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TRANSPORT FINDINGS

Bicycle and Free Car Parking Availability at Trip Destinations: A Sustainable Mobility Test for Parking

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Findings

Using a Swiss national survey, we explore three questions that can support better bicycle parking planning: 1) What destinations are the most likely to have bicycle parking? 2) Do trips by e-bikes more frequently end with parking at destinations than those by regular bicycles? 3) Is available bicycle parking at the destination for bicycle trips as frequent as free car parking?
Results suggest a relative undersupply of bicycle parking at destinations compared with free car parking, an increasing need for bicycle parking for costlier e-bikes, and the identification of destination types where bicycle parking is most lacking.

1. Questions

Bicycle parking research largely focuses on worksite parking, parking at transit stations, and the relationship between bicycle parking availability and bicycle use (Heinen and Buehler 2019). Most large travel surveys do not collect information on bicycle parking and no known studies focus on parking for e-bikes.

To influence the use of bicycling, authorities have mostly focused on providing cycling paths. This paper rather focuses on comparing the provision of bicycle parking and free car parking. Provision of free car parking stimulates car use (Shoup 2021) and deters from the goal of increasing sustainable travel modes. The comparison provides what we refer to as a sustainable mobility test for parking.

To assess whether parking offer is adequate with respect to trips completed by cyclists, three questions can support better planning of bicycle parking: 1) What types of destinations are the most likely to have (or not) bicycle parking available? 2) Do trips by e-bikes more frequently end with parking at destinations than trips made with regular bicycles? 3) Is the presence of bicycle parking at the destination as frequent as free car parking?

Evidence at a population level on each of these questions is scarce, suggesting the importance of collecting better data on bicycle parking. We expect free car parking to be more available than bicycle parking, and e-bike trips to be better served by destination parking, given the higher cost of such bicycles.

2. Methods

A randomly assigned sample of trip stages (n= 4,109 bicycle stages; n= 42,465 car stages) conducted by respondents of the 2021 national Swiss Mobility and Transport Microcensus (MTMC) (OFS and ARE, 2023) is used.

In this telephone survey, stages are defined as sections of trips conducted by a specific mode, thereby allowing respondents to declare trips using multiple modes. For bicycle and car trips, stages can involve a connection with public transport stations for the next section of the trip or cover the entire trip.

Stage purposes are identified using the question: "What did you do once you arrived at your destination?" The 13 categories of stage purpose were recoded to 7 categories (see Table 1). Because business trips and accompanying trips are far less frequent stages with too few values for analyses, they are grouped into a Other purpose category.

Respondents were randomly assigned to special sections. The "slow mobility" section included the presence of bicycle parking at the stage destination for those making bicycle stages. For car parking, respondents declaring a car stage as a driver or passenger were asked to declare car parking costs when the destination was not home or a border crossing and when they were 18 and over. Because parking was only asked when a car or bicycle trip was made, the survey does not support an evaluation of foregone trips due to lack of parking. Declared bicycle parking at border crossing and home destinations were omitted to match the car parking question.

The question on bike parking was: "Did you have designated spaces for parking/dropping off bikes at the stage destination?" In the codebook, the information "Interviewer instructions: provided by the owner" did not specify whether this was systematically provided to respondents and this addition can change the nature of responses. It is expected that all bicycle stages had some form of parking available at destinations. But bicyclists that declared no parking likely used "fly parking" such as mooring to street furniture, a sign of undersupply of bicycle parking (Aldred and Jungnickel 2013; Larsen 2015). The question on car parking was: "How much did you have to pay, in Swiss francs (CHF), to park your car at the destination (of the stage)?" Values for car parking were recoded to 3 categories, including free. Paid car parking categories are shown for reference.

We run Two-sample tests of proportions to compare proportions of use of bicycle parking to proportions of use of free car parking for declared stages by purpose and overall. The same tests are used to compare bicycle parking for regular and e-bike stages. We report on two-tailed tests with 95% confidence level. Survey weights are used for all analyses.

Table 1. Samples of bicycling and car trips by purpose, weighted

	Regular bicycle trips		Electric bicycle trips		All bicycle trips		Car driver or passenger trips	
	Observations	Column %	Observations	Column %	Observations	Column %	Observations	Column %
Purpose of trip stage								
Working	393	12.0	129	17.7	522	12.9	9,274	23.0
Education, school	239	5.9	9	1.3	248	5.2	369	0.9
Shopping	337	10.4	70	10.3	407	10.4	8,695	20.4
Errands and use of services	108	3.4	28	4.2	136	3.5	3,283	7.3
Leisure activity	655	18.9	123	17.6	778	18.7	9,948	23.4
Changing mode (Transit station)	207	6.9	25	3.9	232	6.4	3,432	7.7
Other	1,477	42.5	309	45.1	1,786	42.9	7,464	17.3
Total	3,416	100.0	693	100.0	4,109	100.0	42,465	100.0

3. Findings

The bicyclist stage sample is separated into regular bicycle stages (n=3,416) and e-bike stages (n=693) and the most frequent stage destinations for all bicycle stages were in descending order: Other, Leisure activity, Working, and Shopping (Table 1). In contrast, car stages were more frequently for the purposes of Leisure activity, Working, Shopping and Other. E-bicycles were notably more frequently used than regular bicycles for Work and Errands and less used for Education and Transfer at transit stations.

In Table 2, the share of bicycle stages where bicycle parking was available at destinations are reported, along with the share of free car parking and car parking costs categories for car stages.

The average overall availability of bicycle parking is 76.2%. Shares vary between 48% for E-bikes in Leisure activities and 97% for regular bicycles in Education settings. Workplace destinations provide important bicycle parking opportunities (88.8%). Destinations with purposes of Errands and services and conducting Leisure activities have less frequent parking available for bicycles. Surprisingly, for seven out eight purposes, e-bikes stages are completed with lower shares of parking at the destination than regular bicycles stages. Tests of proportions are significantly different for four purposes. While these results are surprising, we surmise that: 1) many e-bikes have built-in frame locks, GPS and alert-declaring detectors that, combined with greater bike weight, can serve as deterrent for mid-day on-street theft; 2) some e-bike owners may be carless and thus more dependent on their e-bikes regardless of parking security. As e-bike may be key to a sustainable mobility system (Rérat, Marincek, and Ravalet 2024) this is suboptimal.

On average, free car parking is found at 90.9% of trip destinations. The highest share of stages where car parking was not free is for transfers at transit stations (24.3%) and for educational settings (nearly 19%, with over 12% paying more than 4 CHF). Tests of proportions reveal that save for educational settings (significantly less free car parking) and transfers at transit stations (no difference), free car parking is significantly more widely available than bicycle parking. The proposed sustainable mobility test for parking is thus failed. To support a transition to sustainable mobility and bridge the availability gap with free car parking, policies for the generalized implementation of accessible, secured and covered bicycle parking are necessary. Assessing multiple localities to identify if any actually have more bicycle parking than free car parking is an interesting area for future research. Many cities have seemingly considered that bicyclists can manage finding parking anywhere while criticizing the use of fly parking on street furniture. Demonstrating a potential imbalance is the goal of the proposed test.

Table 2. Presence of parking at destinations for trips according to modes, weighted

	Regular bicycles (83%)	E-bikes (17%)		All bicycles	Car (driver or passenger)			
	Bicycle parking	Bicycle parking	Test of proportion: regular vs. E-bikes	Bicycle parking	Cost of car parking			Test of proportion: All bicycle parking vs. free car parking
	Yes	Yes		Yes	Free	1-4 CHF	Over 4 CHF	
	Row %	Row %	p < 0.05	Row %	Row %	Row %	Row %	p < 0.05
Purpose of trip stage								
Working	90.2	83.6		88.8	95.7	2.1	2.2	*
Education, school	97.4	84.9	*	96.9	80.8	7.1	12.1	*
Shopping	78.7	71.3		77.6	87.0	12.3	0.8	*
Errands and use of services	55.6	67.7		57.9	87.3	11.2	1.5	*
Leisure activity	67.3	47.7	*	64.5	91.8	5.8	2.4	*
Changing mode (Transit station)	78.6	58.0	*	76.6	75.7	14.3	10.0	
Other	78.8	59.0		70.7	96.4	2.6	0.9	*
Total	78.0	66.5	*	76.2	90.9	6.8	2.4	*

Bicyclist stages sample answered the slow mobility module and a bicycle stage was reported on the survey day.

Car driver and passenger stages sample are 18 years or older and a car stage was reported on the survey day. Two tailed test of proportion: * = $p < 0.05$

The use of "provided by the owner" should be systematic in future surveys. More generally, lack of clarity on proximity, quality and abundance of parking requires improvements to data collection. This data only relates to trips that were actually conducted and therefore, for which users likely expected that parking would be available. Foregone trips due to lack of parking is another area for future research.

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SUPPLEMENTARY MATERIALS

Tables 1 & 2

Download: https://findingspress.org/article/144294-bicycle-and-free-car-parking-availability-at-trip-destinations-a-sustainable-mobility-test-for-parking/attachment/302031.xlsx