryl bike in this study, compared to the proportion of residents who used a Beryl bike in this study (30.5%). A Fisher's exact test revealed this difference in

This suggests the allocation of free credits may be more effective at motivating adoption of Beryl bikes among target groups of individuals who make similar, frequent journeys (i.e., commuting or work-related travel), than for groups with more heterogenous journey destinations.

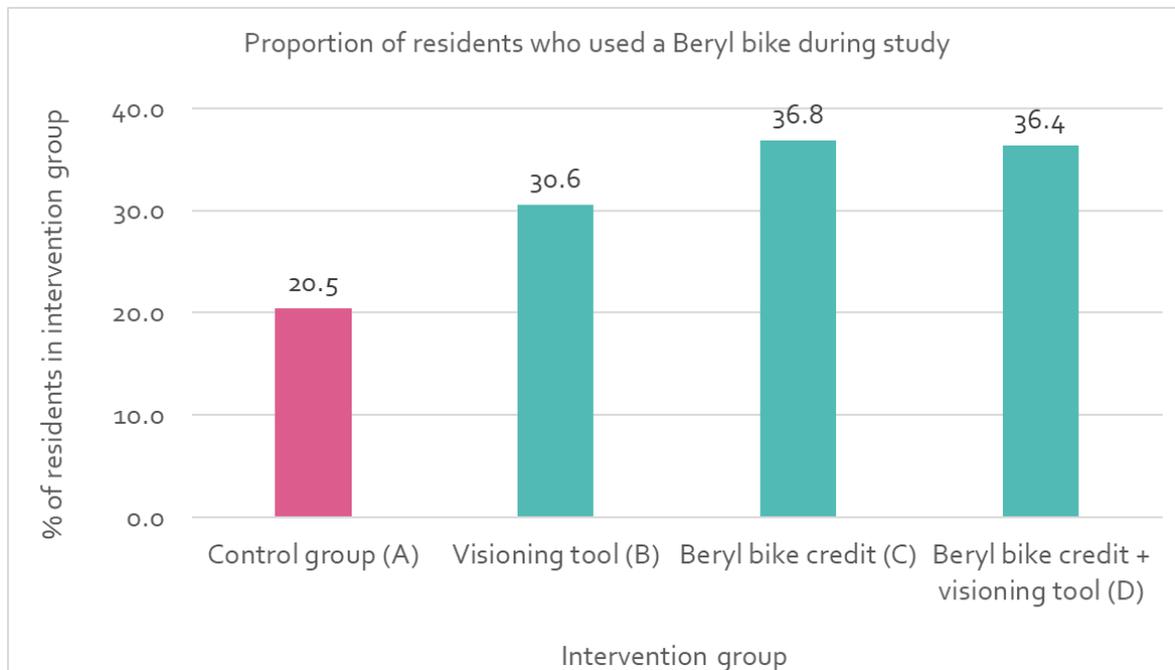


Figure 18, Proportion of each intervention group that used a Beryl bike during the study

8.2 Visioning tool to reduce car use

The second intervention in this study was the Pen portraits visioning tool⁸⁴, which was presented to residents that were allocated to Groups B and D. These participants were asked: "please consider your personal situation...where you live in Cornwall, your job, your family commitments, your transport needs. Then choose the character which you think might be the closest to your situation." Table 22 shows which characters the participants selected; *older couple living in a rural area* and *middle income parents* were the most common. The visioning tool can be found in Appendix 11.1.

proportions is statistically significant, $p = .005$, although one of the cell counts was less than 5 (Council staff who did not use a Beryl bike, $n = 4$).

⁸⁴ Prosser, A., et al. (2022). Developing an evidence-based toolkit for car reduction. See: [CAST Report on Pen Portraits Project Main report web.pdf \(dropbox.com\)](#).

Table 22, 'Pen portrait' characters selected by recipients of the visioning tool intervention

Pen portrait characters	Residents (from Groups B & D)	
	Frequency	(%)
an older couple living in a rural area	21	33.9
middle-income parents	20	32.3
a young adult living in an urban area	15	24.2
a small business owner	4	6.5
a single parent on lower income	2	3.2
a young adult who uses a wheelchair	0	0.0

After reading the character's story, participants were asked to reflect on whether they found the story relevant to their own lives and travel needs. Figure 19 shows over half (53.4%) believe the story is *somewhat relevant*. This finding indicates that presenting narratives of low-carbon travel and the potential co-benefits of reducing car use resonates with some people, but not all. The mean score for perceived relevance was 2.62 which, for comparison, is lower than the study of Scottish residents using these pen portraits, where mean scores ranged from 3.03 to 3.73⁸⁵.

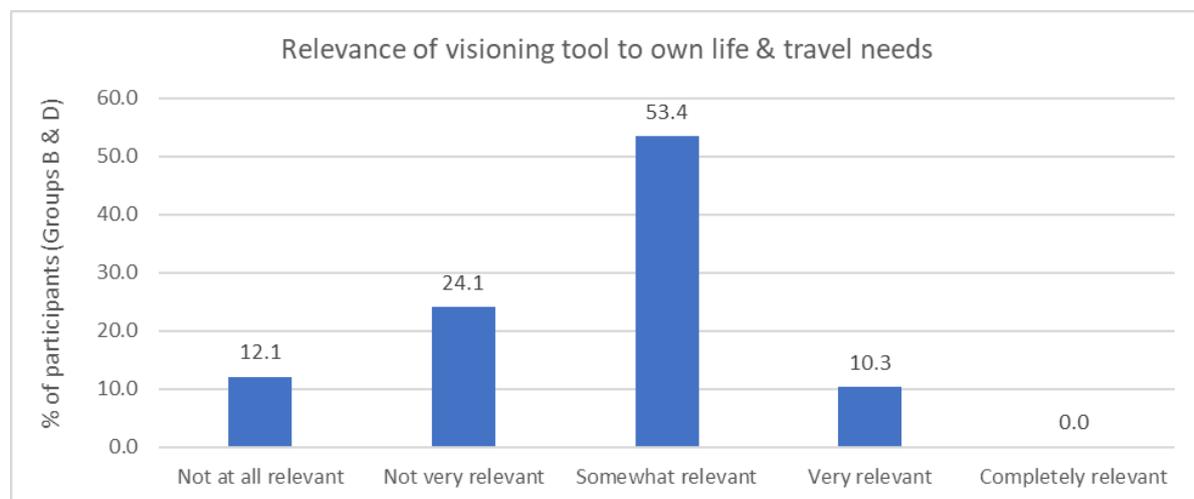


Figure 19, Perceived relevance of the visioning tool to participants' lives and travel needs

The participants were then asked two questions about the potential impact of the visioning tool on their travel behaviour: 1) to what extent the scenario made them feel they could reduce their car use (the dark blue bars in Figure 20), and 2) whether the story gave them ideas for how they might change how they travel in Cornwall or reduce their need to travel

⁸⁵ Prosser et al. (2022) present a range of mean scores that relate to participants' perceptions of the pen portrait character they chose. The mean score for each of the six characters was calculated using a 5 point scale where *not at all relevant* = 1 and *completely relevant* = 5.

(the light blue bars). The most common response for both questions was *a little* and this indicates the visioning tool did not have a significant impact on changing travel behaviours. The mean score for reducing car use was 2.00 which is somewhat lower than the study of Scottish residents, where mean scores ranged from 2.50 to 3.13⁸⁶. The mean score for generating ideas about changing travel behaviour or reducing the need to travel was 1.77 (this question was not presented to Scottish residents).

This low perceived impact could be because the participants did not find the visioning tool useful in terms of presenting novel ideas or highlighting possible lifestyle benefits of reducing car use. However, it could also reflect structural barriers such as limited active travel infrastructure and public transport services (see sections 2 and 9.2) which constrain participants' capacity to reduce their car use, irrespective of whether they wish to. Considering the 60.9% of residents that would like to reduce their car use (see section 2, Table 8), there is evidently a desire for mode shift, but some may feel unable to alter their travel behaviours.

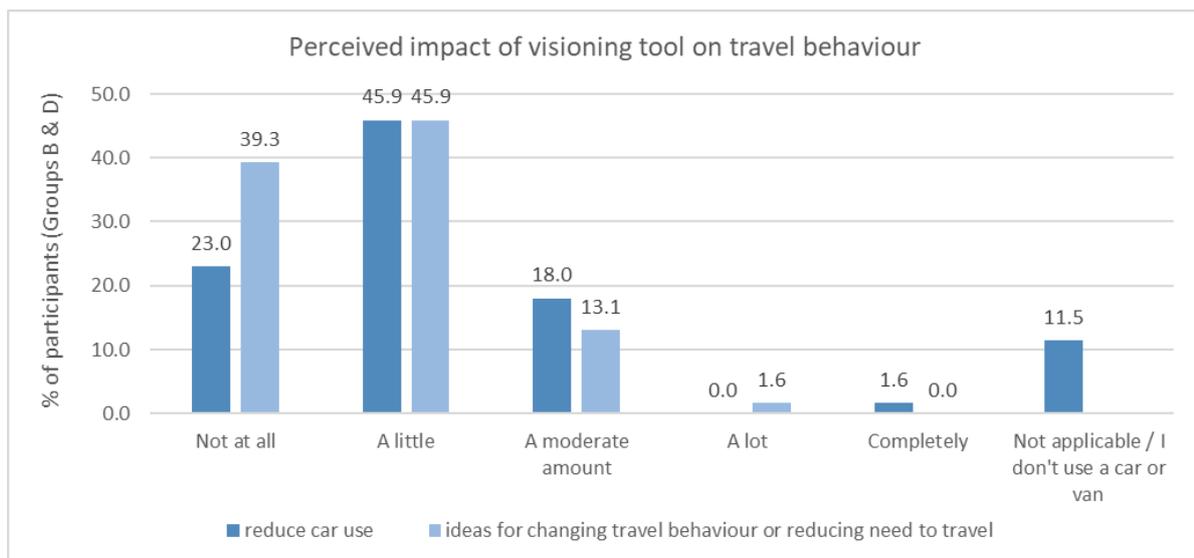


Figure 20, Perceived impact of the visioning tool on participants' travel behaviours

8.3 Measuring changes in travel behaviour and physical activity

One objective of this study was to measure any changes in travel behaviour which could be attributed to the interventions and this data is presented below.

⁸⁶ As with perceived relevance, Prosser et al. (2022) present a range of mean scores for the perceived impact of the visioning tool in reducing car use, that relates to the six pen portrait characters. The mean scores were calculated using a 5 point scale where *not at all* = 1 and *completely* = 5.

Impact of Beryl bikes on cycling behaviour

One benefit of bike share is that it can motivate non-cyclists to re-engage with cycling, or to cycle for the first time ever. Beryl bike users in this study were asked about their cycling behaviour prior to hiring a Beryl bike. The results are presented in Table 23 and we can see that hiring a Beryl bike encouraged one in six residents to start cycling after a long break, or to cycle for the first time (14.7%, 2.9%). In addition, approximately one in five residents (17.6%) and Council staff (20.0%) started cycling after a shorter break. These impacts are smaller than those reported in the CoMoUK survey⁸⁷, but this Cornwall study nevertheless provides further evidence that bike share schemes encourage the uptake of active travel among people who may have a lower propensity to use active modes. Engaging these 'harder to reach' social groups and providing mode shift options that are feasible and accessible to them is crucial for achieving equitable, low-carbon travel goals.

Table 23, Impact of Beryl bike use on participants' cycling behaviour

Impact of Beryl bike use on cycling behaviour	Residents (%)	Council staff (%)
Encourage to cycle for the first time ever	2.9	0.0
Encourage to cycle for the first time after a long break (5 years or more)	14.7	0.0
Encourage to cycle for the first time after a shorter break (less than 5 years)	17.6	20.0
No change, I was already cycling	61.8	80.0
Don't know / Not applicable	2.9	0.0

Commute journey frequency using different travel modes

Participants were asked in the pre-intervention and post-intervention surveys how many commute journeys they make per week using different modes of transport⁸⁸. These questions investigated whether mode shift occurred during this study. Car (travelling alone) is the most frequently used form of travel for residents (46.4%) and for Council staff (50.0%). However, many residents also use public transport (17.9%) and active modes (37.4%) to get to their place of work or study. Half of the Council staff participants use active travel for their commute. Residents' mean journey frequency increased for most travel modes in the post-intervention survey⁸⁹ (Table 24), although the differences are not statistically significant

⁸⁷ CoMoUK Annual Bike Share Report 2022. Available at: [Document > Bike Share Annual Report UK 2022 \(como.org.uk\)](https://como.org.uk). They found bike share motivated 7-8% of respondents to cycle for the first time ever, 27-43% to cycle for the first time after a long break (5 years or more), and 27-30% to cycle after a shorter break (1-4 years). The ranges are based on gender.

⁸⁸ Participants were informed that travelling there and back would count as two separate journeys.

⁸⁹ There is no clear reason for this increase in residents' commute journey frequency in the post-intervention survey (Table 24, below). The increase in non-commute journey frequency could reflect participants taking more leisure time or holiday during July (Tables 26 and 27).

(paired samples t-tests). Further analysis found no differences between the four intervention groups, nor between Beryl bike users and non-users. There were no statistically significant differences in Council staff's commute journeys before and after the intervention (Table 25).

Table 24, Residents' commute journey frequency

Residents' commute journeys per week	Pre-intervention no. of residents	Post-intervention no. of residents	Pre-intervention mean	Post-intervention mean
Walking or Wheeling	34	39	5.1	10.1
Bicycle (including electric bike)	23	33	3.7	7.7
Scooter (including electric scooter)	0	1	0	1.0
Motorbike	1	0	1.0	0
Car / van (travelling alone)	70	73	4.7	7.2
Car / van (sharing lifts with others)	24	30	3.3	6.6
Car club (e.g., Co Cars)	0	1	0	20.0
Bus	21	26	3.9	5.7
Train	6	17	5.3	5.5
Other	6	3	4.8	4.3
N/A - I don't work or I work entirely from home	32	34	-	-

Table 25, Council staff's commute journey frequency

Council staff commute journeys per week	Pre-intervention no. of employees	Post-intervention no. of employees	Pre-intervention mean	Post-intervention mean
Walking or Wheeling	4	4	6.5	5.3
Bicycle (including electric bike)	3	6	3.3	10.8
Scooter (including electric scooter)	0	0	0	0
Motorbike	0	0	0	0
Car / van (travelling alone)	7	7	3.3	12.9
Car / van (sharing lifts with others)	1	2	2.0	3.0
Car club (e.g., Co Cars)	0	0	0	0
Bus	0	0	0	0
Train	1	1	8.0	8.0
Other	0	0	0	0
N/A - I don't work or I work entirely from home	5	2	-	-

Non-commute journey frequency using different travel modes

Participants were also asked how many non-commute journeys they make per week using different modes (Tables 26 and 27). Single occupancy car journeys are prevalent for residents (56.3%) and Council employees (64.3%). However, active travel is comparatively more common for non-commute journeys, with 86.1% of residents and 85.7% of Council staff using active modes. Residents' mean journey frequency increased for all travel modes in the post-intervention survey, and the increase for walking or wheeling is statistically significant. However, the increases in residents' car journeys (travelling alone and sharing lifts) are also statistically significant⁹⁰, and so there is no clear evidence of mode shift from car to active modes. Further analysis found statistically significant increases in walking or wheeling frequency for residents who received the visioning tool and those who received free Beryl bike credits. However, these groups also increased their car use and so these results reflect broader trends for all residents over the study period, rather than the interventions having a clear impact on non-commute travel behaviour.

⁹⁰ Paired samples t-tests revealed:

- 1) Residents' weekly frequency of walking / wheeling non-commute journeys increased in the post-intervention survey (11.95 ± 18.45), compared to the frequency in the pre-intervention survey (5.29 ± 3.53), a statistically significant increase of 6.66 (95% CI, 2.14 to 11.19), $t(61) = 2.944$, $p = .005$.
- 2) Residents' weekly frequency of car non-commute journeys (single occupancy) increased in the post-intervention survey (8.25 ± 9.53), compared to the frequency in the pre-intervention survey (4.67 ± 3.73), a statistically significant increase of 3.58 (95% CI, .68 to 6.49), $t(47) = 2.481$, $p = .017$.
- 3) Residents' weekly frequency of car non-commute journeys (sharing lifts) increased in the post-intervention survey (6.82 ± 4.81), compared to the frequency in the pre-intervention survey (4.59 ± 2.97), a statistically significant increase of 2.23 (95% CI, .12 to 4.33), $t(21) = 2.199$, $p = .039$.

Table 26, Residents' non-commute journey frequency

Residents' non-commute journeys per week	Pre-intervention no. of residents	Post-intervention no. of residents	Pre-intervention mean	Post-intervention mean
Walking or Wheeling	97	99	5.3	11.9
Bicycle (including electric bike)	33	51	3.1	5.5
Scooter (including electric scooter)	0	1	0	2.0
Motorbike	1	3	1.0	1.7
Car / van (travelling alone)	85	89	4.7	8.3
Car / van (sharing lifts with others)	51	68	4.6	6.8
Car club (e.g., Co Cars)	0	0	0	0
Bus	27	32	2.8	3.8
Train	8	16	1.5	2.0
Other	2	2	9.0	6.5
N/A - I tend to stay at home	5	2	-	-

Table 27, Council staff's non-commute journey frequency

Council staff non-commute journeys per week	Pre-intervention no. of employees	Post-intervention no. of employees	Pre-intervention mean	Post-intervention mean
Walking or Wheeling	10	10	9.9	27.8
Bicycle (including electric bike)	2	7	2.0	5.0
Scooter (including electric scooter)	0	0	0	0
Motorbike	0	0	0	0
Car / van (travelling alone)	9	10	5.0	12.5
Car / van (sharing lifts with others)	6	5	6.7	9.0
Car club (e.g., Co Cars)	0	0	0	0
Bus	0	2	0	1.5
Train	1	2	2.0	2.5
Other	2	0	0	0
N/A - I tend to stay at home	1	0	-	-

Work-related journey frequency using different travel modes

Council staff were asked about the frequency of trips they make as part of their job role (Table 28). The majority of Council employees (57.1%) use a car (travelling alone), although some also walk or wheel (28.6%). There were no statistically significant differences in journey frequency before and after the intervention (paired samples t-tests).

Table 28, Council staff's work-related journey frequency

Council staff work-related journeys per week	Pre-intervention no. of employees	Post-intervention no. of employees	Pre-intervention mean	Post-intervention mean
Walking or Wheeling	4	1	1.8	10.0
Bicycle (including electric bike)	0	1	0	2.0
Scooter (including electric scooter)	0	0	0	0
Motorbike	0	0	0	0
Car / van (travelling alone)	8	5	2.4	5.0
Car / van (sharing lifts with others)	2	2	1.5	2.5
Car club (e.g., Co Cars)	0	0	0	0
Bus	0	0	0	0
Train	0	1	0	2.0
Other	0	0	0	0
N/A - I don't need to travel in my job role	3	7	-	-

Frequency of car use for short journeys

One of the Council's aspirations for Beryl Bikes is that the scheme will encourage car substitution for short journeys⁹¹. Participants were therefore asked how often they use a car for short journeys (i.e., less than three miles). Table 29 shows residents' frequency of short car journeys increased in the post-intervention survey, which likely reflects the overall increase in car use identified in Tables 24 and 26. Beryl bike users (2.90) have a lower mean frequency than non-users (3.24) in the post-intervention survey, but the difference is not statistically significant (independent samples t-test). There were no statistically significant differences between the four intervention groups' frequency of short car journeys before and after the intervention (paired samples t-tests; two-way mixed ANOVA).

⁹¹ Cornwall Council news, 22nd February 2023: [Cornwall's e-bikers rack up the miles as cycle share scheme expands to Penzance - Cornwall Council](#).

Table 29, Frequency of short car journeys

	Pre-intervention		Post-intervention	
	Mean number of days per week	Median number of days per week	Mean number of days per week	Median number of days per week
Residents	2.94	3	3.14	3
Council staff	3.54	3	3.23	3
Beryl bike users (residents)	2.45	2	2.90	3
Non-Beryl users (residents)	3.17	3	3.24	3

Non-Beryl users' travel behaviours

Residents who did not use a Beryl bike were asked in the travel diary whether their use of active travel, public transport or lift-sharing had changed in the past week, compared to a typical week (Figure 21). This question was included to identify any broader change in travel behaviours over the study period, aside from using a Beryl bike, which could be attributed to the interventions. These findings could then be triangulated with journey frequency presented in Tables 24 and 26. No clear trends were identified for public transport or lift-sharing. However, one in four residents reported using active travel 'a bit more' and one in five reported 'a lot more', compared to a typical week.

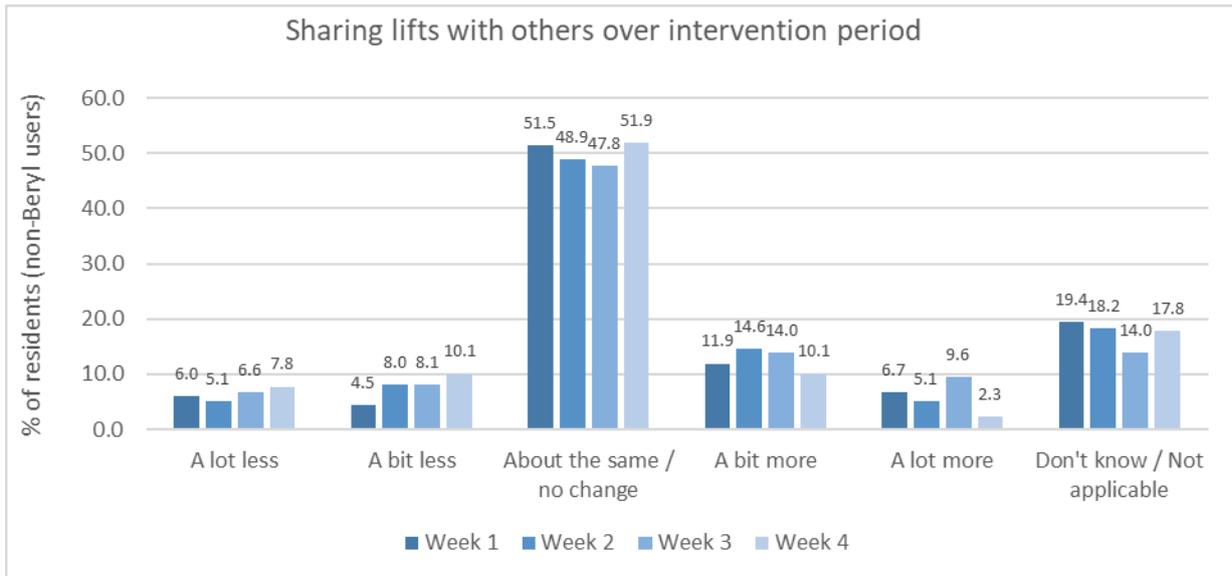
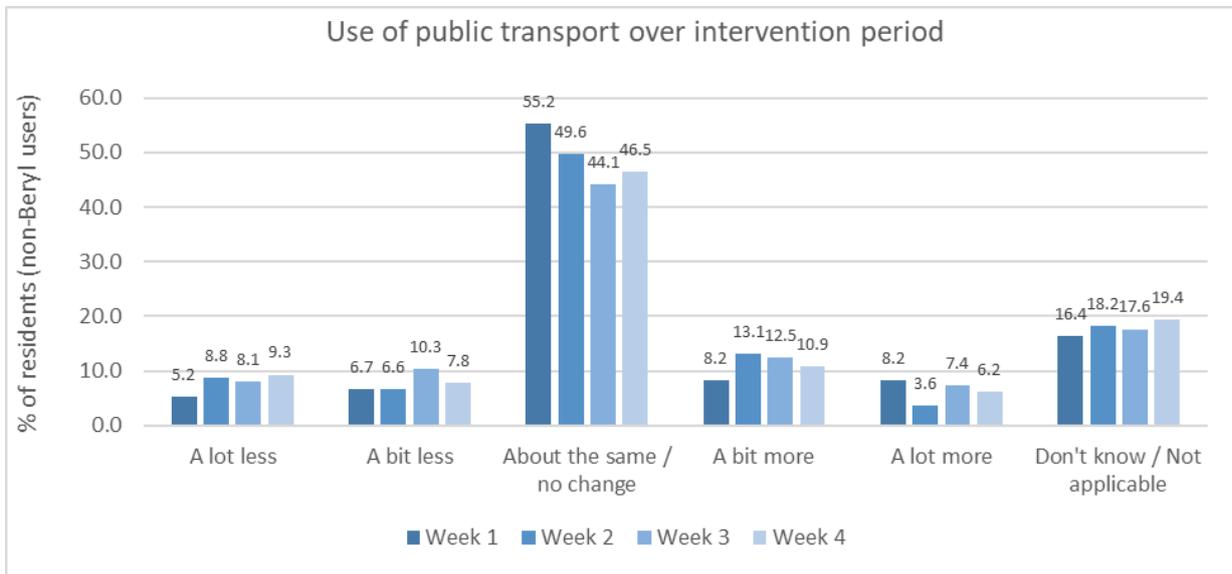
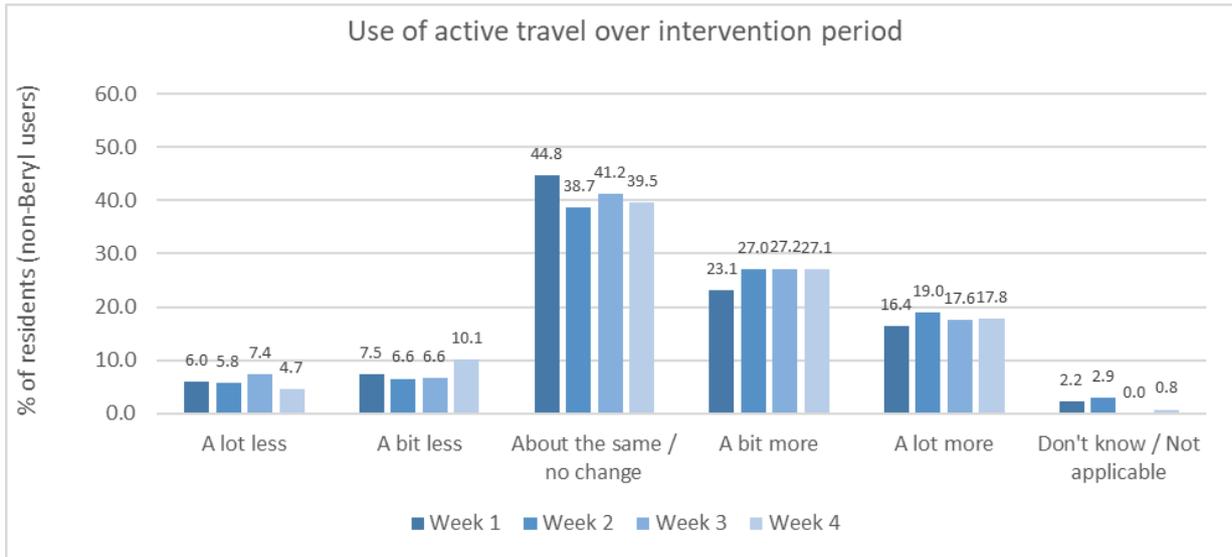


Figure 21, Non-Beryl users' change in travel behaviours over the intervention period (residents only)

Measuring change in physical activity

Participants' activity level was investigated to determine whether increased active travel may encourage increased physical exercise as a health spillover effect. Participants were asked how many hours per week they spend doing three types of physical activity⁹²:

- Exercise (such as swimming, jogging, aerobics, football, tennis, gym workout etc.)
- Cycling (including cycling to work and during leisure time)
- Walking or wheeling (including to work, shopping, for pleasure etc.)

Figure 22 shows residents and Council staff increased the duration of all three types of physical activity over the study period⁹³. The increase in Council employees' time spent walking or wheeling is statistically significant⁹⁴. Further analysis found no statistically significant differences in physical activity before and after the intervention for the four intervention groups, nor for Beryl bike users (paired samples t-tests).

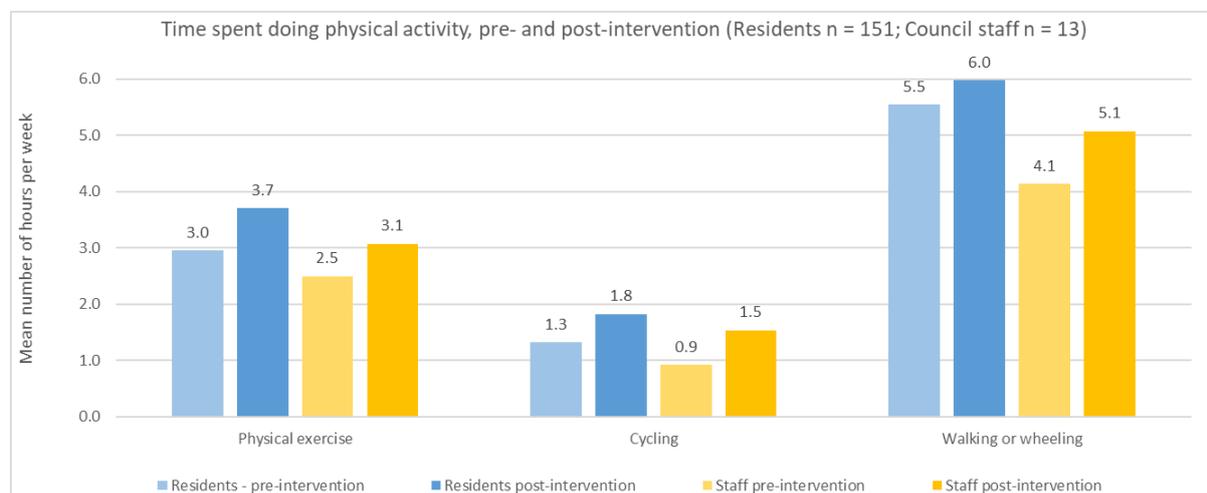


Figure 22, Weekly duration of physical activity during the study period

⁹² This question was adapted from the General Practice Physical Activity Questionnaire, a screening tool commonly used in routine general practice to provide a simple physical activity index. See: National Health Service (2013), [General practice physical activity questionnaire \(GPPAQ\) - GOV.UK \(www.gov.uk\)](http://www.gov.uk).

⁹³ It is not possible to directly compare residents and Council staff in terms of the number of hours per week, as they were presented with slightly different scales. The scale used for residents was '0 – 10' hours per week, whereas the Council staff scale was '0 – 6 or more' hours per week. This may decrease the Council staff mean, relative to residents.

⁹⁴ A paired samples t-test revealed Council employees' weekly duration of walking or wheeling increased in the post-intervention survey (5.08 ± 1.80), compared to the weekly duration in the pre-intervention survey (4.00 ± 1.83), a statistically significant increase of 1.08 (95% CI, .242 to 1.91), $t(12) = 2.809$, $p = .016$.

9 Public opinion on the Council's climate action and travel policies

In addition to trialling the two active travel interventions, this study explored the views of people living in Cornwall on various travel policies. These include 'push policies' which restrict or discourage car use and 'pull policies' which encourage greater use of public transport, active travel and shared mobility. Participants also provided qualitative feedback on a wide range of actions they believe Cornwall Council should take.

9.1 Level of support for travel policies

Measuring public support for push policies

Participants were asked to what extent they would support or oppose four travel policies to help tackle climate change. There is strong support among residents for 20 mph speed zones and Low Traffic Neighbourhoods (the green segments in Figure 23) and this is consistent with, and even exceeds, the level of support identified in previous research on Cornwall residents' perceptions⁹⁵. Public opinion on car parking restrictions is somewhat divided and one in three residents is opposed to this measure, although this opposition is less pronounced than in the previous study where almost half of residents were opposed. There is relatively strong support among Council staff for car parking restrictions, although this sample may not be representative of the Council's workforce as they have a discernible interest in active travel.

People who would like to reduce their car use, those with an undergraduate or postgraduate degree, and those with greater concern about climate change and air pollution are more supportive of all four push policies. Beryl bike users are more supportive of Low Traffic Neighbourhoods, whereas people who live in urban areas are more supportive of Low Emission Zones. People who do not own a car are more supportive of parking restrictions⁹⁶.

⁹⁵ Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#). CAST report for Cornwall Council.

The recent introduction of 20 mph speed restrictions in Wales has been very effective; see BBC news, 21st Feb 2024: [Wales' 20mph limit: Average speed down 4mph after switch - BBC News](#).

⁹⁶ Independent samples t-tests and Welch t-tests revealed (for the resident sample):

- 1) A Welch t-test revealed people who would like to reduce their car use are more supportive of low traffic neighbourhoods ($4.18 \pm .95$) than people who are not interested in reducing their car use (2.89 ± 1.42), a statistically significant difference of 1.29 (95% CI, .70 to 1.89), $t(33) = 4.450$, $p = .001$
- 2) A Welch t-test revealed people who would like to reduce their car use are more supportive of low emissions zones (3.73 ± 1.30) than people who are not interested in reducing their car use (2.56 ± 1.60), a statistically significant difference of 1.17 (95% CI, .49 to 1.86), $t(36) = 3.483$, $p = .001$
- 3) A Welch t-test revealed people who would like to reduce their car use are more supportive of 20 mph speed zones ($4.21 \pm .97$) than people who are not interested in reducing their car use (2.93 ± 1.54), a statistically significant difference of 1.28 (95% CI, .64 to 1.92), $t(32) = 4.085$, $p = .001$
- 4) An independent samples t-test revealed people who would like to reduce their car use are more supportive of restricted car parking in workplaces and town centres (3.20 ± 1.26) than people who are not interested in

There were no statistically significant differences in the level of support based on other grouping variables such as age, gender, having children living at home, income, owning a bike, or having a longstanding health condition (independent samples t-tests).

reducing their car use (2.00 ± 1.33), a statistically significant difference of 1.20 (95% CI, .64 to 1.75), $t(117) = 4.281, p = .001$

5) An independent samples t-test revealed people with an undergraduate or postgraduate degree are more supportive of low traffic neighbourhoods (4.11 ± 1.08) than people who do not have a degree (3.62 ± 1.18), a statistically significant difference of .49 (95% CI, .10 to .87), $t(142) = 2.491, p = .014$

6) A Welch t-test revealed people with an undergraduate or postgraduate degree are more supportive of low emissions zones (3.88 ± 1.26) than people who do not have a degree (2.94 ± 1.48), a statistically significant difference of .94 (95% CI, .45 to 1.43), $t(87) = 3.834, p = .001$

7) A Welch t-test revealed people with an undergraduate or postgraduate degree are more supportive of 20 mph speed zones ($4.24 \pm .98$) than people who do not have a degree (3.68 ± 1.32), a statistically significant difference of .56 (95% CI, .14 to .99), $t(78) = 2.666, p = .009$

8) An independent samples t-test revealed people with an undergraduate or postgraduate degree are more supportive of restricted car parking in workplaces and town centres (3.33 ± 1.36) than people who do not have a degree (2.70 ± 1.33), a statistically significant difference of .63 (95% CI, .16 to 1.10), $t(142) = 2.673, p = .008$

9) A Welch t-test revealed people who are very or extremely worried about climate change are more supportive of low traffic neighbourhoods ($4.31 \pm .77$) than people who are less concerned about climate change (not at all worried, not very worried, somewhat worried; 3.19 ± 1.40), a statistically significant difference of 1.12 (95% CI, .71 to 1.54), $t(71) = 5.454, p = .001$

10) A Welch t-test revealed people who are very or extremely worried about climate change are more supportive of low emissions zones (4.03 ± 1.10) than people who are less concerned about climate change (2.61 ± 1.50), a statistically significant difference of 1.42 (95% CI, .96 to 1.88), $t(85) = 6.106, p = .001$

11) A Welch t-test revealed people who are very or extremely worried about climate change are more supportive of 20 mph speed zones ($4.38 \pm .82$) than people who are less concerned about climate change (3.33 ± 1.45), a statistically significant difference of 1.05 (95% CI, .62 to 1.48), $t(72) = 4.881, p = .001$

12) An independent samples t-test revealed people who are very or extremely worried about climate change are more supportive of restricted car parking in workplaces and town centres (3.44 ± 1.27) than people who are less concerned about climate change (2.46 ± 1.38), a statistically significant difference of .98 (95% CI, .54 to 1.42), $t(149) = 4.410, p = .001$

13) A Welch t-test revealed people who are very or extremely worried about air pollution are more supportive of low traffic neighbourhoods ($4.44 \pm .82$) than people who are less concerned about air pollution (not at all worried, not very worried, somewhat worried; 3.61 ± 1.23), a statistically significant difference of .83 (95% CI, .51 to 1.17), $t(144) = 5.004, p = .001$

14) A Welch t-test revealed people who are very or extremely worried about air pollution are more supportive of low emissions zones (4.13 ± 1.18) than people who are less concerned about air pollution (3.19 ± 1.45), a statistically significant difference of .94 (95% CI, .51 to 1.38), $t(128) = 4.335, p = .001$

15) A Welch t-test revealed people who are very or extremely worried about air pollution are more supportive of 20 mph speed zones ($4.44 \pm .95$) than people who are less concerned about air pollution (3.76 ± 1.26), a statistically significant difference of .68 (95% CI, .32 to 1.04), $t(135) = 3.763, p = .001$

16) An independent samples t-test revealed people who are very or extremely worried about air pollution are more supportive of restricted car parking in workplaces and town centres (3.61 ± 1.38) than people who are less concerned about air pollution (2.80 ± 1.31), a statistically significant difference of .80 (95% CI, .36 to 1.26), $t(149) = 3.356, p = .001$

17) An independent samples t-test revealed Beryl bike users are more supportive of low traffic neighbourhoods (4.28 ± 1.03) than non-users (3.74 ± 1.19), a statistically significant difference of .54 (95% CI, .14 to .94), $t(149) = 2.666, p = .009$

18) A Welch t-test revealed people who live in urban areas are more supportive of low emissions zones (3.76 ± 1.27) than people who live in rural areas (3.30 ± 1.53), a statistically significant difference of .46 (95% CI, .01 to .91), $t(147) = 2.015, p = .046$

19) An independent samples t-test revealed people who do not own or have regular access to a car are more supportive of restricted car parking in workplaces and town centres (3.81 ± 1.25) than people who own a car (2.98 ± 1.38), a statistically significant difference of .83 (95% CI, .20 to 1.47), $t(149) = 2.600, p = .010$

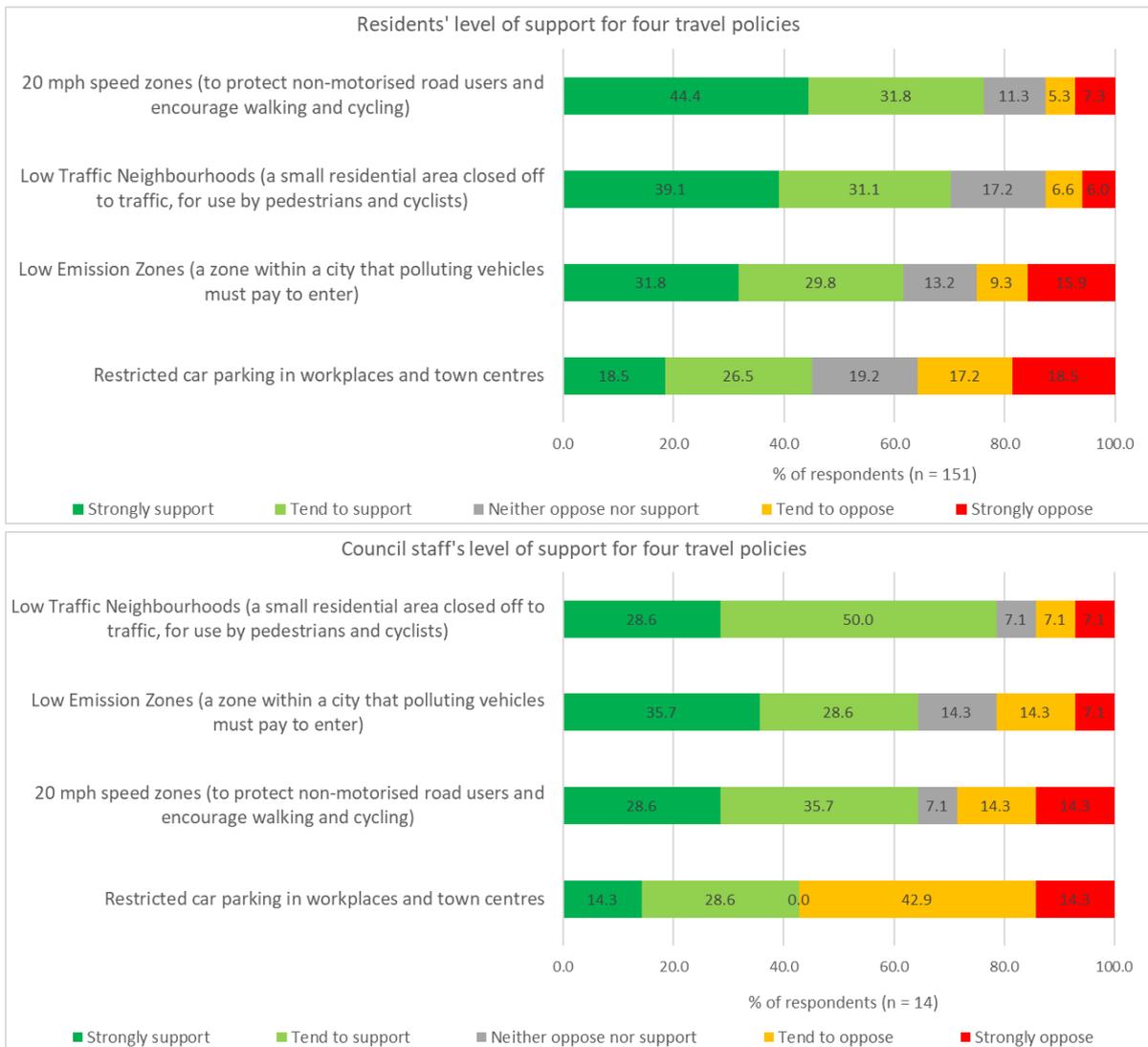


Figure 23, Participants' level of support for, or opposition to, four travel policies

Measuring public support for a Workplace Parking Levy

A Workplace Parking Levy is a push policy which was implemented by Nottingham City Council in 2012, raising almost £90 million for investment in sustainable public transport. This investment, together with a comprehensive Local Transport Plan, has reduced traffic congestion in Nottingham by 47% and transport-related carbon emissions by 58%⁹⁷. Despite these successes, it remains the only Workplace Parking Levy in operation in the UK. Several local authorities are exploring whether a Workplace Parking Levy would be feasible for the cities or regions they represent and some have initiated public consultations⁹⁸. In this study,

⁹⁷ Transport Nottingham (2022). Nottingham's Workplace Parking Levy 10 Year Impact Report. Available at: [Ten years on: Nottingham's Workplace Parking Levy keeps the city moving ahead – Transport Nottingham](#); Also see: [Workplace Parking Levy - Nottingham City Council](#)

⁹⁸ For example: [Workplace Parking Levy \(WPL\) - City of Edinburgh Council - Citizen Space](#) ; [Workplace parking levy | Oxfordshire County Council](#).

participants were presented with the following explanation and asked to what extent they would support a Workplace Parking Levy:

“A Workplace Parking Levy is a Council charge on employers who provide workplace car parking, with the money to be invested in improving public transport and the cycle lane network in Cornwall. Employers can decide whether to absorb the cost or pass it on to their employees who use the parking spaces.”

Figure 24 shows 45% of residents and 60% of Council staff oppose the policy. However, there is some variation in opinion because one in three residents support a Workplace Parking Levy, together with 15% of Council staff. Beryl bike users are more supportive of a Workplace Parking Levy than non-users⁹⁹. There were no statistically significant differences in the level of support based on other grouping variables such as car ownership, living in a rural or urban area, commute distance, gender, income, or level of climate concern (independent samples t-tests).

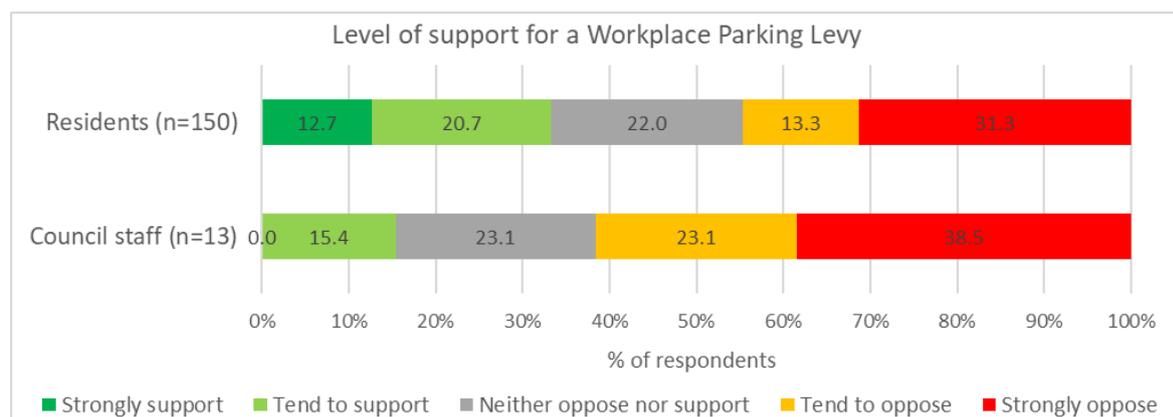


Figure 24, Participants' level of support for a Workplace Parking Levy

Further engagement and consultation with residents and staff, highlighting Nottingham as a replicable model and the potential benefits it could generate in Cornwall, may increase public support. This consultation should consider whether some people may be disproportionately affected because they have less capacity to adjust their car use, for example those who live in rural areas without adequate public transport, or people with disabilities. Perceived fairness is one of the most important determinants of acceptability of climate policy and so if a measure is considered to be unfair to particular social groups, this

⁹⁹ An independent samples t-test revealed Beryl bike users are more supportive of a Workplace Parking Levy (3.11 ± 1.35) than non-users (2.52 ± 1.42), a statistically significant difference of .59 (95% CI, .10 to 1.08), $t(148) = 2.376, p = .019$

increases the likelihood of opposition¹⁰⁰. Public engagement is essential not only to ensure the legitimacy of a new policy, but also to increase levels of trust between the public and policymakers, and to provide a sense of hope and agency that local authorities are working with communities to act on climate change¹⁰¹.

Transport improvements to reduce multiple vehicle households

Participants with two or more vehicles in their household were presented with five transport improvements and asked to what extent these measures would encourage their household to reduce their vehicle ownership to only one car or van. Figure 25 shows improved public transport services and active infrastructure are the most popular pull policies, with over 65% of residents and 80% of Council staff indicating these measures would encourage them to downsize to one vehicle. The remaining three measures are different models of shared mobility and over one-third of residents indicated these improvements would not influence their vehicle ownership at all. These individuals may have had a negative experience of using shared mobility, or they simply do not consider it feasible for their personal circumstances. What we can infer is that the majority of participants are not opposed to reducing their vehicle ownership *in principle*, given the high proportion who would consider downsizing if more active travel or public transport options were available.

People with children living at home are less convinced that greater availability of car club vehicles or Beryl bikes would encourage them to reduce their household's vehicle ownership. People with an undergraduate or postgraduate degree are more confident that greater availability of Beryl bikes would encourage them to reduce their household's vehicle ownership¹⁰². There were no statistically significant differences based on other grouping variables such as driving intention, living in a rural or urban area, commute distance, age,

¹⁰⁰ Mitev, K., et al. (2023). [The implications of behavioural science for effective climate policy \(CAST\) - Climate Change Committee \(theccc.org.uk\)](#). Also see: Powell, D., & James, E. (2023). How public engagement can support reducing car use: A briefing for policy makers and communicators. [CAST Briefing 21](#).

¹⁰¹ Powell, D., & James, E. (2023). How can politicians avoid a net-zero backlash? The role of public engagement: a briefing for policy makers and communicators. [CAST Briefing 20](#). Also see: Capstick, S., et al. (2020). Climate Change Citizens' Assemblies. [CAST Briefing 03 - Climate Change Citizens' Assemblies](#).

¹⁰² Independent samples t-test revealed (for the resident sample):

1) Multiple vehicle households with children (under 18) are less certain that greater availability of car clubs would encourage them to reduce their vehicle ownership ($1.48 \pm .87$), compared to multiple vehicle households without children living at home (2.17 ± 1.03), a statistically significant difference of .69 (95% CI, .17 to 1.2), $t(61) = 2.625, p = .011$

2) Multiple vehicle households with children (under 18) are less certain that greater availability of Beryl bikes would encourage them to reduce their vehicle ownership ($1.50 \pm .78$), compared to multiple vehicle households without children living at home (2.36 ± 1.05), a statistically significant difference of .86 (95% CI, .37 to 1.34), $t(67) = 3.510, p = .001$

3) People with an undergraduate or postgraduate degree who live in multiple vehicle households are more certain that greater availability of Beryl bikes would encourage them to reduce their vehicle ownership (2.36 ± 1.03), compared to those without a degree who live in multiple vehicle households (1.76 ± 1.00), a statistically significant difference of .60 (95% CI, .11 to 1.10), $t(64) = 2.430, p = .018$

gender, income, or concern about climate change or air pollution (independent samples t-tests).

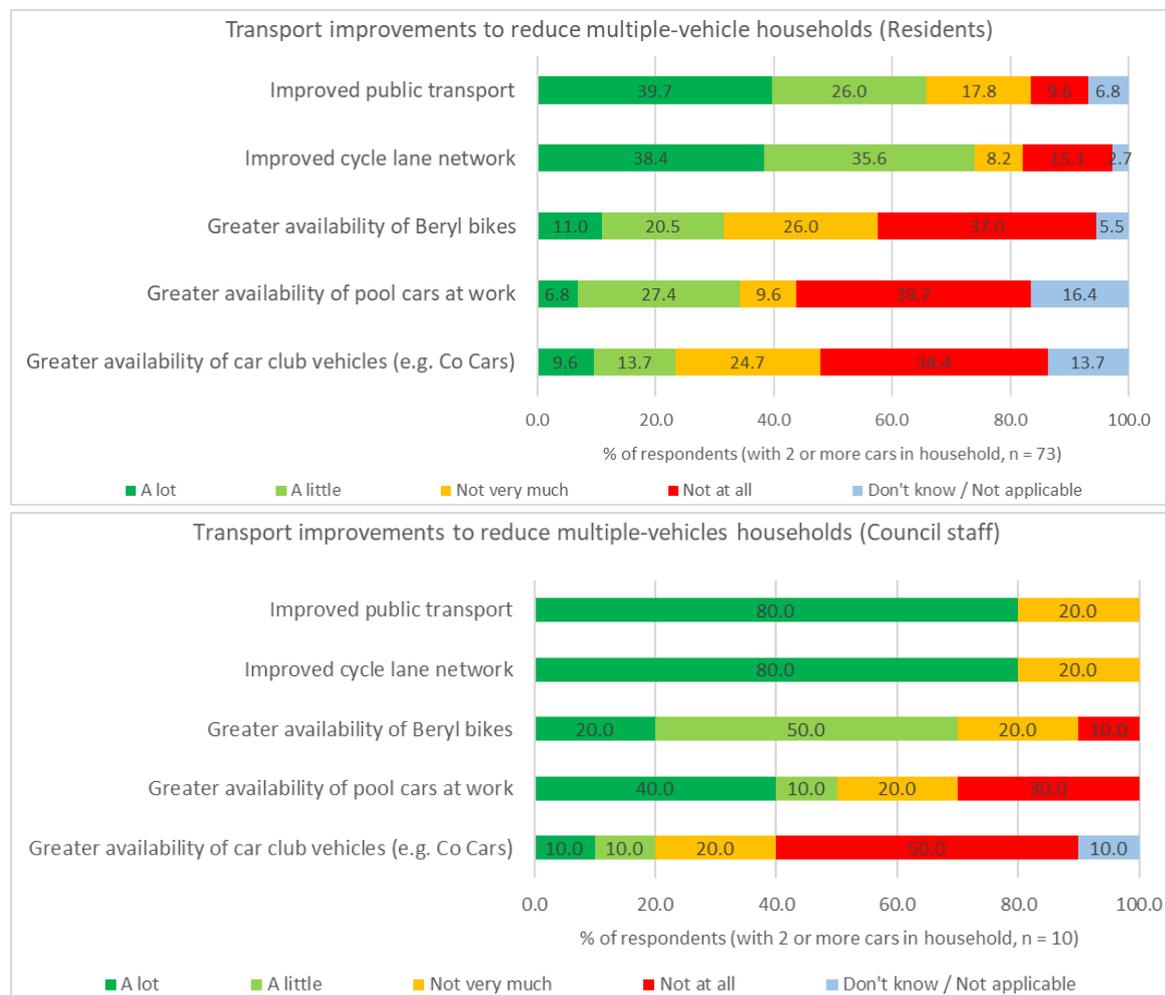


Figure 25, Perceived impact of transport improvements to reduce multiple-vehicle households

There are 32 million cars on the roads in Great Britain and the number of multiple vehicle households is increasing¹⁰³. These trends highlight the challenge of shifting away from private car use. Car clubs offer a flexible, cost-effective alternative to car ownership but there are currently only 5,167 car club vehicles operating across the UK¹⁰⁴, and so car clubs remain inaccessible to many people. Previous research has identified further barriers to adoption including *cost*, *inconvenience* (i.e., the need to plan ahead, having to travel to collect the vehicle), *competences* (i.e., using an unfamiliar vehicle, anticipated hassle with learning how the scheme works), and *personal factors* (i.e., childcare responsibilities, commuting behaviour,

¹⁰³ Department for Transport (2021). [Vehicle Licensing Statistics: April to June 2021 \(publishing.service.gov.uk\)](https://www.gov.uk/government/publications/vehicle-licensing-statistics-april-to-june-2021). There was a small decrease in the number of multiple vehicle households in 2022, which likely reflects increased remote working during the pandemic and a re-evaluation of household needs for car travel. However, the long term trend is towards increasing multiple vehicle ownership.

¹⁰⁴ Department for Transport (2023). <https://www.gov.uk/government/publications/car-clubs-local-authority-toolkit>

habits, a preference for car ownership)¹⁰⁵. Some of these barriers may be reflected in the low perceived impact of expanding car clubs on vehicle ownership in Figure 25.

Recommendations for overcoming these barriers include highlighting societal benefits such as reduced traffic congestion, free trial sessions so potential adopters can experience shared mobility (and potentially have an opportunity to try an electric vehicle), and targeting car owners with pro-environmental attitudes or younger people who may have less identity attachment to car ownership¹⁰⁵.

9.2 Qualitative findings - Council actions to reduce travel-related carbon emissions

Participants were asked their views on the most important actions Cornwall Council should take to reduce carbon emissions related to travel, or to support active ways to travel. Of the 165 participants who completed the study, 137 residents and 11 Council staff provided qualitative feedback. There are twelve overarching topics which are grouped into two broad categories, 'pull' measures and 'push' measures. Stronger enforcement of existing traffic regulations are presented in the push category.

This qualitative data is insightful for two reasons. First, this is the participants' opportunity to articulate their opinions to the Council in their own words. Their suggestions were varied and encompass multiple policy areas, particularly around the Council's role in enabling active travel, improving public transport, and a reprioritisation away from cars in favour of pedestrians by creating more traffic-free space and increasing road safety. Second, this data provides a greater level of detail on some key themes explored in previous questions. For example, there are eleven distinct sub-themes under the general topic of 'encourage or enable active travel' (see Table 30). Consistent with the quantitative findings presented in section 9.1, and with the wider evidence base¹⁰⁶, there is strong support for 'pull policies' and fewer examples of 'push policies'.

¹⁰⁵ See: 1) Burghard, U., & Dütschke, E. (2019). Who wants shared mobility? Lessons from early adopters and mainstream drivers on electric carsharing in Germany. *Transportation Research Part D: Transport and Environment*, 71, 96-109, <https://doi.org/10.1016/j.trd.2018.11.011>.

2) Sopjani, L., et al. (2020). Shared mobility services versus private car: Implications of changes in everyday life. *Journal of Cleaner Production*, 259, 120845, <https://doi.org/10.1016/j.jclepro.2020.120845>.

3) Kreemers, L. M., et al. (2021). Behavioural perspective on car owners' uptake of shared e-mobility: Car owners' motives for, and barriers to, trying out a vehicle from a Smart Shared Green Mobility Hub. Research group Psychology for Sustainable Cities - Amsterdam University of Applied Sciences. Available at: [21 MEMO eHubs Hva.pdf](#).

¹⁰⁶ The Climate Assembly UK - The Path to Net Zero (2020) <https://www.climateassembly.uk/report>. Also see, recent polling: Ipsos and CAST - Net Zero Living (2022) <https://www.ipsos.com/sites/default/files/ct/publication/documents/2022-06/net-zero-living-ipsos-cast-2022.pdf>

Pull policies and measures

Tables 30 - 37 present qualitative feedback on pull policies or measures. Increasing active travel infrastructure so that people can walk and cycle safely was, by some margin, the most common recommendation. Public transport that is affordable, frequent, reliable, and connects to remote rural areas is another priority. Some participants emphasised a need for the Council to engage with the public to change perceptions around low-carbon travel, as well as provide road awareness training for motorists and cyclists to improve road safety. Installing more electric vehicle charging points was another key suggestion.

Table 30, Council actions to encourage or enable active travel

Theme	Example quote	Prevalence
Increase cycle path network	"Build more dedicated cycle lanes joining towns."	99
Increase walking path network and safeguard 'right of way'	"Audit the public footpath network in Cornwall. Many paths are in poor condition or have terrible access points."	17
Improve signage and maintenance of cycle paths	"...vegetation and grass growing over the tarmac making pathways and cycle lanes so narrow they are no longer usable."	9
Provide secure bike storage in towns	"Introduce secure public cycle parking in town centres."	7
Incentivise active travel	"Subsidise the purchase of e bikes (in addition to the cycle to work scheme)."	7
Provide cycling proficiency training	"A cycle training scheme especially for active retired people would make me feel a lot more confident about using bikes."	5
Provide more pedestrian crossings	"Provide a pedestrian crossing at the junction of Slades Rd and Tregonissey Rd in St Austell."	4
Provide secure bike storage and shower facilities at work	"Help employers provide cycle commute friendly facilities - parking, showering etc."	3
Follow successful models from other countries	"Use Paris/Amsterdam as an example."	3
Prohibit dogs on cycle paths	"Clear cycle lanes with no dogs allowed - trip hazard posed by leads."	2
Establish walking buses to school	"Reduce school time congestion with travel to school with walking buses."	1

Table 31, Public transport provision

Theme	Example quote	Prevalence
Cheaper public transport	"Subsidised travel on buses and trains."	51
Increase connectivity and services to remote areas	"There are rural areas that are not possible to access by public transport."	34
More frequent public transport	"Increase the frequency and reliability of buses within large towns and to connect towns and villages to one another."	32
Improve public transport (not specific) ¹⁰⁷	"Improve public transport."	27
More reliable public transport	"...a bus system that is reliable and actually turns up. Too often buses do not arrive, so people then tend to not rely on them."	15
Reduce public transport journey duration / provide direct services	"Public transport links for that journey would take more than 1.5 hours so I have had to drive due to time limits."	11
Invest in electric buses and taxis	"Get electric buses, they give out loads of emissions."	10
Expand public transport schedule (early mornings, evenings, weekends)	"I use buses a lot in Cornwall: the joined up ticketing and £5 daily fare is great but there are few services in the evenings."	10
Expand Park & Ride	"Newquay needs a park and ride, especially in the summer."	9
Improve integration between different travel modes	"Improve integrated travel so that public transport supports cycle travel."	8
Allow bikes on buses	"Allow bikes on buses."	2
Increase bike spaces on trains	"I have been unable to get my bike onto any train in Cornwall, making it easier to just drive."	2
Invest in zero carbon ferries	"Zero carbon ferries"	1
Nationalise public transport	"Nationalise the bus and rail companies and put the control back in the public's hand..."	1

¹⁰⁷ Some participants' responses refer to a broad theme or action but do not provide any explanatory detail and these are indicated by: (not specific)

Table 32, Public engagement to change travel behaviours and attitudes

Theme	Example quote	Prevalence
Encourage active travel	"The council could promote active travel, such as walking and cycling..."	13
Provide road awareness training for drivers	"Promote a BIG education programme for motorists to know that a stated case in LAW is that a cyclist is entitled to wobble! i.e. give us 6 feet minimum clearance when passing."	9
Encourage use of public transport	"Engaging the public in choosing alternatives...How walking, car sharing, using local buses, electric bikes and the train could reduce their carbon footprint."	5
Encourage car sharing	"Make it so that you cannot park at hotspot locations unless you are car sharing/pooling."	5
Change social norms which deter mode shift	"There seems to be a social stigma around public transport and cycling that needs to change."	4
Provide road awareness training for cyclists	"Encourage cyclists to wear high vis clothing and display lights during the day."	4
Encourage remote working	"Encourage more working from home to reduce commuting."	3
Promote electric vehicles	"Promote the use of electric vehicles."	2
Encourage employers to provide travel plans	"Getting workplaces involved in active travel schemes."	2

Table 33, Shared transport provision

Theme	Example quote	Prevalence
Provide e-scooters	"Beryl bikes in my home town (Hayle) would be great, or e-scooters."	4

Table 34, Enable uptake of electric vehicles

Theme	Example quote	Prevalence
Provide more EV charging infrastructure	"Provide more fast electric charging points."	10
Incentivise EV purchase	"Electric cars are incredibly expensive and do something to reduce the cost by at least 50%."	3

Table 35, Reduce the need for travel by providing local services

Theme	Example quote	Prevalence
Improve local services	"Improve town centre shopping so people don't drive to out of town supermarkets/retail parks."	4
Provide more green space in towns	"Ensure towns lacking in outdoor green provision have better access to this type of space..."	1
Build affordable housing	"Increase the availability of affordable housing near public transportation to encourage residents to live closer to their workplaces."	1

Table 36, Support disadvantaged groups

Theme	Example quote	Prevalence
Support people on low incomes to buy a bike	"Help low-income families access bikes."	5
Support people with a disability	"Enable rural folks, including those with disabilities, to get to their urban destinations (for goods, services and socialising) and home again."	2

Table 37, Council in-house actions

Theme	Example quote	Prevalence
Ensure Council use low-carbon travel modes	"Lead by example and consider electric vehicles for council services."	6
Improve road maintenance	"Better road surfaces."	2

Push policies and measures

Tables 38 - 41 present qualitative feedback on push policies or measures. Echoing the quantitative findings in section 9.1, several participants expressed support for pedestrianised areas, Low Traffic Neighbourhoods, and 20 mph speed limits. Other recommendations focus on discouraging car use and this includes reducing the availability of parking, increasing parking fees, and introducing a 'tourism tax' to reduce traffic congestion and provide revenue for infrastructure improvements.

Table 38, *Traffic and travel policies*

Theme	Example quote	Prevalence
Support for Low Traffic Neighbourhoods and pedestrianised areas	"Pedestrianised town centres."	18
Expand 20 mph speed limit to more areas	"Set speed as 20mph and not national speed limit between small country villages as country lanes should be made more safe."	13
Install traffic calming measures	"Traffic calming measures surrounding towns."	5
Introduce a carbon tax	"Implement a carbon tax...which would increase the cost of carbon-intensive travel, such as air travel or long car journeys."	3
Support for Low Emission Zones	"Low emission zones are discouraging for people that drive when it is not necessary or they could walk/cycle."	2
Council does not need to act on climate change	"Any action taken by any council in Britain would make no difference to global warming, as Britain as a whole is responsible for less than 1% of worldwide emissions."	2
Do not penalise motorists	"Don't penalize motorists who live in rural areas and have no other option."	1

Table 39, Parking enforcement and provision

Theme	Example quote	Prevalence
Restrict parking in towns	"Having limited car parks, raising the price of parking and few available parking spaces."	4
Increase parking fees	"Increase parking charges..."	4
Prevent illegal parking	"Work with police to tackle driving and parking related offences, especially speeding in residential areas and main pedestrian routes, and pavement parking, to reduce the hostile environment for pedestrians."	4
Provide more parking spaces	"Removing parking in towns promotes poor parking and makes it less safe."	2
Reduce parking fees	"Car parking charges are extortionate."	2

Table 40, Enforcement of traffic regulations

Theme	Example quote	Prevalence
Enforce speed limits	"Enforce 20 mph zones."	3
Prevent anti-social driving	"Antisocial driving in town centres such as Falmouth begins routinely at 6pm which is well documented with local police."	1
Prevent cars idling	"Reduce cars idling near schools..."	1

Table 41, Discourage tourism to reduce traffic congestion

Theme	Example quote	Prevalence
Introduce a tax on tourists	"£1 per night Tourist tax on accommodation? How can those who use our roads heavily but do not contribute to the infrastructure..."	4
Discourage tourist traffic (not specific)	"Seek to reduce the volumes of tourist traffic."	4

10 Key findings and recommendations

The final section summarises the key findings from this study and presents some evidence-based recommendations for encouraging the uptake of active travel in Cornwall.

10.1 Key findings

Perceptions of mode shift to active travel:

- Although private car is the dominant mode of travel in Cornwall, a high proportion of residents (60.9%) and Council staff (78.6%) would like to reduce their vehicle use.
- Road safety concerns and a lack of cycle paths and footpaths are the most important barriers to active travel in Cornwall, particularly for women.

Perceptions of owning and using e-bikes:

- There is keen interest in owning an e-bike; one in six residents already owns an e-bike, and one in five is considering buying one in the next 12 months.
- Some participants are concerned about bike theft and the affordability of e-bikes.
- Most people feel able to ride an e-bike, although older people (aged 60+), women, and those with a longstanding health condition are less confident in their cycling ability.

Perceptions of Beryl bikes/e-bike shared mobility:

- There is strong agreement that Beryl bikes provide multiple practical benefits, for example, trying an e-bike before buying one, reduced concern around bike maintenance and theft, and avoiding traffic congestion and parking difficulties.
- The participants also consider co-benefits to be important, such as reducing carbon footprint, providing exercise, and improving mental health.
- People living in rural areas and those on lower incomes tend to rank these attributes higher than people living in urban areas or on higher incomes.
- The main barriers to uptake of Beryl bikes are cost, unavailability of bikes in the parking bays, and road safety concerns.

Use of Beryl bikes in this study:

- Commuting and leisure or exercise are the most common Beryl bike journey purposes. To a lesser extent, Beryl bikes are used as a component of multimodal travel.
- Beryl bikes re-engage non-cyclists; hiring a Beryl bike encouraged one in three residents to cycle again after a break.
- Users reported a high level of satisfaction with the digital and physical aspects of Beryl bikes.

Mode shift and carbon emission reduction:

- Beryl bikes encourage mode shift for short journeys; 27.9% of Beryl bike journeys substituted private car use, and 14.8% substituted public transport. The average journey distance was 2.06 – 3.21 km (or 1.28 – 1.99 miles).
- The estimated emission reduction due to mode shift from single occupancy car to Beryl bike is 96.2 – 626.2 g CO₂e per journey, or 1.1 – 13.6 kg CO₂e per person per year. For context, 13.6 kg CO₂e per person per year is equivalent to 1.2% of the annual travel carbon footprint of a Cornwall resident¹⁰⁸.

Effectiveness of the two behaviour change interventions:

- Prior to this study, 6.6% of residents and 28.6% of Council staff had used a Beryl bike in Cornwall. This increased to 30.5% of residents and 71.4% of Council staff during this study.
- A higher proportion of residents in each of the three intervention groups used a Beryl bike during this study, compared to the control group¹⁰⁹. However, these differences are not statistically significant.
- Over half of the participants that received the visioning tool intervention consider the low-carbon travel narrative to be somewhat relevant to their lives and travel needs.

Public opinion on travel policies to reduce carbon emissions:

- There is strong public support for 20 mph speed limits, Low Traffic Neighbourhoods and Low Emission Zones. There is less support for car parking restrictions.
- There is moderate support for the introduction of a Workplace Parking Levy - one in three residents support the policy, together with one in six Council employees.
- The participants' qualitative feedback focused on 'pull policies' which make active travel and public transport easier or more accessible, rather than 'push policies' which discourage car use.

10.2 Recommendations

Support mode shift for commuting:

- This study found a high proportion of Beryl bike journeys are for commuting. Where possible, installing new Beryl bike parking bays close to places of work, such as large offices or industrial estates, may facilitate active travel for commuting amongst large

¹⁰⁸ 13.6 kg CO₂e per person per year is 1.2% of the annual road and rail combined transport emissions per Cornwall resident. The carbon emission from aviation and marine navigation are excluded from this calculation, as e-bike shared mobility cannot substitute for these travel modes. See Cornwall Sector emissions: [The Carbon Neutral Challenge - Cornwall Council](#).

¹⁰⁹ Intervention groups: A - control group (no intervention); B - visioning tool only; C - free Beryl bike credits only; D - visioning tool plus free Beryl bike credits.

groups of commuters making similar journeys (compared to the more heterogenous destinations of non-commute journeys).

- Engage large and medium-sized employers to develop travel plans for their workforce. Along with providing pool cars and establishing 'lift to work' car sharing schemes, these travel plans should encourage active travel by providing pool e-bikes or incentivising use of Beryl bikes or private bikes. Workplaces should also provide shower facilities.
- Several participants provided qualitative feedback on the lack of secure bike storage in workplaces and town centres. Installing secure storage, and encouraging employers to do the same, would alleviate concerns of bike theft.
- Enable and promote multimodal travel by expanding 'Park and e-bike ride' and Beryl bike integration with public transport hubs. Consider incentivisation options, such as Beryl bike concessions travelling from 'Park and e-bike ride' parking bays, or working with employers to reward employees who engage in mode shift.

Encourage uptake of Beryl bikes and cycling among target groups:

- Offer free trials of Beryl bikes at leisure hotspots such as parks and beaches, as well as provide in-person advice on how the scheme works, to raise awareness and recruit new users.
- Target non-cyclists by presenting inspiring cases of individuals who discovered how using an e-bike enabled them to start cycling again.
- This could be packaged with an offer of free bike-ability courses for adults who have less cycling confidence, but would consider riding a bike or an e-bike in a supported and safe environment.

Focus on short journeys in messaging on mode shift:

- Behaviour change efforts to reduce car use can become polarised or misinterpreted as asking people to give up their car completely. This can hopefully be avoided by focusing on active travel for short journeys, emphasising the health and lifestyle benefits for individuals and communities, and highlighting how each journey replacing a car represents a considerable reduction in personal carbon footprint.
- Engage with existing networks of trusted messengers such as community organisations, travel charities, health professionals, and business leaders to normalise using active travel for short journeys. Reward e-bike users for encouraging others to try e-bike use, by giving referral incentives.

Improve maintenance and signage of cycle routes and footpaths:

- A lack of active travel infrastructure is the main barrier to active travel in Cornwall and the Council is already developing Local Cycling and Walking Infrastructure Plans to address

this¹¹⁰. However, some of the qualitative feedback focused on better maintenance of existing paths and improving signage to facilitate access. These actions may be cost-effective and quick to implement in the short term.

- These improvements should include paths used for commuting and leisure that connect to residential areas, and not only the popular tourist routes.
- There are successful models of local authorities working with volunteer groups and land owners to carrying out maintenance, for example, The Ramblers in Monmouthshire¹¹¹. The Council has an important role in coordinating such initiatives and providing tools and resources.

Initiate public engagement on push policies to reduce car use:

- One finding from this study and a previous CAST report¹¹² is the relatively high level of public support for push policies, some of which have encountered strong opposition in other parts of the UK. Combining push and pull policies is more effective to cut car use than pull policies alone and so, together with the ongoing roll out of 20 mph speed limits, the Council could consider piloting a Workplace Parking Levy and/or Low Traffic Neighbourhoods (in addition to the existing 'school streets' initiatives).
- These pilots should be preceded by public consultation to enable local communities to be involved in the decision-making process and have agency in the outcomes. These deliberative forums are an opportunity to highlight the potential benefits for individuals and communities, present successful examples from other parts of the UK and Europe, and discuss any concerns people may have.
- Particular attention should be given to how some social groups may be disproportionately affected, and clearly outline how these impacts will be mitigated.
- A 'test and learn' framing is recommended, whereby the Council and communities learn together what works and does not work through experience and compiling evidence. Opportunities for communities to review this evidence and provide prospective feedback should be built into the pilot design.

¹¹⁰ For example: [Falmouth & Penryn Cycling and Walking Infrastructure Plan | Let's Talk Cornwall](#)

¹¹¹ BBC coverage, 12th January 2024: <https://www.bbc.co.uk/news/science-environment-67937253> ; Also see advice for public: [maintaining paths - Paths for All | Paths for All](#)

¹¹² Wilson, M., & Whitmarsh, L. (2023). [Cornwall Council behaviour change and engagement programme – survey of residents](#). CAST report for Cornwall Council.

11 Appendices

11.1 Survey 1 protocol (pre-intervention)

Block 1: Intro and consent

Travel behaviour survey 1

Information about this study

What is this study about?

We are researchers at the University of Bath working with Cornwall Council to understand what is important to people living in Cornwall and what influences their lifestyles and travel habits.

What does the study involve?

You will receive a behaviour change intervention that relates to your travel options. We will ask you to complete three data collection activities:

1. an online survey (1) that will take 10 - 15 minutes
2. an online travel diary once a week, for four weeks. The diary will take approximately 3 minutes to complete each week
3. an online survey (2) that will take about 10 minutes

You will be asked questions about your current travel behaviours and your views on different ways to travel. We estimate your total time commitment for all activities to be one hour.

Who can take part?

Anyone (aged 16+) who currently lives or works in one of these towns/city: Truro, Falmouth, Penryn, Newquay, Penzance and St Austell. You must also have an interest in active ways to travel (e.g. walking, cycling, wheeling). You will need to own a smartphone.

What are the benefits and risks of taking part?

The information you provide will be very useful for the research team and Cornwall Council to understand what people living in Cornwall think about different travel options. You will receive **a £25 gift voucher when you complete survey 2**. There are no risks associated with participating.

This research has been reviewed and approved by the University's Department of Psychology Research Ethics Committee (reference: 23 - 079).

Do I have to take part?

Taking part in this study is entirely voluntary. You are free to withdraw at any time. You can withdraw by simply closing your browser during any of the data collection activities described above. When you complete the final data collection activity (survey 2), we will anonymise your responses. Your data would then be anonymous and cannot be traced back to you, and so we would be unable to identify and remove your data.

What happens to all the information?

All the information you provide is confidential and will be stored on a secure drive at the University of Bath (encrypted and password-protected). Anonymised data will be archived indefinitely in the UK Data Archive and may be used by the Council or other researchers in future studies. The University of Bath privacy notice can be found [here](#). If you choose to withdraw from the study, we will remove all of your data.

We will ask for your email address. Your contact details will be stored separately from your survey data, so your responses cannot be identified. We will use your email address for two purposes: 1) to send you links for the online travel diaries, and 2) to send you the gift voucher. Your email address will be permanently deleted within 14 days of the study completion.

What do I do if I have any questions?

Please contact the research team at the University of Bath for further information: Mark Wilson (mw2640@bath.ac.uk) or Lorraine Whitmarsh (lw2253@bath.ac.uk).

Or if you have any concerns about this study, please contact the Department of Psychology Research Ethics Committee: (psychology-ethics@bath.ac.uk; +44 (0)1225 384714).

Department of Psychology
University of Bath
Claverton Down
Bath, BA2 7AY

How can I take part?

Please click the arrow below

Consent Form

Please indicate that you have read and understood the following statements:

1. I understand the nature and purpose of the procedures involved in this study. These have been communicated to me on the information sheet on the previous page.
2. I understand that my participation in this study is entirely voluntary. I can withdraw from the study by closing the browser during any of the data collection activities. Once I complete the final data collection activity (survey 2), my data is anonymised and can no longer be withdrawn from the study.
3. I understand and acknowledge that this study is designed to promote scientific knowledge and may be used by Cornwall Council to inform policy and delivery.
4. I understand that I will be asked to provide my email address. My email address will be permanently deleted within 14 days of the study completion. My data will be anonymised when I complete the final data collection activity, so I cannot be identified in any research outputs.
5. I understand that the University of Bath may use the data collected for this project in a future research project but that the conditions on this form under which I have provided the data will still apply. Anonymised data stored on the UK Data Archive may be used by the Council or other researchers in future studies.
6. I understand that the personal data will be processed in accordance with current UK data protection legislation. The University of Bath privacy notice can be found [here](#).
7. I understand that I am free to discuss any concerns I may have with the research team: Mark Wilson (mw2640@bath.ac.uk) or Lorraine Whitmarsh (lw2253@bath.ac.uk). If they are unable to resolve your concern or you wish to make a complaint, please contact the Department of Psychology Research Ethics Committee: (psychology-ethics@bath.ac.uk; +44 (0)1225 384714). The PREC reference number for this study is: 23 079.

I have read the above statements and consent to take part:

- I **CONSENT** to take part in the study (1)
- I **DO NOT CONSENT** to take part in the study (2)

Q247 I confirm I am aged 16 years or older, I own a smartphone, and I currently **live or work** in Truro, Falmouth, Penryn, Newquay, Penzance or St Austell:

- Yes (1)
- No (2)

Please click the right arrow to continue.

[End of Block: Intro and consent](#)

Block 2: Baseline travel behaviours

About how you travel

These questions are about how you commute to work and other travel you do (e.g. for shopping, visiting friends etc.).

Q1 Do you own or have regular access to a vehicle (e.g. a car, van or motorbike)?

(Please select all options that apply)

- Yes - a petrol or diesel vehicle (1)
- Yes - a hybrid vehicle (2)
- Yes - an electric vehicle (3)
- Yes - a car share scheme (e.g. Co-cars) (4)
- No (5)

Q111 In a typical week, how many journeys per week do you make to / from your place of work or education (i.e. **commuting**) using the following modes of transport?

	Number of commute journeys per week (travelling there and back would count as two journeys) (1)
N/A - I don't work or I work entirely from home (just write 1 in the box) (Q111_11)	
Walking, or Wheeling (i.e. use a wheelchair) (Q111_1)	

Bicycle (including electric bike) (Q111_2)

Scooter (including electric scooter) (Q111_3)

Motorbike (Q111_4)

Car / van (travelling alone) (Q111_5)

Car / van (sharing lifts with others) (Q111_6)

Car club (e.g. Co Cars) (Q111_7)

Bus (Q111_8)

Train (Q111_9)

Other (please specify) (Q111_10)

Q213 If you commute, approximately how far (in miles) is your home to your place of work / study?

Q112 In a typical week, how many journeys per week do you make to / from other destinations (e.g. to the shops, visiting friends) using the following modes of transport?

	Number of non-work journeys per week (travelling there and back would count as two journeys) (1)
N/A - I tend to stay at home (just write 1 in the box) (Q112_11)	
Walking, or Wheeling (i.e. use a wheelchair) (Q112_1)	
Bicycle (including electric bike) (Q112_2)	
Scooter (including electric scooter) (Q112_3)	
Motorbike (Q112_4)	
Car / van (travelling alone) (Q112_5)	
Car / van (sharing lifts with others) (Q112_6)	
Car club (e.g. Co Cars) (Q112_7)	

Bus (Q112_8)	
Train (Q112_9)	
Other (please specify) (Q112_10)	

Q304 Which statement best describes your current car driving?

- I drive, and am not interested in reducing my car use (1)
- I drive, but would like to reduce my car use (2)
- I do not drive, but would like to start doing so (3)
- I do not drive, and have no interest in doing so (4)
- Don't know / None of the above (5)

Display This Question:

If Do you own or have regular access to a vehicle (e.g. a car, van or motorbike)? = Yes - a petrol or diesel vehicle OR Yes - a hybrid vehicle OR Yes - an electric vehicle OR Yes - a car share scheme (e.g. Co-cars)

Q331 In a typical week, how often do you use a car for short journeys (i.e. less than 3 miles)?

	0 (8)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Number of days per week: (6)	<input type="radio"/>							

End of Block: Baseline travel behaviours

Block 3: Active travel

About Active Travel

These questions are about active ways to travel (e.g. walking, cycling, wheeling) and physical activity.

Q245 Please tell us about your current bike ownership:

- I own a conventional pedal bike (1)
- I own an e-bike (i.e. an electric bike) (2)
- I own a bike but it is in disrepair (3)
- I used to own a bike but I got rid of it (4)
- I have never owned a bike (5)
- Not applicable / I can't ride a bike (6)
- Other (please specify) (7) _____

(Note – routing question for intervention group allocation in Block 7 – Travel intervention)

Q186 To what extent have the following prevented you from walking or cycling as a main mode of travel?

	Not at all (1)	A little (2)	Somewhat (3)	A lot (4)	Not applicable (99)
Lack of cycle lanes or walking paths (Q186_1)	<input type="radio"/>				
Feeling unsafe cycling on roads (Q186_2)	<input type="radio"/>				
Lack of cycling confidence or competence (Q186_3)	<input type="radio"/>				

The distance is too far (Q186_4)

Not feasible due to long-standing illness, injury or disability (Q186_5)

Q381 During the last week, how many hours did you spend on each of the following activities?

(Please move the slider into the correct position)

Number of hours

0 1 2 3 4 5 6 7 8 9 10

Physical exercise

such as swimming, jogging, aerobics, football, tennis, gym workout etc. ()



Cycling, including

cycling to work and during leisure time ()



Walking,

or **Wheeling** (i.e. use a wheelchair), including walking / wheeling to work, shopping, for pleasure etc. ()



End of Block: Active travel

Block 4: e-bikes

About e-bikes and bike share

You're doing great! These questions are about your views on e-bikes and bike share schemes (e.g. Beryl bikes).

Q285 How likely is your household to buy an e-bike (or another e-bike) in the next 12 months?

- Very unlikely (1)
- Somewhat unlikely (2)
- Neither likely nor unlikely (3)
- Somewhat likely (4)
- Very likely (5)
- Don't know (77)

Display This Question:

If Please tell us about your current bike ownership: = I own an e-bike IS NOT SELECTED

Q292 What are your opinions on owning an e-bike?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
My household could easily afford to buy an e-bike (Q292_1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Storing an e-bike at my home would be difficult (Q292_2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I owned an e-bike, I would worry about it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

getting stolen
(at home or
when out)
(Q292_3)

Display This Question:

If Please tell us about your current bike ownership: = I own an e-bike IS SELECTED

Q293 What are your opinions on owning an e-bike?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
My household could easily afford to buy the e-bike(s) we own (Q293_1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Storing an e-bike at my home is difficult (Q293_2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I worry about my/our e-bike getting stolen (at home or when out) (Q293_3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q289 Please give your opinions about regularly using an e-bike yourself:

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)	Don't know / Not applicable (77)
I would find it easy to ride an e-	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

bike if I
wanted to
(Q289_1)

People who
are
important
to me
would
support me
using an e-
bike
(Q289_2)

I see myself
as the kind
of person
who might
regularly
ride an e-
bike
(Q289_3)

<input type="radio"/>					
<input type="radio"/>					

Q287 Apart from yourself, do you know anyone personally (e.g. friends, family, neighbours, work colleagues) who regularly uses an e-bike?

- Yes (1)
- No (2)
- Don't know (77)

Q223 Bike share schemes (e.g. Beryl bikes) are relatively new in Cornwall.
Have you already used a bike share scheme?

- Yes - I've used Beryl bikes in Cornwall (1)
- Yes - I've used a bike share scheme in another city / location (2)
- No (3)

Q295 How did you first hear about Beryl bikes in Cornwall?

- Taking part in this study (1)
- Council website or newsletters (2)
- Coverage on TV / radio / newspapers / news websites (3)
- A friend, family member, or colleague told me (4)
- I saw a Beryl bike docking station / someone riding a Beryl bike (5)
- Advert on social media / the internet (6)
- A local notice or flyer promoting Beryl bikes (7)
- Other (please specify) (8) _____
- I can't remember (9)

Q267 To what extent do you agree with the following statements about Beryl bikes?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
It's becoming more common for people in my town to use Beryl bikes (Q267_1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm aware that people where I live and work use Beryl bikes (Q267_2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q302 To what extent do you agree with the following statements about how using Beryl bikes may help you personally? (Part A)

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)	Not applicable (99)
It will make my trips quicker (Q302_1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It will make my trips easier (Q302_2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will be able to cycle longer distances (Q302_3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can avoid fatigue or getting sweaty before work or socialising (Q302_4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It will help me reduce my carbon footprint (Q302_5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q301 To what extent do you agree with the following statements about how using Beryl bikes may help you personally? (Part B)

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)	Not applicable (99)
It will provide me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

with exercise (Q301_6)						
It will provide me with mental health benefits (Q301_7)	<input type="radio"/>					
It will enable me to cycle with friends / family as a group (Q301_8)	<input type="radio"/>					
It will take away concerns around bike maintenance and storage (Q301_9)	<input type="radio"/>					
It will take away the worry of bike theft (Q301_10)	<input type="radio"/>					

Q300 To what extent do you agree with the following statements about how using Beryl bikes may help you personally? (Part C)

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)	Not applicable (99)
It will save me money (Q300_11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It will connect me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

to places
not served
by public
transport
(Q300_12)

I will be
able to use
my car less
(Q300_13)

I will avoid
traffic
congestion
/ parking
difficulties
(Q300_14)

I can try an
e-bike
before I
decide
whether to
buy one
(Q300_15)

<input type="radio"/>					
<input type="radio"/>					
<input type="radio"/>					

Q252 In which town(s)/city are you most likely to use Beryl bikes?
(Please select all that apply)

- Falmouth (1)
- Penryn (2)
- Truro (3)
- St Austell (4)
- Newquay (5)
- Penzance (6)
- Not applicable (77)

Q286 Is there a Beryl bike parking bay within walking distance of your home?

- Yes (1)
- No (2)
- Don't know (77)

Q290 Is there a Beryl bike parking bay within walking distance of your place of work or education?

- Yes (1)
- No (2)
- Don't know / Not applicable (77)

Q316 If you use public transport, is there a Beryl bike parking bay within walking distance of key public transport hubs (e.g. train station, bus station)?

- Yes (1)
- No (2)
- Don't know / Not applicable (77)

End of Block: e-bikes

Block 5: Concern about climate change

Climate change

Almost there! The next few questions are about your views on climate change and the environment.

Q136 How worried are you about the following issues?

	Not at all worried (1)	Not very worried (2)	Somewhat worried (3)	Very worried (4)	Extremely worried (5)
Climate change (Q136_1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Air pollution (in my local area) (Q136_2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q139 Which of these statements best describes your views?

Addressing climate change requires...

- little or no urgency (1)
- a low level of urgency (2)
- a moderate level of urgency (3)
- a high level of urgency (4)
- an extremely high level of urgency (5)

Q150 To what extent would you support or oppose the following policy measures to help tackle climate change?

	Strongly oppose (1)	Tend to oppose (2)	Neither oppose nor support (3)	Tend to support (4)	Strongly support (5)
Low Traffic Neighbourhoods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(a small residential area closed off to traffic, for use by pedestrians and cyclists)
(Q150_1)

Low Emission Zones (a zone within a city that polluting vehicles must pay to enter)
(Q150_2)

20 mph speed zones (to protect non-motorised road users and encourage walking and cycling)
(Q150_3)

Restricted car parking in workplaces and town centres
(Q150_4)



Q137 What in your view are the most important actions Cornwall Council should take to reduce carbon emissions **related to travel**?

End of Block: Concern about climate change and the environment

Block 6: Demographics

About you

Finally, please tell us a bit more about yourself.

Q77 What kind of property do you live in?

- Detached house (1)
- Semi-detached house (2)
- Terraced house (3)
- Flat or bedsit (4)

Q83 How many bedrooms does your home have?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 or more (4)

Q273 What best describes the area where you live?

- Countryside or small village (1)
- Large village or small town (2)
- Suburbs of large town or city (3)
- Centre of large town or city (4)

Q304 What is the first half of your postcode (e.g. TR1, PL14)?

Q210 How do you self-identify?

- Female (1)

- Male (2)
 - Non-binary (3)
 - None of the above (if you wish, please specify) (4)
-

- Prefer not to say (88)

Q301 What is your age (in years)?

Q138 What is your ethnic group?

Please choose one option that best describes your ethnic group or background

- White British / White Cornish (1)
- Mixed / Multiple ethnic groups (2)
- Asian / Asian British (3)
- Black / African / Caribbean / Black British (4)
- Minority Ethnic / Roma / Gypsy / Traveller (5)
- Other ethnic group (6)
- Prefer not to say (88)

Q142 Do you have a long-standing illness, injury or disability that limits your normal day-to-day activities?

By 'long-standing' we mean anything that has troubled you over a period of time. 'Normal day-to-day activities' includes things like eating, washing, walking and going shopping.

- Yes (1)
- No (2)
- Prefer not to say (88)

Q302 How many adults (aged 18 or older), including you, live in your home?

Q144 How many children (under 18) live in your home?

Prefer not to say (88)

Q178 What is the highest level of education you have achieved so far?

- No formal qualifications (1)
- GCSE or O-level (2)
- A-level (3)
- Undergraduate degree (e.g. Bachelor's) (4)
- Postgraduate degree (e.g. Master's, PhD) (5)
- Vocational qualification (6)
- Other (7)
- Prefer not to say (88)

Q165 Which option best describes your employment status?

- Employed full time (30+ hrs/wk) (1)
- Employed part time (less than 30 hrs/wk) (2)
- Self-employed (3)
- Unemployed (4)
- Looking after home / family (5)
- Studying (6)
- Retired (7)
- Other (8)
- Prefer not to say (88)

Q145 Please indicate the approximate combined income of your **household** (per year, before tax deductions):

- Less than £6,000 (1)
- £6,000 - £12,999 (2)
- £13,000 - £18,999 (3)
- £19,000 - £25,999 (4)
- £26,000 - £31,999 (5)
- £32,000 - £47,999 (6)
- £48,000 - £63,999 (7)
- £64,000 - £95,999 (8)
- More than £96,000 (9)
- Prefer not to say (88)

[End of Block: Demographics](#)

Block 7 – Travel intervention. Random allocation to one of four groups: A, B, C or D

Group A - Control group

Q360 Thank you for completing the first survey. The next stage of this study is to complete a weekly travel diary - I'll send you the first travel diary in a week's time.

We asked you about your views on bike share schemes. Beryl bikes are supported by Cornwall Council and are available in Truro, Falmouth, Penryn, Newquay, Penzance and St Austell. You can hire Beryl bikes for single journeys (pay as you ride), or for multiple journeys (you buy 'minute bundles', to use when you need).

More information about Beryl bikes can be found [here](#).

Q323 What is your email address?

(We will only use your email address to: 1. send you the weekly travel diaries, and 2. send you the £25 gift voucher at the end of the study)

Group B - Pen portraits only

Q361 Thank you for completing the first survey.

We asked you about your views on bike share schemes. Beryl bikes are supported by Cornwall Council and are available in Truro, Falmouth, Penryn, Newquay, Penzance and St Austell. You can hire Beryl bikes for single journeys (pay as you ride), or for multiple journeys (you buy 'minute bundles', to use when you need).

More information about Beryl bikes can be found [here](#).

Q249 What is your email address?

(We will only use your email address to: 1. send you the weekly travel diaries, and 2. send you the £25 gift voucher at the end of the study)

Q17 For the next stage, you will be presented with a scenario which describes how someone has changed their travel behaviour in some way. There are six short stories of people who have successfully reduced their car use (takes approx. 3 minutes to read).

Please consider your personal situation... where you live in Cornwall, your job, your family commitments, your transport needs. Then choose the character which you think might be the closest to your situation.

If you decide their story isn't relevant for your situation, you can choose a different story to read. These stories do not capture the experiences of everyone living in Cornwall, but there may be some aspects which you find relatable.

Q401 Please select one of the characters to read their story, then click the 'next' button:

- an older couple living in a rural area (1)
- a young adult living in an urban area (2)
- middle-income parents (3)
- a single parent on lower income (4)
- a small business owner (5)
- a young adult who uses a wheelchair (6)

An older couple living in a rural area



Mary and John, an older couple living in a rural area

Mary and her husband John have lived in Cornwall all their lives and a lot has changed over that time. Now in their 60s, one thing they've noticed is how reliant they are on their cars to get around, compared to when they were younger. They love living in Cornwall and they think rural life should be protected as it's such an important part of Cornwall's tradition and identity. There's a strong sense of community in their village and a slower pace of life, which is really nice compared to the hustle and bustle of the towns.

Previous travel behaviour

Living in a rural area has made it very difficult to manage without a car. For John, a retired engineer, cars are a hobby, as well as a bit of a status symbol. He takes pride in his car and it reminds him that his hard work has paid off. For Mary, driving has always felt necessary, but a bit stressful and exhausting. The roads are really narrow and windy in their area, so she has to be very focused to make sure she can see horse riders or any oncoming cars, especially on the corners. Even John finds it a bit tiring to do long drives on the country lanes, but they'd never really considered any other way of getting around.

New travel behaviour with less car use

During the pandemic, they found out about different food delivery options and decided to

get a delivery once a week, which reduced their need to drive to the supermarket. Their neighbours, who they are friendly with, offered to give John and Mary lifts whenever they were driving into town. John and Mary have also started organising trips with friends who live in the village, travelling together on the bus, which allows them to get into town for the day without the stress of dealing with traffic or finding somewhere to park. They don't go into town very often, but it makes for a nice day out. Mary, who is over 66, gets to travel free with her bus pass and she likes poking fun at John, who still has to pay.

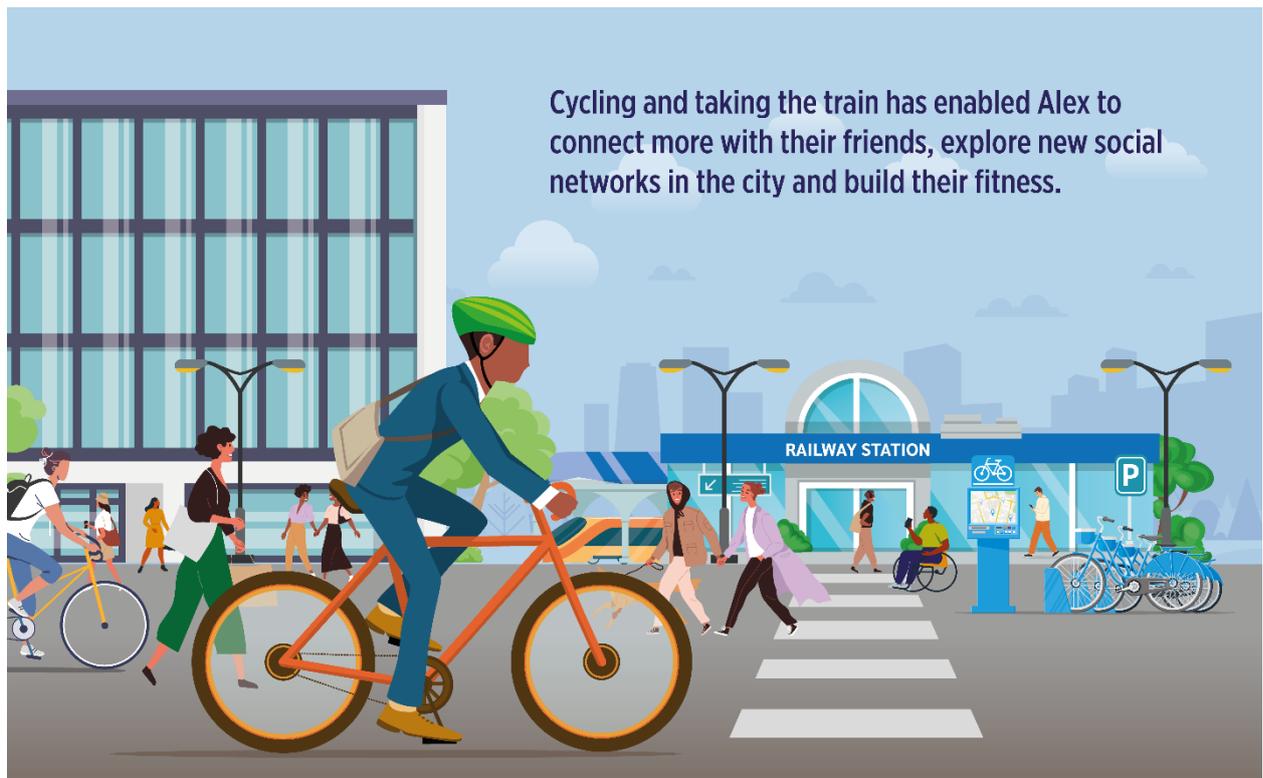
Benefits they've experienced as a result of changing their travel behaviour

Mary and John remembered how much they enjoyed walking and exploring Cornwall when they were younger, so they decided to make walking a bigger part of their lives again. Some friends recommended the 'iWalkCornwall' app and the South West Coast Path Association website, which gives them lots of ideas for different walks to do in their area. They've rediscovered a sense of pride, getting back into the beautiful nature and coastline on their doorstep, and they are feeling much fitter and healthier. Another real change is that they are seeing more of their neighbours and friends now. It takes a bit of planning to use the buses and trains, but not driving means they've got more time when they travel to chat, read a book, or just look out the window and take in the lovely scenery.

Click the left arrow to return to the list of characters.

Click the right arrow to move onto the next task.

A young adult living in an urban area



Cycling and taking the train has enabled Alex to connect more with their friends, explore new social networks in the city and build their fitness.

Alex, a young adult living in an urban area

Alex left the family home to go to university and has just started a graduate role in the large town they studied in. They lived in a village in rural Cornwall with their parents until starting their degree. Alex was keen to move to a more urban and diverse area, and they were excited to explore all that the town has to offer.

Previous travel behaviour

They'd always used their parents' old car when living at home and so they brought the car to university with them. They thought this would be the most economical option as trains in Cornwall are quite expensive. Having the car also meant they could return home more often. Since Alex moved to the town, the car has become a burden. It took a bit of time to get the parking permit sorted, but even after that, parking is becoming more and more difficult to find. Sometimes they have to park quite far away and then walk the rest of the way home. The parking permit was expensive and so is petrol, and this puts a strain on their disposable income.

New travel behaviour with less car use

Alex started thinking about what life might be like without their own car. They've been feeling bad about having a car, given the environmental impact, but it was difficult to figure

out other options that they could afford. The car was pretty old and they'd started having problems with it which were expensive to fix. Taking the car to the garage was really time consuming as well, so they started trying other ways to travel. The cost of public transport seemed a bit steep at first, about £60 a month, but this worked out cheaper than running a car once you added up the insurance, MOT, repairs, road tax, and petrol. They were also able to get a Young Persons Railcard, which means they can more easily afford the train home. They did a bit of research online and realised how many places in Cornwall you can explore without a car, to get into nature, or to go to the beaches. They also heard about a 'Cycle to Work' scheme offered by their employer. They've just bought a brand new commuter bike that they pay for monthly and save a bit of money on tax.

Benefits they've experienced as a result of changing their travel behaviour

Getting rid of the car has been a game changer for Alex. Parking in the town was stressful and expensive, and catching the train home is a lot more enjoyable than having to concentrate on driving. They try to plan ahead to buy the cheapest tickets and they've managed to find a return ticket for only £25. Cycling has been really great for Alex's fitness and wellbeing, and joining a local cycle group on Facebook means they've made some new friends and gained a new hobby too! Alex isn't worried about bike theft as they bring the bike inside at home and can use the bike lock-up unit at work. It took some time to build up their confidence riding the bike, but they've really enjoyed not having the responsibility of a car. They realised that, without any real burden on their finances, they've found a way to reduce their carbon footprint and see more of the countryside.

Click the left arrow to return to the list of characters.

Click the right arrow to move onto the next task.

Middle-income parents



Nia and John, middle-income parents

Nia and John are in their mid-30s and have two children who are at primary school. Nia works as a software developer and John works at a marketing firm. They live in a large town, in a desirable area, with a park and lots of local shops and cafés. Their house is within walking distance of the school their children attend. Their children like going to the park on the way home from school.

Previous travel behaviour

Nia and John didn't have much time to spare in the morning before work, so they would take it in turns to drive their children to school. The traffic was usually busy, and the exhaust fumes and noise near the school put them off walking. They each had their own car to drive to work. They also used the car for the big weekly food shop every Saturday, at the large supermarket on the outskirts of town.

New travel behaviour with less car use

Nia and John's workplaces introduced flexible working policies during the pandemic and so now they often work from home, which means less driving. They noticed that quite a few families had started walking their kids to school. Their own children had been asking them to walk more because they learned about climate change and the environment in one of their

classes. Although it took a while to establish a new routine, they've started to really enjoy walking the kids to school. It gives them some quality family time in the morning and some fresh air before work. Now they are exploring their neighbourhood on foot and they've realised they can buy most of the groceries they need locally. They only go to the big supermarket when there's something they can't find very easily in the local shops, and so now they have more free time on the weekends. They decided they probably only need one car, so they agreed to sell one and see how it goes. They use the other car a lot less than before, mainly for day trips or visiting family and friends.

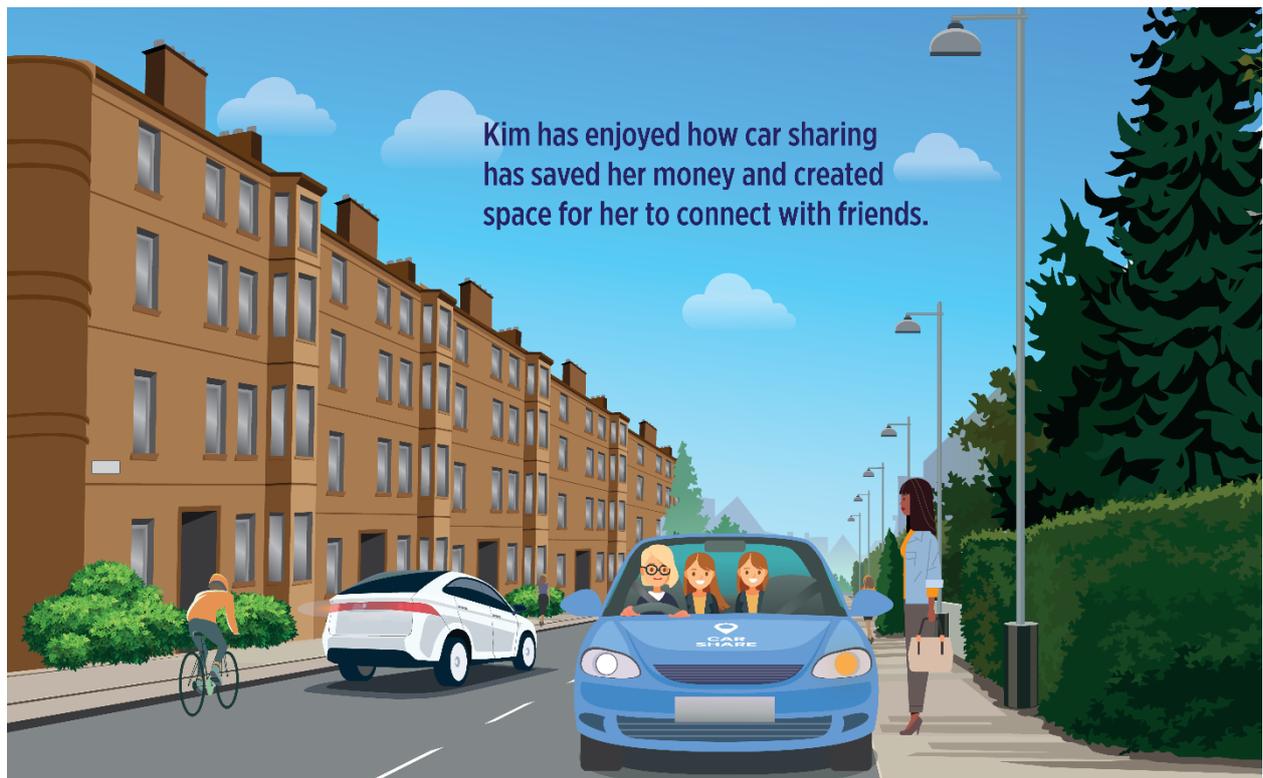
Benefits they've experienced as a result of changing their travel behaviour

They realised the air pollution around the school was so bad because everyone would drive, but after a public consultation organised by the school and the local community, a 'school streets' initiative was set up which reduces traffic near the school. They've found it inspiring to see how the kids from the school have encouraged and motivated the adults to try something new, which is better for the environment and for their health! Nia used the money from selling her car to buy new bikes for the family and put the rest of the money in their savings. It did take a while to build their confidence on the bikes, but over time they've realised they are actually quite good at it and they've started to feel much fitter. The new 20 mph speed limits made things feel safer and more people seem to be out cycling. The high street has now been pedestrianised, so it's become a pleasure to get around by bike or walking. They often bump into people they know, and this has helped Nia and John to feel more connected to their community.

Click the left arrow to return to the list of characters.

Click the right arrow to move onto the next task.

A single parent on lower income



Kim has enjoyed how car sharing has saved her money and created space for her to connect with friends.

Kim, a single parent on a low income

Kim and her children live in a small town in Cornwall. Her children are twins and they are fourteen years old. After the twins got settled in secondary school and became more independent, Kim decided to take on some extra work to support her family's increasing living costs. She now works two jobs, one at a factory on the industrial estate, and one as a receptionist in the evenings at a hotel in the neighbouring town, which is about 7 miles away. She doesn't get much free time nowadays, but she enjoys spending time with the kids, and meeting up with her friends on her days off.

Previous travel behaviour

Kim has a car, but she found it difficult to afford the running costs. The local bus service finishes early and so public transport wasn't really a viable option to get home after her hotel shift. She doesn't enjoy driving, but having the car means Kim could get to work, pick up the kids after school, and go into town to meet her friends. She'd heard about people being more environmentally friendly, but she was sceptical that other transport options were affordable and convenient enough, and so she stuck with what she knew worked best for her and her family.

New travel behaviour with less car use

Kim finds that driving everywhere is expensive and tiring, and she wanted to find another way to commute to the hotel. After chatting with her friend, Jessie, she found out that Jessie had started a new job in the hospice, which is quite close to the hotel. Jessie was struggling a bit with living costs and so they decided to take turns in giving each other lifts to work, when their shifts align. Kim also saw an advert about reduced prices for bus tickets, which now cost only £2 for all buses in Cornwall. She's started using the bus when she needs to go into town and this also saves on parking fees.

Benefits she's experienced as a result of changing her travel behaviour

Lift sharing means Kim can spend more time with Jessie. Chatting with her friend is a much nicer way to start and end her shift, and she saves a bit of money each week on petrol. She mentioned lift sharing to her manager, who thought it was a good idea and so the factory is trialling a scheme which encourages everyone to share lifts to and from work. So far, it seems to be working well.

Click the left arrow to return to the list of characters.

Click the right arrow to move onto the next task.

A small business owner



Yasmin's green credentials have attracted new customers. She's also reduced her costs, so she's got more to reinvest in the business and community.

Yasmin, a small business owner

Yasmin owns a popular restaurant and deli supermarket in the centre of a rural town in Cornwall. She is recognised across the community because she organises a number of fun events throughout the year, like cooking classes and pop up street food stalls.

Previous travel behaviour

Running the business keeps Yasmin very busy and she found it difficult to spare the time for walking or getting public transport around town. She often needs a car to get to the restaurant for the early morning deliveries. She began offering a home delivery service to her customers, so her business started to depend on cars and motorbikes much more than it used to. She was concerned about the environmental impact, but she felt she didn't have the time or any alternative options to compromise on the swift delivery and high-quality customer service she was known for.

New travel behaviour with less car use

Yasmin realised that some of her competitors in the area were starting to use more environmentally friendly methods for home delivery. With growing public concern for the environment, and the rising cost of using cars for home delivery, she decided to change her business model. For local deliveries, she now employs delivery riders who use e-bikes, which

reduces her overheads as well as the carbon footprint of her business. When the traffic is bad, the delivery riders are actually quicker than delivering by car. She's installed a charging point at the back of the shop, so they can recharge the e-bikes easily. Initially, she wasn't sure how this change would go, but overall it's really helped the efficiency of the deliveries, especially during spring, summer and autumn when the weather is ok. After chatting to one of the delivery riders, she felt inspired to look into e-bikes as an option for herself to get around. She was pleasantly surprised to hear that a bike share scheme, Beryl bikes, has just started in her town. She is using Beryl bikes for a couple of months while she decides whether to buy her own e-bike.

Benefits she's experienced as a result of changing her travel behaviour

Yasmin is relieved that she no longer has to choose between offering good customer service and reducing her environmental impact. She's started promoting her business based on its green credentials and has since attracted new customers who had heard about her deliveries by e-bike. Reducing costs, and the increase in business that she's seen, means she can invest more money into growing her business.

Click the left arrow to return to the list of characters.

Click the right arrow to move onto the next task.

A young adult who uses a wheelchair



Mike, a young adult who uses a wheelchair

Mike lives on the outskirts of town with his girlfriend Niamh. He works as an IT specialist for a large sales company based in the town centre. Mike lives with a physical impairment which seriously affects his mobility and so he is assisted by a wheelchair all of the time. This can make it quite challenging and tiring, as not all public spaces are designed to be inclusive of people like Mike. In his spare time, he loves to watch football matches at his club and pop into his local pub for a drink afterwards.

Previous travel behaviour

Mike is able to live independently because he has a car. Driving into work was really his only option – even that took careful planning and would sometimes leave him pretty exhausted. When he joined the company, he worked with them to build their awareness about how important the option of working from home is for people living with disabilities. They learned a lot from him and agreed for him to work from home most of the time, but come into the office once a week because he really enjoys and values seeing the team, and some clients, in person. Thankfully, the building is disability inclusive, with ramps and automatic doors, but there were still a few improvements which he suggested.

New travel behaviour with less car use

Since the pandemic, everyone has been working from home some of the time, but Mike's team now have scheduled days when they agree to come into the office. It's a good way to make sure people get face-to-face contact and keep up to date on the issues that aren't really discussed in their online meetings. His positive experience with his employer empowered him to write to his local football club about the limited number of disability parking spots at the stadium, and other challenges for wheelchair users such as the lack of dropped kerbs or wide pavements. Although the club did take a while to respond, they agreed to increase the disability parking spots by three and install wheelchair accessible infrastructure.

Benefits he's experienced as a result of changing his travel behaviour

Mike has often found it difficult to engage with the environmental movement, so knowing that he's already reducing his carbon footprint by not driving into work every day, but still maintaining his independence, feels good. Mike heard on local radio about some actions the Council were taking to create pedestrianised areas and encourage Cornwall residents to use active ways to travel. He is a passionate advocate of improving public spaces to ensure they are accessible and inclusive, and he wanted to make sure that any new travel infrastructure or initiatives to reduce carbon emissions didn't overlook being disability inclusive. Having already worked with his company and his football club, he feels he can offer some valuable input in this process of improving his local town that he loves.

Click the left arrow to return to the list of characters.

Click the right arrow to move onto the next task.

Please reflect on their story and answer the following questions:

Q410 How relevant did you find the scenario to your own life and travel needs?

- Not at all relevant (1)
- Not very relevant (2)
- Somewhat relevant (3)
- Very relevant (4)
- Completely relevant (5)

Q411 To what extent did the scenario make you feel you could reduce your car use?

- Not at all (1)
- A little (2)
- A moderate amount (3)
- A lot (4)
- Completely (5)
- Not applicable / I don't use a car (6)

Q413 Did their story give you any ideas for how you might change how you travel in Cornwall, or reduce your need to travel?

- Not at all (1)
- A little (2)
- A moderate amount (3)
- A lot (4)
- Completely (5)

Q415 Thank you! The next stage of this study is to complete a weekly travel diary - I'll send you the first travel diary in a week's time.

During the next four weeks, think about how you could reduce your car use. Please also

consider what benefits or drawbacks you experience from making these changes.

Group C - Beryl bikes only

Q322 Thank you for completing the first survey. I'll send you the first travel diary in a week's time.

For the next stage, you will receive free credits to use Beryl bikes. Beryl bikes are e-bikes for public use that you can hire for single journeys (pay as you ride), or for multiple journeys (you buy 'minute bundles', to use when you need). For this study, you will receive a free bundle of 400 minutes to use over the next four weeks.

Beryl bikes are supported by Cornwall Council and are available in Truro, Falmouth, Penryn, Newquay, Penzance and St Austell.

To use Beryl bikes, you will need to download the 'Beryl' app from 'App Store' or 'Google Play' and then create an account, using the same email address you provide below.

If you have already registered with Beryl bikes - great! Please provide the same email address below that you used to register with Beryl bikes.

More information about Beryl bikes can be found [here](#).

Q324 What is your email address?

(We will only use your email address to: 1. send you a code to claim your free bundle of Beryl bike minutes, 2. send you the weekly travel diaries, and 3. send you the £25 gift voucher at the end of the study)

Q325 We would like to use anonymised travel data from Beryl bikes about the study participants' journeys (e.g. average journey distance using a Beryl bike, average journey duration etc.). This data will not identify you in any way.

To collect this data, we will need to share your email address with Beryl bikes. If you do not consent to the University of Bath researchers sharing your email address with Beryl bikes,

please opt out below. You can still participate in this study even if you opt out.

I **OPT OUT** to sharing my email address with Beryl bikes (1)

Group D - Beryl bikes + Pen portraits

Thank you for completing the first survey.

For the next stage, you will receive free credits to use Beryl bikes. Beryl bikes are e-bikes for public use that you can hire for single journeys (pay as you ride), or for multiple journeys (you buy 'minute bundles', to use when you need). For this study, you will receive a free bundle of 400 minutes to use over the next four weeks.

Beryl bikes are supported by Cornwall Council and are available in Truro, Falmouth, Penryn, Newquay, Penzance and St Austell.

To use Beryl bikes, you will need to download the 'Beryl' app from 'App Store' or 'Google Play' and then create an account, using the same email address you provide below.

If you have already registered with Beryl bikes - great! Please provide the same email address below that you used to register with Beryl bikes.

More information about Beryl bikes can be found [here](#).

Q358 What is your email address?

(We will only use your email address to: 1. send you a code to claim your free bundle of Beryl bike minutes, 2. send you the weekly travel diaries, and 3. send you the £25 gift voucher at the end of the study)

Q380 We would like to use anonymised travel data from Beryl bikes about the study participants' journeys (e.g. average journey distance using a Beryl bike, average journey duration etc.). This data will not identify you in any way.

To collect this data, we will need to share your email address with Beryl bikes. If you do not consent to the University of Bath researchers sharing your email address with Beryl bikes, please opt out below. You can still participate in this study even if you opt out.

I **OPT OUT** to sharing my email address with Beryl bikes (1)

Participants are then presented with Pen portraits, same as Group B

Q432 Thank you! During the next four weeks, think about how you could reduce your car use. Please also consider what benefits or drawbacks you experience from making these changes.

I'll send you the first travel diary in a week's time.

[End of Block: Group D - Beryl bikes + Pen portraits](#)

Block 8: Debrief

Q355 Cornwall Council is running a series of activities as part of their 'Green Month' in June, together with Pirate FM. Would you be interested in talking to local media? (e.g. a short interview on Pirate FM about your experience of active travel in Cornwall, or a short interview for the Council website).

This is entirely optional!

- Yes (1)
- No (2)

Thank you very much for taking part in this study!

Further information

This study is a collaboration between Cornwall Council and researchers at the University of Bath. The aim of the study is to explore the travel behaviours and perceptions of people living in Cornwall. This information will be used to inform Cornwall Council travel policies or interventions to reduce carbon emissions.

If you have any questions about the study, please contact the research team: Mark Wilson (mw2640@bath.ac.uk) or Lorraine Whitmarsh (lw2253@bath.ac.uk).

If you have concerns about your participation in this study or you wish to make a complaint, please contact the Department of Psychology Research Ethics Committee: (psychology-ethics@bath.ac.uk; +44 (0)1225 384714). The PREC reference number for this study is: 23 - 079.

Privacy Notice: Your data will be used only for the purposes set out in the information sheet. Your consent is conditional upon the University complying with its duties and obligations under current UK data protection legislation. The University of Bath privacy notice can be found [here](#).

Please CLICK THE ARROW BELOW to submit your responses

End of Block: Debrief

Thank you for taking part in this study!
Your responses have been recorded.
We will send you the first travel diary in a week's time.

END OF SURVEY

11.2 Travel diary protocol

Block 1: Introduction

Travel diary - Week 1

Thank you for taking part in this study!

This travel diary will take approximately 3 minutes to complete.

Please click the arrow to start

Q15 What is your email address?

(We ask this to match your responses across all four travel diaries)

Q13 Did you use a Beryl bike this week?

Yes (1)

No (2)

[End of Block: Use of Beryl bikes](#)

IF Q13 = NO

Block 2: Reasons for non-use

Q18 Please tell us the reason(s) why you chose not to use a Beryl bike this week (please select all options that apply).

We ask this question to understand any barriers people living in Cornwall may experience to cycling or using a bike share scheme.

- I didn't need / want to travel by bike this week (1)
- I prefer to use my own bike, or walk (2)
- The weather was bad (3)
- There are no Beryl bike parking bays near where I live / work (4)
- There were no Beryl bikes available in the parking bays (5)
- I have a health condition or disability which prevents me from cycling (6)
- I don't feel safe cycling on roads with traffic (7)
- I don't feel confident in my cycling ability (8)
- I don't own any safety equipment (e.g. a bike helmet, hi-vis clothing) (9)
- I don't know how to use the Beryl bike scheme (10)
- I can't afford to use Beryl bikes (11)
- I've had a negative experience using Beryl bikes (please specify) (12)

- Other (please specify) (13) _____

Q32 Compared to a typical week, have you travelled more or less **this week** using the following ways to travel?

	A lot more (1)	A bit more (2)	About the same / no change (3)	A bit less (4)	A lot less (5)	Don't know / Not applicable (77)
Active travel (e.g. walking, cycling, wheeling) (Q32_1)))))))
Public transport (Q32_2)))))))
Sharing lifts with others (as the driver or as a passenger) (Q32_3)))))))

Q20 Do you have any comments or suggestions about using Beryl bikes, or how the Council could support active ways to travel in Cornwall (e.g. walking, cycling, wheeling)?

End of Block: Reasons for non-use

Debrief

END OF SURVEY

IF Q13 = YES

Block 3: Journeys, purpose, mode shift

Q1 How many journeys did you make by Beryl bike on each day?

(There and back would count as **two** journeys)

	0 (6)	1 (1)	2 (2)	3 (3)	4 (4)	5 or more (5)
Monday (1)))))))
Tuesday (2)))))))
Wednesday (3)))))))
Thursday (4)))))))
Friday (5)))))))
Saturday (6)))))))
Sunday (7)))))))

DISPLAY LOGIC - DAYS PRESENTED BASED ON RESPONSES TO Q1

Q5 In total, how far did you travel by Beryl bike each day?

(i.e. the **combined distance** travelled for **ALL** Beryl bike journeys on that day)



Thursday ()



Friday ()



Saturday ()



Sunday ()



Q29 What purpose(s) were your Beryl bike journeys for?

(Please select all options that apply for your Beryl bike journeys this week)

- Commuting to my place of work or study (1)
- The school run (2)
- Business-related travel (e.g. visiting clients, making deliveries) (3)
- Going to the shops, doctors, cinema etc. (4)
- Visiting family or friends (5)
- Leisure or exercise (6)
- Part of a journey using different travel modes (e.g. Beryl bike + public transport) (7)
- Other (8)

Q30 Before you started using Beryl bikes, which mode of transport would you have typically used for your journey(s)?

(Please select all options that apply for your Beryl bike journeys this week)

- Not applicable - I wouldn't have made the journey (1)

- My own vehicle (e.g. car / van / motorbike) (2)
- Public transport (3)
- My own bike / e-bike (4)
- I would walk (5)
- Someone would give me a lift (6)
- Other (7)

Q20 Do you have any comments or suggestions about using Beryl bikes, or how the Council could support active ways to travel in Cornwall (e.g. walking, cycling, wheeling)?

End of Block: Journeys, purpose, mode shift

Debrief

END OF SURVEY

11.3 Survey 2 protocol (post-intervention)

Thank you for completing the final travel diary.

This is Survey 2. Some questions may be similar to questions you previously answered in Survey 1 - this is intentional.

Please click the arrow to start

Block 1: Baseline travel behaviours

About how you travel

These questions are about how you commute to work and other travel you do (e.g. for shopping, visiting friends etc.).

Q111B In a typical week, how many journeys per week do you make to / from your place of work or education (i.e. **commuting**) using the following modes of transport?

	Number of commute journeys per week (travelling there and back would count as two journeys) (1)
N/A - I don't work or I work entirely from home (just write 1 in the box) (Q111_11)	
Walking, or Wheeling (i.e. use a wheelchair) (Q111_1)	
Bicycle (including electric bike) (Q111_2)	
Scooter (including electric scooter) (Q111_3)	

Motorbike (Q111_4)	
Car / van (travelling alone) (Q111_5)	
Car / van (sharing lifts with others) (Q111_6)	
Car club (e.g. Co Cars) (Q111_7)	
Bus (Q111_8)	
Train (Q111_9)	
Other (please specify) (Q111_10)	

Q112B In a typical week, how many journeys per week do you make to / from other destinations (e.g. to the shops, visiting friends) using the following modes of transport?

	Number of non-work journeys per week (travelling there and back would count as two journeys) (1)
--	--

N/A - I tend to stay at home (*just write 1 in the box*) (Q112_11)

Walking,
or Wheeling (i.e. use a wheelchair) (Q112_1)

Bicycle (including electric bike) (Q112_2)

Scooter (including electric scooter) (Q112_3)

Motorbike (Q112_4)

Car / van (travelling alone) (Q112_5)

Car / van (sharing lifts with others) (Q112_6)

Car club (e.g. Co Cars) (Q112_7)

Bus (Q112_8)

Train (Q112_9)

Other (please specify) (Q112_10)

Q331 B During the last month, how often did you use a car or van for short journeys (i.e. less than 3 miles)?

N/A - I don't drive / own a car or van (99)

0 (8)	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
-------	-------	-------	-------	-------	-------	-------	-------

Number of days per week: (6)

))))))))
---	---	---	---	---	---	---	---

Q340 Does your household own **two or more** cars / vans?

- Yes (1)
- No - my household owns **one** car or van (2)
- No - my household does not own a car or van (3)

Display This Question:
If Q340 = Yes

Q341 To what extent would the following encourage your household to reduce your vehicle ownership to only one car / van?

	Not at all (1)	Not very much (2)	A little (3)	A lot (4)	Don't know / Not applicable (77)
Greater availability of car club vehicles (e.g. Co Cars) (Q341_1))))))
Improved cycle lane network (Q341_2))))))
Improved public transport (Q341_3))))))
Greater availability of Beryl bikes (Q341_4))))))
Greater availability of pool cars at work (i.e. use of company cars or vans by employees) (Q341_5))))))

Q342 To what extent would you support a 'workplace parking levy'?

A Workplace Parking Levy is a Council charge on employers who provide workplace car parking, with the money to be invested in improving public transport and the cycle lane network in Cornwall.

Employers can decide whether to absorb the cost or pass it on to their employees who use the parking spaces.

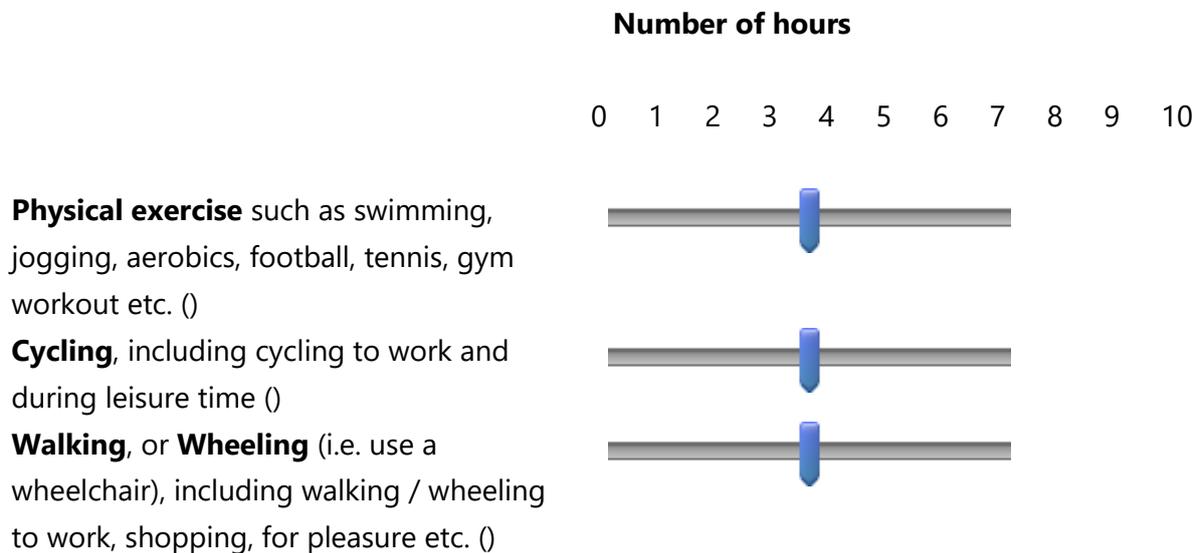
- Strongly oppose (1)
- Tend to oppose (2)
- Neither oppose nor support (3)
- Tend to support (4)
- Strongly support (5)

[End of Block: Baseline travel behaviours](#)

Block 2: Active travel

Q381 During the last week, how many hours did you spend on each of the following activities?

(Please move the slider into the correct position)



End of Block: Active travel

Block 3: e-bikes

About e-bikes and bike share

You're doing great! These questions are about your views on e-bikes and bike share schemes (e.g. Beryl bikes).

Q285 B How likely is your household to buy an e-bike (or another e-bike) in the next 12 months?

- Very unlikely (1)
- Somewhat unlikely (2)
- Neither likely nor unlikely (3)

- Somewhat likely (4)
- Very likely (5)
- Don't know (77)

Q592 To what extent do you agree with the following statement?

My household could easily afford to buy e-bikes for everyone in the household

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)
- Don't know / Not applicable (77)

Q267 B To what extent do you agree with the following statements about Beryl bikes?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
It's becoming more common for people in my town to use Beryl bikes (Q267 B_1))))))
I'm aware that people where I live and work use)))))

Beryl bikes
(Q267 B_2)

Q266 Since hearing about the Beryl bike scheme in Cornwall, have you recommended Beryl bikes to anyone else?

Yes (please indicate how many people) (1)

No (2)

Q268 Has anyone recommended Beryl bikes to you?

Yes (please indicate how many people) (1)

No (2)

Q302 B To what extent do you agree with the following statements about how using Beryl bikes may help you personally? (Part A)

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)	Not applicable (99)
It will make my trips quicker (Q302 B_1)))))))
It will make my trips easier (Q302 B_2)))))))
I will be able to cycle longer))))))

distances
(Q302 B_3)
I can avoid
fatigue or))))))
getting
sweaty
before
work or
socialising
(Q302 B_4)
It will help
me reduce))))))
my carbon
footprint
(Q302 B_5)

Q301 B To what extent do you agree with the following statements about how using Beryl bikes may help you personally? (Part B)

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)	Not applicable (99)
It will provide me) with exercise) (Q301 B_6)))))))
It will provide me) with mental) health) benefits) (Q301 B_7)))))))
It will enable me to cycle) with friends) / family as a) group (Q301) B_8)))))))

It will take away concerns around bike maintenance and storage (Q301 B_9)

It will take away the worry of bike theft (Q301 B_10)

Q300 B To what extent do you agree with the following statements about how using Beryl bikes may help you personally? (Part C)

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)	Not applicable (99)
It will save me money (Q300 B_11)))))))
It will connect me to places not served by public transport (Q300 B_12)))))))
I will be able to use my car less (Q300 B_13)))))))

I will avoid traffic)))))))

congestion / parking difficulties

(Q300 B_14)

I can try an e-bike)))))))

before I decide whether to buy one

(Q300 B_15)

End of Block: e-bikes

ROUTING QUESTION – BLOCK 4 OR BLOCK 5

Q556 Did you use a Beryl bike during the last **month**?

- Yes (1)
- No (2)

Block 4: Evaluation of Beryl bikes - not used this week (IF Q556 = Yes)

Q555 Did hiring a Beryl bike encourage you to...

- cycle for the first time ever? (1)
- cycle for the first time after a long break (5 years or more)? (2)
- cycle for the first time after a shorter break (less than 5 years)? (3)
- No change, I was already cycling (4)
- Don't know / Not applicable (77)

Q505 During the last month, did you combine Beryl bikes with any other mode of transport for a journey? (e.g. after a train or bus trip)

Please select all that apply

- No, I did not combine Beryl bikes with another mode of transport (1)
- Bus (2)
- Train (3)
- Taxi (4)
- Car / van as a driver (5)

- Car / van as a passenger (6)
- E-scooter / scooter / motorcycle (7)
- Other (please specify) (8) _____

Q519 Please rate your experience of the following aspects of using Beryl bikes (Part A):

	Very dissatisfied (1)	Somewhat dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Somewhat satisfied (4)	Very satisfied (5)	Don't know / Not applicable (77)
Bike comfort (Q519_1)))))))
Lights (Q519_2)))))))
Brakes (Q519_3)))))))
Gears (Q519_4)))))))
Basket carrying capacity (if applicable) (Q519_5)))))))

Q537 Please rate your experience of the following aspects of using Beryl bikes (Part B):

	Very dissatisfied (1)	Somewhat dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Somewhat satisfied (4)	Very satisfied (5)	Don't know / Not applicable (77)

Bike battery charge (Q537_6)))))))
Bike locking / unlocking process (Q537_7)))))))
Availability of bikes in the parking bays (Q537_8)))))))
Location of the parking bays (Q537_9)))))))
Price (Q537_10)))))))

Q528 Please rate your experience of the following aspects of using Beryl bikes (Part C):

	Very dissatisfied (1)	Somewhat dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Somewhat satisfied (4)	Very satisfied (5)	Don't know / Not applicable (77)
Customer service (Q528_11)))))))
Registration process (Q528_12)))))))
Ease of use - Beryl app (Q528_13)))))))

Communication
s (e.g. emails,
social media)
(Q528_14)

End of Block: Evaluation of Beryl bikes - not used this week

Block 5: Evaluation of Beryl bikes - used this week (IF Q556 = No)

Q62 Did hiring a Beryl bike encourage you to...

- cycle for the first time ever? (1)
- cycle for the first time after a long break (5 years or more)? (2)
- cycle for the first time after a shorter break (less than 5 years)? (3)
- No change, I was already cycling (4)
- Don't know / Not applicable (77)

Q63 During the last month, did you combine Beryl bikes with any other mode of transport for a journey? (e.g. after a train or bus trip)

Please select all that apply

- No, I did not combine Beryl bikes with another mode of transport (1)
- Bus (2)
- Train (3)
- Taxi (4)
- Car / van as a driver (5)
- Car / van as a passenger (6)
- E-scooter / scooter / motorcycle (7)
- Other (please specify) (8) _____

Q64 Please rate your experience of the following aspects of using Beryl bikes (Part A):

	Very dissatisfied (1)	Somewhat dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Somewhat satisfied (4)	Very satisfied (5)	Don't know / Not applicable (77)
Bike comfort (Q64_1)))))))
Lights (Q64_2)))))))
Brakes (Q64_3)))))))
Gears (Q64_4)))))))
Basket carrying capacity (if applicable) (Q64_5)))))))

Q65 Please rate your experience of the following aspects of using Beryl bikes (Part B):

	Very dissatisfied (1)	Somewhat dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Somewhat satisfied (4)	Very satisfied (5)	Don't know / Not applicable (77)
Bike battery charge (Q65_6)))))))
Bike locking / unlocking process (Q65_7)))))))
Availability of bikes in))))))

the
 parking
 bays
 (Q65_8)
 Location of
 the))))))
 parking
 bays
 (Q65_9)
 Price
 (Q65_10)))))))

Q66 Please rate your experience of the following aspects of using Beryl bikes (Part C):

	Very dissatisfied (1)	Somewhat dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Somewhat satisfied (4)	Very satisfied (5)	Don't know / Not applicable (77)
Customer service (Q66_11)))))))
Registration process (Q66_12)))))))
Ease of use - Beryl app (Q66_13)))))))
Communications (e.g. emails, social media) (Q66_14)))))))

End of Block: Evaluation of Beryl bikes - used this week

Block 6: Barriers to Beryl bike use

Q506 What do you think are **the three main barriers** to people using Beryl bikes in Cornwall?

(Please select **three** options from the list below)

- Lack of awareness about Beryl bikes (1)
- Lack of availability of bikes in parking bays (2)
- Location of parking bays (3)
- Cost of using Beryl bikes (4)
- Beryl bike design / comfort (5)
- Beryl bike reliability / battery charge (6)
- Personal safety / busy roads / lack of safe cycling routes (7)
- Lack of cycling confidence or competence (8)
- Long distances / steep hills (9)

End of Block: Barriers to Beryl bike use

Q317 Thank you for your responses.

Would you like to receive a £25 Love2Shop e-giftcard for participating in this study?

Yes (1)

No (2)

Debrief

Thank you very much for taking part in this study!

Further information

This study is a collaboration between Cornwall Council and researchers at the University of Bath. The aim of the study is to explore the travel behaviours and perceptions of people living in Cornwall. This information will be used to inform Cornwall Council travel policies or interventions to reduce carbon emissions.

If you have any questions about the study, please contact the research team: Mark Wilson (mw2640@bath.ac.uk) or Lorraine Whitmarsh (lw2253@bath.ac.uk).

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Please CLICK THE ARROW BELOW to submit your responses

End of Block: Debrief