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Personal e-scooter ownership and use: Perspectives from New Zealand

By
Stephen Greaves[a], Ferdinand C Balfoort[b]

[a] Sydney School of Public Health, Faculty of Medicine and Health, The University of Sydney

[b] Doctoral Candidate in Law, Charles Darwin University

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ABSTRACT: In common with much of the world, e-scooters have emerged onto the urban landscape in New Zealand, promising both a practical and greener form of personal mobility. While focus has primarily been around managing shared e-scooter services, relatively liberal e-scooter legislation has encouraged the purchase of personal/private e-scooters, which are not regulated at the point of sale, exacerbating concerns around how to safely accommodate this emerging mode. In turn, this highlights the need for better understanding of personal e-scooter users, about which relatively little is known. Drawing from a survey of 252 current and former e-scooter owners in New Zealand, this paper provides estimates of e-scooter ownership, explores motivations for purchasing e-scooters, who is buying them, what consumers are looking for, how they are being used and implications for shared e-scooter schemes. Results suggest around 60% of personal e-scooters are capable of travelling about the maximum 'safe' e-scooter speed limit in New Zealand of 25 kph. E-scooter owners are more likely be male, middle-aged, middle/higher income, employed and have tried a shared e-scooter scheme prior to purchase and be motivated by the flexibility, performance, and potential cost-savings. The growing number of shared e-scooter services is evidently providing a pathway to purchase, a complementary mode and potentially a factor in people selling their e-scooter. Going forward, safely accommodating, and regulating e-scooter usage without compromising the intrinsic appeal of this emerging mode of transport is essential, if it is to play a meaningful role in moving us towards more sustainable mobility systems.

KEY WORDS: ***e-scooters, personal ownership, sustainable mobility***

AUTHORS: **Greaves, Balfoort**

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CONTACT:

INSTITUTE OF TRANSPORT AND LOGISTICS STUDIES (H04)

The Australian Key Centre in Transport and Logistics Management

The University of Sydney NSW 2006 Australia

Telephone: +612 9114 1813

E-mail: business.itlsinfo@sydney.edu.au

Internet: http://sydney.edu.au/business/itls

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1 Introduction

In common with much of the world, e-scooters have emerged onto the urban landscape in New Zealand, promising both a practical and greener form of personal mobility. Much of the focus has been on shared e-scooters, which are regulated in terms of the devices, where they can legally operate, how fast they are allowed to go, and who can use them. Concurrently, there has been an increase in personal/private e-scooters, which are not subject to the same regulations and/or level of enforcement, exacerbating growing concerns around how to safely accommodate this emerging mode. While much is known about users and their use of shared e-scooter schemes, relatively little is known about personal e-scooter users. The current paper presents an exploratory analysis of personal e-scooter owners in New Zealand. The primary analysis is based on a survey of 252 current and former e-scooter owners, exploring motivations for purchasing e-scooters, who is buying them, what consumers are looking for, how they are being used and potential implications for shared e-scooter schemes.

2 Background

2.1 Personal e-scooter use

Despite the fact personal e-scooters vastly outnumber shared e-scooters – based on import data provided by NZ Stats[1], roughly 400,000 e-scooters were imported into New Zealand over the 2018-2023 period, compared to 6,106 shared e-scooters operating as of early 2024 (Ride Report, 2024) - most of the research to-date has focused on shared schemes (Arbeláez Vélez, 2024; Badia and Jenelius, 2023). Most shared schemes have been initiated as trials, where there is clearly an imperative as part of the evaluation to survey users, arguably the most comprehensive example being the UK National e-scooter evaluation (UK Department of Transport, 2022). Surveying users is relatively straightforward as they typically provide contact details as part of the registration process and download an app, which can be used as a mechanism for sending/submitting surveys. Clearly, as with any survey requiring participant recall, it is imperative to encourage users to complete the survey as soon after completing their travel as possible. For personal e-scooter users, the situation is more challenging, often relying on a variety of methods to recruit including social media, posters, and postcards (Leung and Burke, 2022). Given the semi-legality of personal e-scooters in many jurisdictions, these difficulties can be accentuated.

In the closest parallel to the situation under investigation here, Leung & Burke (2022) provide evidence from Queensland, which was the first Australian jurisdiction to legalise use of personal e-scooters. The most pertinent finding relates to the legality of e-scooters being purchased, with 60% capable of exceeding the current hardware-regulated speed limit of 25kph. Purchasers tend to be older and most had tried an e-scooter (shared or someone else's) prior to purchase with the top reasons cited as cost-effectiveness, recreation, and convenience. While there have been comparisons of shared e-scooter and e-bike schemes (Curl & Fitt, 2020), to the authors' knowledge little is known about the interplay between personal and shared e-scooters and whether they are complementary or competing modes.

2.2 Personal and shared e-scooters

Comparative research between shared and personal e-scooters has largely focused on safety and broader sustainability concerns. The first point to note is most reviews of safety and sustainability focussed research tend to either not differentiate between owned/shared and/or note challenges in distinguishing between them (Mitropoulos et al., 2023). Safety dialogues have tended to be dominated by high-profile incidents involving e-scooters with the finger of blame largely being pointed at personal e-scooter users (UK Department of Transport, 2022).

[1] https://infoshare.stats.govt.nz/

However, it is not clear-cut – recent analysis of shared and personal e-scooter users in Brisbane, where footpath e-scootering is legal, suggest that shared e-scooter users are much less likely to wear helmets (mandatory in Australia) than those on personal e-scooters and that interactions with pedestrians rarely occur (Haworth et al., 2021). In terms of broader sustainability comparisons, e-scooters are carbon-intensive to manufacture, rely on lithium-ion batteries, have a short lifespan (3-5 years) with limited recycling options – roughly half their carbon emissions are associated with their manufacture (Hollingsworth et al., 2019). Their justification is primarily based on substituting travel made by more carbon-intensive modes, particularly replacing cars for short trips (typically 2-5 km) and as a first/last mile to service public transport as well as reducing car ownership (Hosseinzadeh et al., 2021). The evidence-to-date suggests personal e-scooters may emit less net-carbon emissions relative to the modes they substitute for than shared e-scooters (Reck et al., 2022). While at first this may seem counterintuitive, evidence suggests that shared e-scooters tend to have shorter life-spans, have greater costs associated with repositioning and are more likely to substitute for active modes, particularly walking and public transport (Wallgren et al., 2023). By contrast, personal e-scooters, have been associated with a greater likelihood of replacing *all* modes, including the car and are used for a wider range of trip purposes than shared e-scooters (Laa & Leth, 2020). Clearly, this is a debate set to continue, particularly as shared services ramp up in New Zealand and elsewhere.

3 E-scootering in New Zealand

3.1 The transport context in New Zealand

Located in the South Pacific, New Zealand is the sixth-largest island nation in the world by area. The nation comprises a North and South Island, with a total population of over five million. Eighty percent of the population reside on the North Island, with one-third of the population residing in the capital Auckland. Other than Auckland and a few smaller cities, the country is largely agrarian and relies on tourism, particularly the South Island. In terms of transport, New Zealand conducts a continuous 2-day national household travel of around 2,000 people/annum (NZ Ministry of Transport, 2024). At a national level, car is the dominant mode (81%), followed by walking (11%), public transport (5%), cycling (2%) and other modes (1%). E-scootering is not currently identified as a specific mode in the national survey, although plans are to include this in future iterations. Within urban centres, car reliance while slightly lower is still the dominant mode - 43% of all car trips are less than 5 km, a distance potentially substitutable by micromobility modes, including e-bikes and e-scooters.

Since they were first legalised in New Zealand in 2018, e-scooters have emerged rapidly onto the transport landscape. Shared e-scooter services have gone through consolidation in New Zealand, with eight providers (15,000 e-scooters) in 2021 being reduced to three providers (6,106 e-scooters) operating in 15 population centres making around 19,000 trips/day (Ride Report, 2024). Figure 1 provides the geographical context for current operations.

Figure 1: Shared e-scooter services in New Zealand (2024)

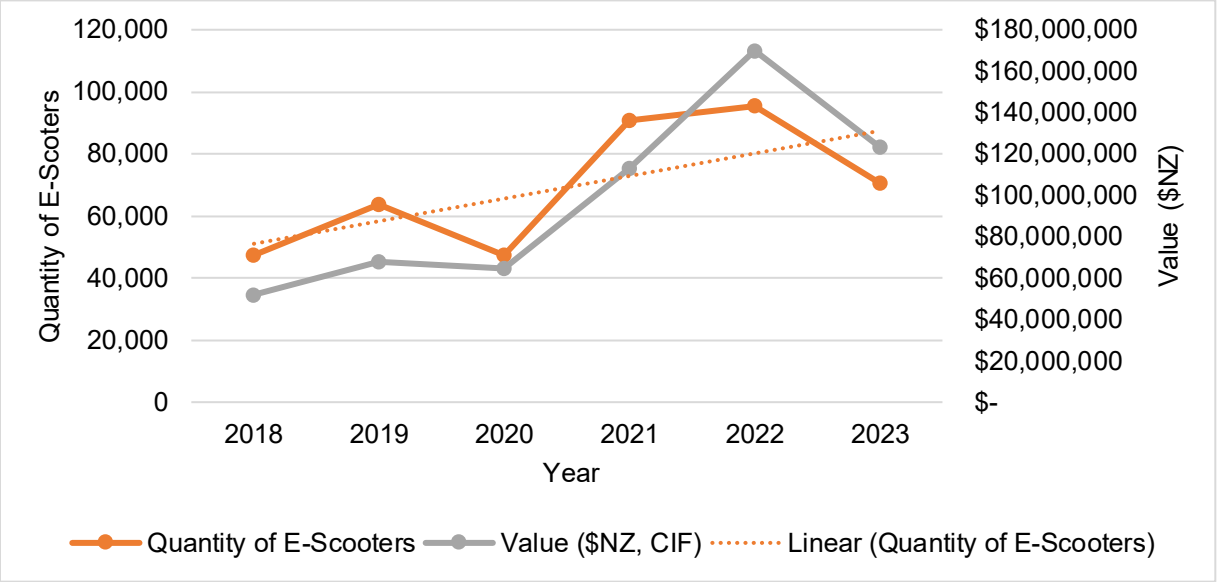
Source: (Ride Report, 2024) available at https://public.ridereport.com/regions/newzealand

3.2 E-scooter ownership and use

While information for shared e-scooters is reasonably accessible, the opposite is true for personal e-scooters, which suffer from little/no reliable information on ownership and use among the general population, a situation mirrored in Australia and many other countries (Zagorskas & Burinskienė, 2020). One potential source of e-scooter numbers is sales data. However, sales data are problematic, as e-scooters can be purchased from a range of sources (online, speciality stores, general department stores etc) and there is no centralised repository or classification method for sales of e-scooters. Import data provide another potential clue and are easily accessible and searchable in New Zealand, courtesy of Stats New Zealand[2]. However, they use the 'Harmonised System' classifications used for International Trade statistics by New Zealand customs, which do not single out electric micro-transport options, such as e-scooters, e-bicycles, and hoverboards. Stats New Zealand were able to run a customised query on their information to provide estimates of 'Electric micro-transport devices', which comprise HS codes 8711600000 and 8711900010. Over the 2018-2023 period, around 400,000 e-scooters have been imported into New Zealand with a combined value of almost $NZ600 million. Ignoring the downturn during the COVID-19 pandemic and the 2023 recession, the trend is upwards with sales growing by around 15-20% per annum. To estimate ownership, we also need to know how many e-scooters have been scrapped, which is equally unreliable. The consensus is that an e-scooter has an average lifespan of 3-5 years although this is clearly a function of the quality of the e-scooter, the battery, how and where it is ridden, maintenance, vandalism, accidental damage etc. If we assume this translates to roughly 10-20% of e-scooters being scrapped each year, this implies between 275,000 – 335,000 e-scooters were in circulation in New Zealand as of the end of 2023, an ownership rate of 5%-7%. Clearly this estimate would be improved with better information on e-scooter sales and scrappage rates.

[2] https://infoshare.stats.govt.nz/

Figure 2: Imported electric micro-transport devices (2018-2023)



Source: Developed by the authors using data provided by Statistics New Zealand www.stats.govt.nz

To the authors knowledge, there are no large-scale surveys that have been conducted in New Zealand, to establish even best guesstimates around e-scooter ownership or usage - as noted previously, the National Survey does not currently ask about e-scooters. What is evident, based on the volume of sales data and local observations it that most e-scooters in circulation are likely not being used/used infrequently. Import data suggest around 20% of e-scooters arrive in the lead-up to Christmas, which marks both the holidays and summer in New Zealand. However, once the novelty/fun wears off, the realities of using e-scootering in poorer weather and on insufficient/risky infrastructure, probably cause many riders to leave them at home.

3.3 E-scooter regulations

General guidelines/recommendations around road transport in New Zealand and Australia are set by Austroads, an independent body of transport agencies representing all the states/ territories in Australia and New Zealand (Austroads, 2024). These guidelines are used to formulate regulations at a state/territory level in Australia and nationally in New Zealand by the New Zealand Transport Agency. In the case of e-scooters, Austroads recommendation was to classify these as a Wheeled Recreational Device (WRD), which bundled them in with regular scooters, skateboards etc. As e-scooter use became more popular and the vehicles capable of greater speeds and associated safety risk, the need to regulate them separately became more apparent. This has resulted in ‘catch-up’ regulations ranging from outright bans on personal e-scooter use on public infrastructure in New South Wales, South Australia, and the Northern Territories, to a myriad of different classifications and conditions under which they are allowed to operate in the remaining states/territories (Table 1).

Table 1: E-scooter regulations in New Zealand & Australia (as of May 2024)

Jurisdiction	NSW Trials[1]	QLD	SA	TAS	VIC	WA	ACT	NT	New Zealand
Last Updated (month/year)	7/22	11/22	7/22	12/21	4/23	12/21	12/19	5/22	10/23
E-Scooter Classification	Motor cycle	PMD[2]	Motor Vehicle	PMD	e-scooter	e-Rideable	PMD	Motor Vehicle	Low-powered vehicle
Personal/private e-scooters	x	√	x	√	√	√	√	x	√
Length/width/ height (cm)	125/70/135 with a max weight of 60kg is specification for e-scooter dimensions set by the federal government as of 7/21								Wheel diameter[3]
Max Weight (kg)	60	60	60	45	None	25	60	60	60
Hardware limited speed (kph)	20	None	25	25	25	25	25	25	None[3]
Footpaths	x	√	√	√	x	√	√	√	√
Shared paths	√	√	√	√	√	√	√	√	√
Bike lanes	√	√	x	√	√	√	x	x	x
Roads up to 50 kph	√	√	x	√	√, 60 kph	√	x	x	√, no limit
Max shared path speed (kph)	10	12	15	15	20	10	15	15	10-15
Max bicycle path speed	Road speed	25	Road speed	Road speed	Road speed	Road speed	Road speed	Road speed	Road speed
Min rider age	16	16	18	16	16	16	12	18	None
Helmet required	√	√	√	√	√	√	√	√	No
Max BAC[4]	0.05	0.05	0.05	0	0	0.05	0	0.05	N/A
Insurance	Required by operators of shared e-scooter schemes, not required for personal e-scooters								

New South Wales; Queensland; South Australia, Tasmania; Victoria; Western Australia; Australian Capital Territory, Northern Territory; [1]Framework for shared e-scooter trials; [2]Personal mobility device; [3]Restricted on maximum power output of motor (300W) and wheels not exceeding 355mm; [4]Blood Alcohol Content

In New Zealand, general rules affecting e-scootering are set at the national level by the New Zealand Transport Agency, ensuring (in theory at least) a degree of consistency across the country (NZ Transport Agency, 2018). E-scooters are classified as *low-powered vehicles*, which imposes physical restrictions on their maximum wheel diameter (355mm) and maximum power output (300W) but *not* their potential maximum speed - this is different to Australia, where e-scooters are physically restricted by hardware-restricted speed limiters other than in Queensland. Onus is on the consumer *not* the vendor for establishing if the e-scooter meets the conditions of a low-powered vehicle although this is also a gray legislative area. Vendors are supposed to advise consumers of the power output limitations established by NZTA and the need for speed limiters, but there is significant confusion over the limits and no assurance that this is happening (NZ Transport Agency, 2023a).

The classification of e-scooters as a low-powered vehicle means the owner does not need to carry a licence, registration or compulsory third-party insurance to use their e-scooter in public. Likewise, their classification means there are no minimum age requirements for riders, Helmets are only recommended and perhaps most contentiously, riders cannot be legally charged under drunk driving rules as these apply to motor vehicles. Likewise, there are no rules around maximum speeds per se, but e-scooters '*must be operated in a careful and considerate manner at a speed that does not put other footpath users at risk and gives way to pedestrians and mobility devices*'. Assessing and enforcing this, is clearly open to interpretation and generally not a priority with police, with only two reported cases of speeding in four years (NZ Transport Agency, 2023c). E-scooters are allowed on footpaths, shared paths, and minor roads, but they are not permitted in designated cycle lanes that are part of the road designed for the sole use of cyclists. E-scooters are allowed on trains but must be foldable to be brought onto a bus.

Interpretation and enforcement of these rules lies with the local government authority (NZ Transport Agency, 2023c). Evidently, compliance is largely functional, primarily undertaken as part of operational contracts of shared e-scooter services regulated through Trading in Public Places bylaws and codes of practice. This has been accompanied by tightening rules around e-scooter specifications, speed limits, no-go zones, helmet wearing, rider age limits etc. However, these regulations do not apply directly to personal e-scooters, creating inconsistencies and significant uncertainty about personal e-scooters in terms of quantum, performance, types, speed limits and impacts on other road users and stakeholders.

In September 2023, the original 2018 New Zealand declaration not to be motor vehicles lapsed threatening to make e-scooter operation illegal on public infrastructure. The declaration was renewed until September 2028 following a review that concluded the benefits of e-scooters as a sustainable form of personal mobility outweighed safety and other concerns around their use (NZ Transport Agency, 2023b). The declaration was supported by a public opinion survey (3670 out of 5644 were in favour) and stakeholder feedback. The implications are that use of both personal and shared e-scooters is likely to increase for the foreseeable future. In turn, this makes it imperative to understand motivations for and use of personal e-scooters, together with assessing their potential interplay with shared e-scooters as a complementary or competing mode going forward. Currently, there is little empirical evidence around these issues, providing the motivation for the current study and data collection.

4 Materials and methods

An online survey designed through a collaborative effort between the Mobility Research partnership[3] and Beam Mobility Pty was distributed using the Survey Monkey panel in early 2022. The aim was to recruit 250 current and former owners of personal e-scooters in New Zealand aged 18-65. The Survey Monkey panel requires the researcher to specify an expected incidence/qualification rate, which would typically be obtained from secondary data or a pilot survey. In our case, noting the challenges with estimating e-scooter ownership, we set the expected incidence/qualification rate for owners/former owners at 10-19%. Survey Monkey provided nominal compensation to participants for completing the survey.

The survey collected the following measures:

Socio-demographics: age, gender, household income, occupation, driver's licence type (None, Learner, Provisional, Full), number of household vehicles, access to shared e-scooters within 5 minutes at home and work.

E-scooter owners: length of ownership, influence of access to shared e-scooters on purchasing decision, e-scooter make and model, reasons for purchase, e-scooter use – trip purposes, frequencies, durations, use of shared e-scooters, long term rental interest.

Former e-scooter owners: influence of access to shared e-scooters on selling decision, reasons for use of shared e-scooters, use of shared e-scooters - purposes, frequencies, durations.

E-scooter make and model: used to classify e-scooters into two groups; 'Basic' e-scooters were those deemed incapable of exceeding the maximum 'generally accepted' speed limit of 25 kph, and 'High-end' e-scooters those capable of exceeding 25 kph. Note, this does not mean the e-scooter is necessarily operating at those speeds, just that it is capable based on design specifications.

[3] The Mobility Research partnership is an independent research body comprising academics and researchers across Australia and New Zealand www.mrp.org

5 Results and discussion

In total 579 members of the public responded to the filter question, '*Have you ever owned (currently or in the past) your own e-scooter*?' Of these, 252 indicated yes and went on to complete the survey. Of these 252 completes, 137 indicated they currently owned an e-scooter and 115 indicated they use to own an e-scooter. For the 137 e-scooter owners, 28 records were excluded based on the e-scooter make and model question (5 shared e-scooters, 4 e-mopeds, 1 e-luggage, 1 e-bike, 17 unknown) leaving a sample of 109 remaining. This in itself was insightful as evidently the term 'e-scooter' is not universally understood and/or interpreted differently. It is also notable, that a small percentage of participants evidently confused shared and personal/private e-scooters, an issue noted in safety related studies on e-scooters, where it is challenging to determine whether injuries are related to private or shared e-scooters (Fang, 2022).

In principle, this information should have been able to provide/corroborate our estimates of e-scooter ownership from import data. However, we were unable to obtain actual qualification rates from Survey Monkey and it is highly probable even if we did, we still had no assurance whether people had actually seen or simply ignored the survey invitation. What we do know is the qualification rate was somewhere between 10-19% so we can infer between 1,250-2,500 invitations were sent to reach the target of 250 owners/former owners. Based on this assumption, we estimate e-scooter ownership to be between 4%-9% (109/1250 – 109/2500), which is in the range of what was estimated using the import data (4%-6%).

Socio-demographics by category of e-scooter and former owners are presented in Table 2. The first point of note is that 60% of e-scooters were capable of exceeding the 'generally accepted' (recall there is not a legal maximum speed for e-scooters in New Zealand) maximum allowable speed of 25 kph. This matches what was reported by Leung and Burke (2022) in Queensland. In terms of gender, while there is a bias towards males (60/40), it is less pronounced than in Queensland, where overall the gender split was closer to 75/25 in favour of males. However, it mirrors more closely the situation in New Zealand with shared e-scooters, where 43% of e-scooter users are reportedly female, although this statistic refers to users of both shared and personal e-scooters (Curl & Fitt, 2020). Evidently, there is a skew towards middle-aged, employed, higher income individuals, but little difference across the two categories of e-scooter. Almost all participants have or are getting a driver's licence and rates of car ownership are high. This raises questions over whether e-scooters are primarily being used for recreation or as a complementary mode, an issue explored in subsequent sections.

Table 2: Sample characteristics

e-scooter ownership group	Basic (<=25 kph)	High End (>25kph)	Former owners
n (% of e-scooter owners*)*	44 (40%)	65 (60%)	115
Gender (est)*			
Male	62%	60%	52%
Female	38%	40%	48%
Age			
18-24	25%	11%	25%
25-34	45%	45%	43%
35-44	25%	29%	18%
45-54	2%	14%	9%
55+	2%	2%	4%
Household Income (NZ$)			
<$15,000	2%	0%	6%
$15,000-$29,999	5%	3%	12%
$30,000-$49,999	18%	12%	10%
$50,000-$74,999	14%	34%	25%
$75,000-$99,999	27%	23%	19%
$100,000-$150,000	25%	23%	13%
$150,000+	9%	5%	15%
Occupation Status			
Student	9%	2%	5%
Employed Full-time	64%	78%	67%
Employed Part-time/casual	16%	8%	13%
Other	11%	12%	15%
Driver's Licence Status			
No licence	2%	2%	6%
Learner licence	18%	8%	20%
Provisional licence	16%	15%	13%
Full licence	64%	75%	58%
Prefer not to say	0%	0%	3%
Household Vehicles			
0	5%	0%	3%
1	18%	31%	30%
2	39%	42%	44%
3	23%	20%	13%
4+	16%	8%	10%

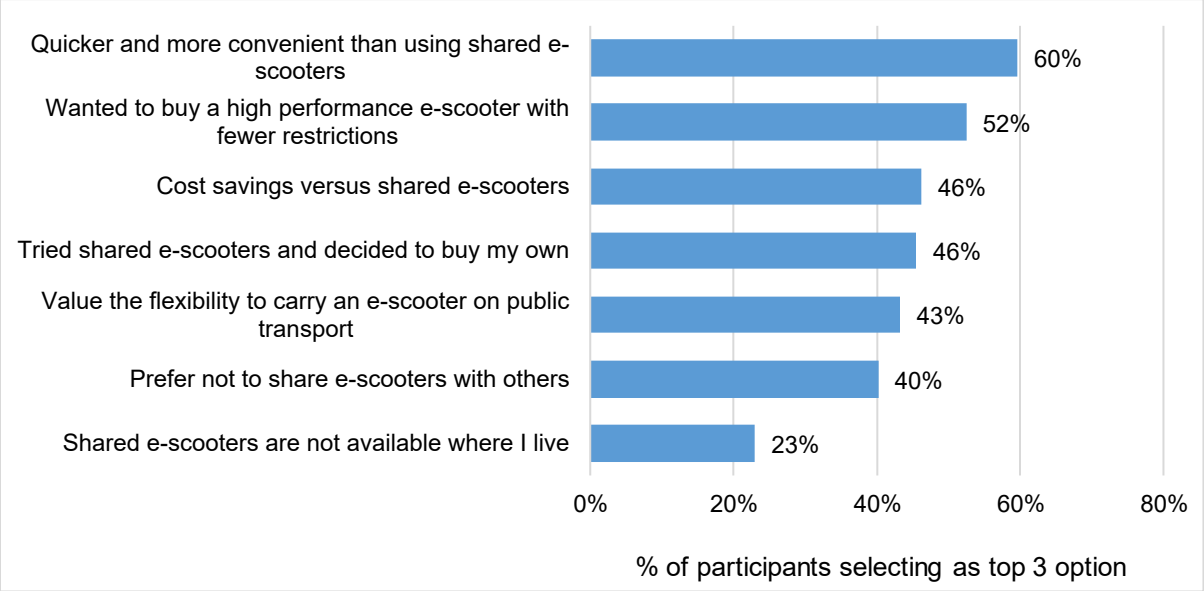
*Survey aimed to recruit roughly equal numbers of males & females. We know that 244 males and 335 females were contacted, so adjusted estimates accordingly.

5.1 Why are people buying (and selling) e-scooters?

Participants were asked to rank the top 3 reasons behind their decision to purchase an e-scooter relative to sharing, with results presented in Figure 3. Evidently, the perceived convenience (60%) and performance advantages (52%) over shared e-scooters ranked as the top reasons overall. While it has already been highlighted that shared schemes have become more prominent in New Zealand, they are restricted in where they can go, who can use them, and their performance, particularly their ability to navigate hills, as well as the

limitations (caps) imposed on the numbers of e-scooters by City council licensing.[4] Cost savings over shared e-scooters (46%) was the 3rd most cited reason. With a median cost of just over NZ$1,000, an e-scooter is a relatively affordable personal mobility option, and dependent on how frequently it is used, can offer savings over shared e-scooter schemes. While it is speculative, one plausible reason is that the time-based charging system of shared e-scooters makes them uncompetitive beyond a distance of around 5km. Notably, in their Queensland evaluation, Leung and Burke (2022) reported cost effectiveness as being the primary reason for using privately owned PMDs. The fourth most cited reason was related to having tried a shared e-scooter scheme as a precursor to purchase (46%). This supports evidence that shared services may provide a potential pathway to purchase (Leung & Burke, 2022; UK Department of Transport, 2022). The practical issue of shared e-scooters not being available where people live aside (23%), the least important reason appears to be an aversion to sharing, although this was still a primary reason for 40% of participants.

Figure 3: Reasons for purchasing an e-scooter over sharing



Participants who had recently sold their e-scooter were asked whether this was a result of access to shared e-scooters. Over half (54%) cited this as a reason, while 39% did not, with the remaining 7% indicating this was not relevant as they did not have access to shared e-scooters. Additionally, 25% of current owners indicated they were more likely to consider selling their e-scooter as a result of access to shared e-scooters. Likelihood of selling was stronger for those who had owned their e-scooter more than 12 months (33%) vs less than 12 months (22%) although there was no difference in terms of the proportions indicating they were less likely to sell (33%). While this needs to be unpacked more, plausible reasons are that e-scooters represent a significant cost, they have a relatively short lifespan (1-2 years for budget models, 2-3 years for premium models depending on how they are ridden, stored, maintained and battery charging habits)[5], they are relatively easy to steal, and it may simply be that they do not meet people's needs.

5.2 How are personal e-scooters being used?

Figure 4 presents a comparison of personal e-scooter and shared e-scooter (asked of former owners) usage. While there are occasional users of personal e-scooters, over 80% use them

[4] https://ourauckland.aucklandcouncil.govt.nz/news/2019/12/updated-conditions-of-e-scooter-licences/

[5] https://dynamicscooter.com/how-long-does-an-electric-scooter-last/

at least one/week with 20% using them daily. Use of shared e-scooters tends to be more infrequent, although over one-third of users report using them at least once/week suggesting they retain an important role for former e-scooter owners. Comparisons of trip purposes highlight the importance of both personal and shared e-scooters as a commuting option both to work/study and as an access/egress mode for public transport (Schwinger et al., 2022). As noted, while e-scooters are allowed on trains, they must be foldable to be carried onto a bus, which is a limitation for many personal e-scooter models. Evidently personal e-scooters are being used for a wider range of trip purposes than shared e-scooters, although both highlight the importance of the 'fun' aspect in their usage.

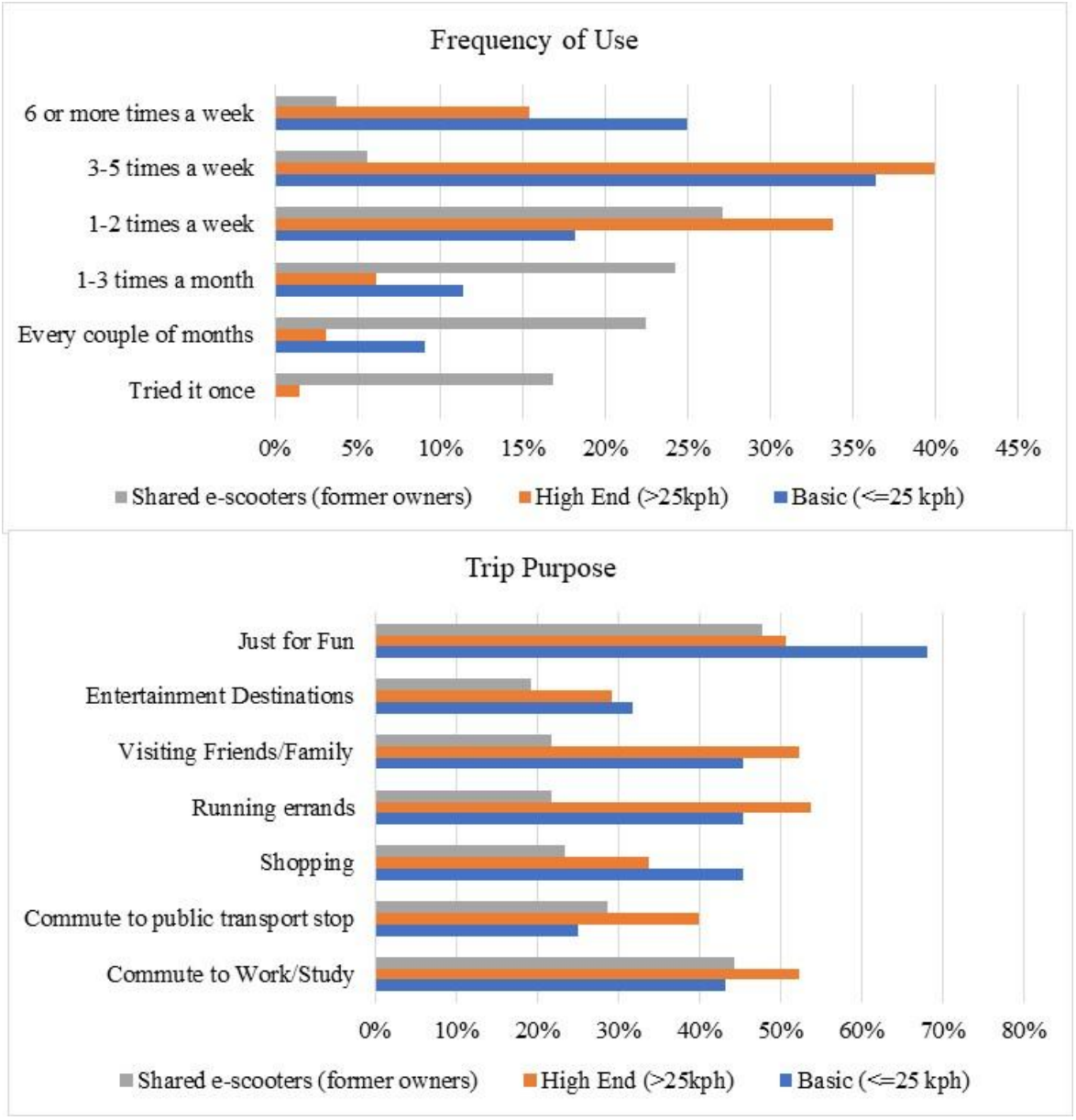


Figure 4: Usage of personal e-scooters and shared e-scooters

5.3 What is the potential impact on shared e-scooters?

Results suggest that shared e-scooters may provide both a conduit to purchase and a reason why people are selling e-scooters. This raises questions around whether shared e-scooters are a complementary or competing mode and vice-versa. Participants were asked whether their usage of shared e-scooters had changed as a result of owning an e-scooter (Figure 5).

While around 60% of personal e-scooter owners were using shared e-scooter services less, over 25% reported using them the same or more. Participants were also asked if they used shared e-scooter services in conjunction with their private e-scooter (Figure not shown) with 40% reporting they usually did. Again, this needs unpacking, but it is plausible that personal e-scooters represent a significant investment and there may be instances when people would rather use a shared service than leave their e-scooter where it could be at risk of theft.

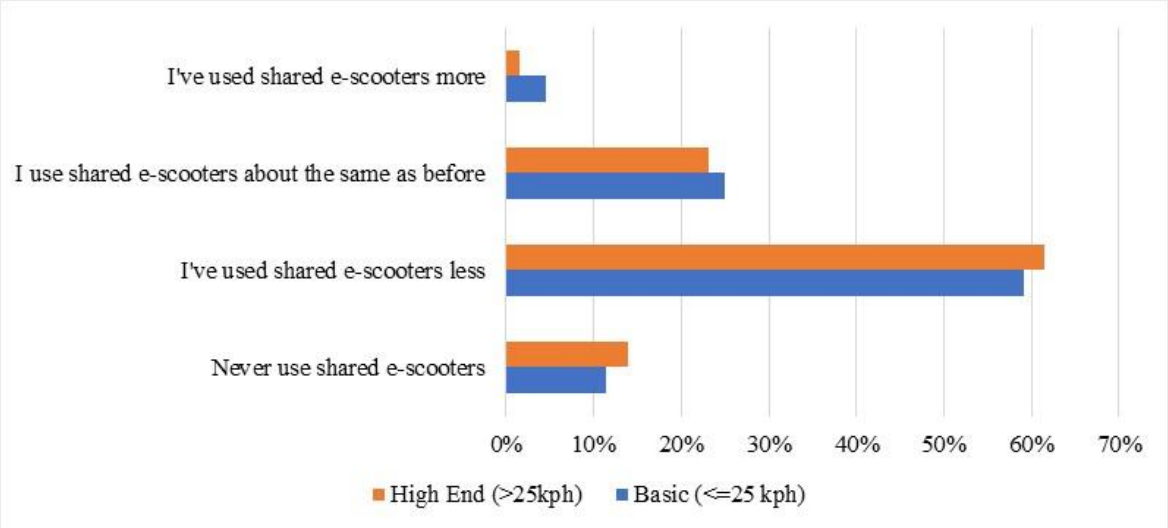


Figure 5: Impacts of personal e-scooter ownership on usage of shared e-scooters

5.4 Study strengths, limitations and future research directions

As with surveys of any 'rare' mode, recruiting and surveying personal/private e-scooter users is fraught with challenges. Available resources and time restricted us to a short online survey through a 3rd party (Survey Monkey), which sought to target e-scooter owners and former owners, and this was achieved. While this is prone to known problems of using Internet panels (Contandriopoulos et al., 2019), this has to be weighed up against use and biases associated with other potential remote approaches (e.g., social media, posters) and the practicalities of more direct approaches recruiting e-scooter riders. Compounding this, while we specified the sample should be drawn from across New Zealand, we were not provided with any locational information on participants. We did not anticipate the high number of former e-scooters that would be recruited although this provided a point of interest that was unanticipated before the survey began. Clearly, we need to understand if this is an aberration of the data collection or a growing trend and possible explanations.

Future research into personal e-scooter use is needed as a complement to the ever-increasing number of studies of shared schemes. First and foremost, reliable estimates of ownership and usage are needed such that we can start to better quantify the role of this mode in terms of travel and sustainability outcomes. We provide two separate estimates of ownership based on our survey data and import data, but clearly these are a starting point, and we welcome more robust verification/validation of these numbers. Questions around safety continue to nag away and provide ammunition for detractors/opponents of a mode that in principle at least, offers a genuine alternative to the car for much day-to-day travel. Unfortunately, much of the negative press around e-scooters has been the result of a few 'e-scooter rogues', but we are still relatively nascent in our understanding of safety issues and appropriate policy response. Most of the empirical research into safety has been based on shared e-scooter datasets or has failed to distinguish between shared and personal e-scooters (Haworth et al., 2021). Likewise, greater understanding of the relative sustainability impacts is warranted, particularly given the conflicting evidence around personal and shared e-scooter schemes (Mitropoulos et al., 2023). We have raised here issues around relative cost-competitiveness of shared and

personal e-scooters, which are clearly impingent on usage, and which are currently difficult to establish primarily as we have relatively poor information on personal e-scooters compared to the wealth of data on shared e-scooters. Following on from this, there are emerging questions around how to ensure 'equitable' access to e-scooters and indeed other micro-mobility transport options. Results here suggest the typical e-scooter owner in New Zealand is likely to have a higher income and own a car. Thought is needed around how to bridge this accessibility gap, whether through expanding and revisiting pricing structures for shared services, lowering entry costs for e-scooter ownership, through leasing and other flexible financial arrangements, effective infrastructure provision, and appropriate regulation.

6 Conclusions

This paper presents insights into personal e-scooter users in New Zealand, a country with relatively liberal laws around their operation. Around 60% of personal e-scooters are capable at travelling above the maximum generally-accepted 'safe' e-scooter speed limit in New Zealand of 25 kph, similar to recent evidence from Queensland (Leung & Burke, 2022). E-scooter owners are more likely to be male, middle-aged, middle/higher income, employed and have tried a shared e-scooter scheme prior to purchase. Personal e-scooters are used more frequently, cover greater travel distances, and cover a wider range of trip purposes than shared e-scooters, but both highlight the importance of 'fun' as a primary motivator. The growing number of shared e-scooter services in different urban centres is evidently providing both a pathway to purchase and a complementary mode and as regulations tighten it will be interesting to see how this relationship develops. Going forward, safely accommodating and regulating e-scooter usage without compromising the intrinsic appeal of this emerging mode of transport is essential, if it is to play a meaningful role in moving us towards more sustainable mobility systems.

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