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Into the wild? Preferences of frequent mountain and forest recreationists for accessibility and mobility

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Outdoor recreation in forests and mountains is growing in popularity globally and especially in industrialised countries. Outdoor recreation has benefits both for practitioners' body and mental health, and local communities for revenue opportunities. This study focuses on frequent outdoor recreationists, who are members of the Italian Alpine Club (CAI), by exploring: (i) the infrastructure preferences for accessing and moving in mountain and forest areas; (ii) possible associations between socio-demographic characteristics and frequency of mountain and forest visits; and (iii) possible relationships between sociodemographic characteristics and the frequency of use of mountain bike and e-bike. Ordinal logistic regression models were used to achieve the second and third objectives. Results show that CAI recreationists tend to prefer limited or no services for accessing mountains. They rarely use e-bikes and mountain bikes and their frequency of visits to mountains are influenced by educational attainment and occupation. Results can provide valuable information for land management decision processes regarding accessibility infrastructures. Future research should address more occasional mountain and forest recreationists and local communities.

Keywords: Outdoor Recreation, Mountains, Forests, Hikers' Preferences, Infrastructure, Accessibility, Mountain Bike, E-bike

Introduction

Worldwide interest in outdoor recreation, meaning "leisure recreational activities occurring outdoors in urban and rural environments" (Jenkins & Pigram 2003), has been growing steadily since the 1950s (Balmford et al. 2015), especially in industrialized areas of Europe (Ingold & Zimmermann 2011). Despite public health benefits (Park et al. 2011) and economic benefits for rural areas, such as some alpine valleys (Lun et al. 2016, Schägner et al. 2017), outdoor recreation can pose social and environmental challenges (Kariel & Draper 1992, Leung & Marion 2000). Understanding how and why recreationists select specific sites is crucial for preparing mountain and forest areas for the growing number of visitors. Nepal & Chipeniuk (2005) proposed a conceptual framework to analyse mountain tourism and recreation. Mountain tourism can be framed as supply, demand, and management issues. Supply encompasses six resource characteristics: diversity, marginality, difficult access, fragility, niche, and aesthetics. Demand is an outcome of three categories of users: local recreationists, tourists, and amenity migrants. Finally, management of the supply and demand of mountain opportunities is based on land-use zonation, which identifies three main areas: nodal centre, where mass tourism occurs; frontcountry, where more nature-oriented activities can take place; and backcountry areas, where specialized settings for intense recreational activities are offered (Nepal & Chipeniuk 2005).

The attractiveness of destination areas can be assessed based on the supply characteristics. Among the factors influencing the attractiveness of an area is distance from the residence (Hörnsten & Fredman 2000), which can be linked to difficult accessibility. Other factors are environmental preferences and experiences (Hörnsten & Fredman 2000, Torbidoni et al. 2005) and proximity to water bodies, forests, and hill and mountain summits (Kienast et al. 2012, De Valck et al. 2017), which can be linked to diversity, niche, and aesthetics concepts in the framework conceptualized by Nepal & Chipeniuk (2005).

Since access to local infrastructures is a key driver in the attractiveness of mountains and forests (Reitsamer et al. 2016), this study primarily focuses on the accessibility aspect of the framework by Nepal & Chipeniuk (2005). Accessibility also influences managers' organization of the land-use zoning.

This study examines accessibility on two levels. The first level pertains to access to mountain and forest areas, allowing individuals to reach outdoor recreation sites, such as the starting point of a trail from their place of residence. The second level focuses on accessibility within these mountain and forest areas, emphasizing the mobility along paths from the trailhead to the final destination. Infrastructures ensure people accessibility to outdoor areas, both to reach them and to move within them once arrived at the destination (Tverijonaite et al. 2018). The first level of accessibility is a key issue when promoting sustainable development of mountain tourism and outdoor recreation (Zeng et al. 2022), but is overlooked in the literature. Recreationists' preferences and accessibility needs depend on outdoor activities (Paracchini et al. 2014, De Valck et al. 2017). The second level of accessibility is also currently under little investigation. Two studies show that availability and features of infrastructures such as signage, amenities, and map availability primarily affect the choice of hikers for the trail (Kelley et al. 2016, Molokáč et al. 2022). Accessibility management for directing recreationists is

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a primary concern for land managers, due to the risk of overcrowding. Before management measures can be taken, the different uses of infrastructures by recreationists need to be explored and understood.

The growth of recreation activities in the forests and mountains can pose challenges due to overcrowding and conflicts between different user groups. This is often the case between hikers and bikers. Use of mountain bikes and e-bikes on hiking trails in mountainous areas is a growing practice worldwide and is potentially impactful on trails (Koemle & Morawetz 2016, Salmeron-Manzano & Manzano-Agugliaro 2018), as the use of bikes is expected to increase significantly in the next few years (Pröbstl-Haider et al. 2018). Inconsistencies between mountain bikers' positive attitude towards sustainability in their practice and their actual behaviour, including reported conflicts with other trail users, emerged in the study by Campbell et al. (2021). The use of mountain and e-bikes on trails can cause two issues: damage to the trails (Pickering et al. 2010) and conflicts among different users (Janowsky & Becker 2002, Reichhart & Arnberger 2010, Schirpke et al. 2020). Conflicts between cyclists and pedestrians have been well known for a long time (Horn 1994). Additional frequent conflicts are between bikers and nature conservationists due to damage to soil, vegetation, and wildlife disturbance (Schirpke et al. 2020). Regulations and management of mountain bikers and e-bikers have already been discussed (Morey et al. 2002). Still, the rising number of practitioners pose new threats and issues for trails, mountains, and forest accessibility. The bikers' profile should be analyzed to establish effective measures to reduce conflicts. Despite the increasing importance of bike use, little is known about how sociodemographic characteristics affect the use of e-bikes compared to more traditional mountain bikes (Melia & Bartle 2021). In a recent survey, Schlemmer et al. (2019) identified key differences between the two user categories: e-bikers tend to be older, practice less physical activity, and have a lower education than mountain bike users. Therefore, different user categories may have different demands, also in terms of access infrastructures. However, Schlemmer et al. (2019) observed that this topic has still not been explored in the literature.

Currently, research on preferences for recreation and infrastructures to reach and move within mountains is poorly investigated (Gundersen & Vistad 2016), though it varies among countries. Preferences for outdoor recreation infrastructures have been extensively explored in Nordic European countries by Gundersen et al. (2017). In contrast, there are only a few studies focused on central and southern European countries. One notable example is the research conducted by Willibald et al. (2019), on the outdoor recreation demand in Switzerland. However, this limited knowledge does not adequately reflect the significance of mountain tourism in central and southern Europe. For instance, the Italian Alps are renowned for their substantial tourism presence. Additionally, Italy is home to the Apennines, which offer a different mountain environment compared to the Alps, both in terms of natural features and human influence. The Apennines have a lower average altitude, are less populated, and receive less tourism compared to the Alps. (Danzi & Figini 2023). Furthermore, Italy has a large community of frequent hikers and mountaineers, who are members of the Italian Alpine Club (CAI). Nontheless, research on recreational infrastructure and biking in Italy appears to be underdeveloped.

This study focuses on frequent recreationists, specifically members of the CAI. The objectives are to: (i) explore preferences for artificial accessibility and mobility infrastructures for recreation (*e.g.*, trails), as well as the impact of hospitality infrastructures and transportation options in mountainous and forested areas; (ii) assess how the sociodemographic characteristics of recreationists influence the frequency of their visits to these areas; and (iii) investigate the potential relationship between sociodemographic characteristics and the frequency of mountain bike and e-bike usage among recreationists.

Materials and methods

The study area and target population

Mountain areas in Italy cover 35.2% of the land, and most mountain areas are also forested areas (Gasparini et al. 2022). The main infrastructure for hiking, *i.e.*, the network of trails, is one of the most developed in Europe, with more than 60,000 km across the mountain areas of continental Italy and the major islands.

The CAI has over 300,000 members in Italy (Club Alpino Italiano 2021), and employs 2,339 staff members who are required to attend training and education courses on various topics related to the environment, nature, and outdoor safety practices. The CAI promotes mountaineering in all its aspects and supports initiatives for conserving mountainous territories and their natural environment. The association is an essential reference point for mountain recreationists in Italy, for the services offered to its members (*e.g.*, accident insurance, discounts for food and accommodation in hospitality structures managed directly by the association, access to several mountaineering courses and conferences) and for the rootedness of the association image amongst mountaineering enthusiasts, given its long history and prestige. The CAI is largely involved in trail planning and management. CAI members are assumed to be frequent outdoor recreationists mainly focused on mountain areas. Therefore, they can be more aware about local issues than the general public due to their frequent engagement in recreational activities in mountain areas (Dunlap & Heffernan 1975, Alcock et al. 2020) and regular interactions with trained staff often accompanying them in field excursions. Frequent travelling to mountain areas might also influence CAI members' perception of accessibility issues. Frequent recreationists may have a different perspective on what constitutes accessible infrastructure compared to more casual users. The study sample can be viewed as a panel of experts in mountain recreation, which means it may not accurately reflect the views of the general population or other recreationists. Moreover, unlike other common recreationists, CAI members can be considered aware of environmental issues due to their affiliation with an evironmental association. For these reasons, we might expect fewer bikers among the respondents. Additionally, we hypothesize that there are differences between mountain bike and e-bike users, as CAI members may lean towards a more traditional approach to their mountain experience.

The questionnaire

We created a Google Forms® questionnaire in collaboration with CAI members involved in the Scientific, Hiking, and Environmental Committees of the association. The questionnaire aimed to explore the usage and preferences for various types of trails in mountain areas, as well as preferences for infrastructure and means to travel to mountain areas. Each trail was described both verbally and visually with accompanying picture. This section was inspired by two studies in northern Europe (Gundersen & Frivold 2008, Gundersen & Vistad 2016). Respondents were asked about their preferred characteristics of trails, including features like clear signage, phone coverage, nature outreach panels, and information about trail status and attributes. They were also inquired about which types of hospitality infrastructure most influenced ther choice of trail. Each type of hospitality infrastructure was described both in words and with accompanying images. This section of the questionnaire was aimed to address objective 1. The second section of the questionnaire examined how often respondents visit the mountains and engage in various recreational activities, including mountain biking and e-biking, to meet objectives 2 and 3. The third section of the questionnaire explored socio-demographic characteristics of respondents to support the data analysis for objectives 2 and 3. A more detailed description of the questionnaire is available in Tab. S1 (Supplementary material). The questionnaire was tested by Mandelli (2021) on 41 respondents selected *via* convenience sampling to obtain feedback on the clarity, consistency, and relevance of the questions. CAI members, forestry students at the University of Padua (northern Italy) and other mountain recreationists

were asked to fill in the questionnaire and report any possible issues. The questionnaire was then revised and distributed through various channels. It was sent via newsletter to all subscribing members (1,241 in 2023) and included in the staff newsletter, which reached 2,339 members in the same year. Additionally, the survey was promoted through provincial sections, the CAI social media accounts, and the association's monthly journal. Staff members were also encouraged to share the survey with the associates they were in contact with. Data collection took place from July 7, 2022, to November 30, 2022.

Statistics

Three ordinal logistic regression models (OLR) were used to evaluate the associations between socio-demographic characteristics, frequency of visits to the mountains, and frequency of use of mountain bikes and e-bikes among the CAI members. The analyses were performed using the R package "ordinal" (Christensen 2022). The independent variables were the socio-demographic characteristics, such as age class, gender, educational background, job, and provenance.

The dependent variable for the frequency of visits to the mountains was an ordered categorical variable, ranging from "Never went" to "Very often". The other two OLR analyses had as their dependent variables the frequency of e-bike and mountain bike usage, which also ranged from "Never used" to "Always used". OLR allows for the estimation of the probabilities of different categorical outcomes when there are more than two discrete options. In OLR, the log odds of each outcome are modeled as a linear combination of the independent variables.

The probability of observing a specific outcome j is equal to the probability that the estimated linear function, along with the random error ε_i, is between the cutpoints calculated for the outcome (eqn. 1):

$$\begin{aligned} P_i(j) &= Pr\,Pr\left(\alpha_{j-1} < V_i + \varepsilon_i < \alpha_j\right) \\ &= Pr\,Pr\left(V_i - \alpha_j < \varepsilon_i < V_i - \alpha_{j-1}\right) \\ &= F_{\varepsilon_i}\left(V_i - \alpha_{j-1}\right) - F_{\varepsilon_i}\left(V_i - \alpha_j\right) \end{aligned} \quad (1)$$

where j are the ordered categories of the dependent variable, i is the respondent, P_i is the probability that the i-th individual chooses a specific category of the dependent variable, α are the cutpoints or thresholds between each category, V_i is the explained part and ε is an error term, $F_{\varepsilon i}$ is the cumulative distribution function of the logistic distribution.

We assumed that ε_i follows a logistic distribution, therefore the model can be expressed as follows (Ben-Elia & Ettema 2009 – eqn. 2):

$$\begin{aligned} P_i(j) &= Pr\,Pr\left(\alpha_{j-1} < V_i \leq \alpha_j\right) \\ &= F\left(\alpha_j - \beta' x_i\right) - F\left(\alpha_{j-1} - \beta' x_i\right) \\ &= \frac{e^{\alpha_j - \beta' x}}{1 + e^{\alpha_j - \beta' x}} - \frac{e^{\alpha_{j-1} - \beta' x}}{1 + e^{\alpha_{j-1} - \beta' x}} \end{aligned} \quad (2)$$

where e raised to the power is the antilog of that number using natural logs. $V_i = \beta' x_i$, is the known or explained part of the respondent's choice, since β' is the vector of coefficients of variables for individual i, and x_i is the vector of specific variables' values for individual i. In the above formula, the probability of i choosing j is equal to the probability that the value of the individual i characteristics multiplied by its coefficient β is between the values of the cutpoints of category j and j-1. The term $\alpha_j - \beta' x_i$ represents the probability that the observed value is less than or equal to the upper cutpoints of the class j. In contrast, $\alpha_{j-1} - \beta' x_i$ represents the probability that the observed part is greater than the lower category. The difference between these two probabilities reflects the likelihood of individual i choosing class j.

The maximum log-likelihood function is the following (Fok & Franses 2002 – eqn. 3):

$$\begin{aligned} \log L &= \sum_{i=1}^{I} \sum_{j=1}^{J} y_{i,j} \log\left[P\left(y_{i,j}=1\right)\right] \\ &= \sum_{i=1}^{I} \sum_{j=1}^{J} y_{i,j} \log\left[F\left(\alpha_j - \beta' x_i\right) - F\left(\alpha_{j-1} - \beta' x_i\right)\right] \end{aligned}$$

where α_j is the constant term of each category, β is the slope coefficient, and x_i is the explanatory variable. We presented the logarithm of the maximum likelihood estimation (MLE – eqn. 3) because the log function is easier to derive, since the log of a product is the sum of the log function of the probabilities of each category to be chosen by the individual i. MLE is a method for estimating population parameters (coefficients in this case) from sample data to maximize the likelihood of obtaining the observed data.

Results

Sample characteristics

The final dataset included 2941 valid responses out of 3273. There were 309 invalid responses from non-members, and 23 questionnaires were excluded because the respondents did not specify their gender. As a result, it was not possible to compare these responses with the original population or include them in the weight calculation for post-stratification to address unresponsiveness.

To assess the representativeness of our dataset, we conducted a Chi-square test for goodness-of-fit and we found that the sample does not fully represent the CAI population in terms of age class, gender, and regional provenance (Tab. 1). To address these differences with the original population (i.e., the CAI members), we calculated the weights for three socio-demographic variables (*i.e.*, age, gender, and provenance) by dividing the target population's theoretical frequencies by the collected sample's empirical frequencies.

Tab. 1 - Sample and population description and representativeness evaluation through the Chi-square Test of goodness-of-fit for known parameters.

Category	Variable	Sample (%)	CAI Population (%)	χ^2	p-value
Type of membership	Staff	33.1	-	-	-
	Associate	66.9	-		
Gender	Men	67.1	63	26.57	< 2.541e^{-7}
	Women	32.1	37		
Age class	18-24	1.62	6.45	227.46	< 2.2e^{-16}
	25-34	6.61	11.26		
	35-44	13.02	13.46		
	45-54	21.46	21.43		
	55-64	30.77	24.49		
	> 65	26.52	22.91		
Education	No degree	54.71	-	-	-
	Degree	45.29	-		
Profession	Student	1.93	-	-	-
	Unemployed	0.78	-		
	Employed	66.1	-		
	Retired	31.11	-		
Provenance	North-East (NE)	37.96	33.71	1692.5	<2.2e^{-16}
	North-West (NW)	20.85	46.46		
	Centre (C)	22.67	14.71		
	South (S)	13.26	3.19		
	Islands (I)	5.26	1.23		
	Non-identifiable	0	0.7		

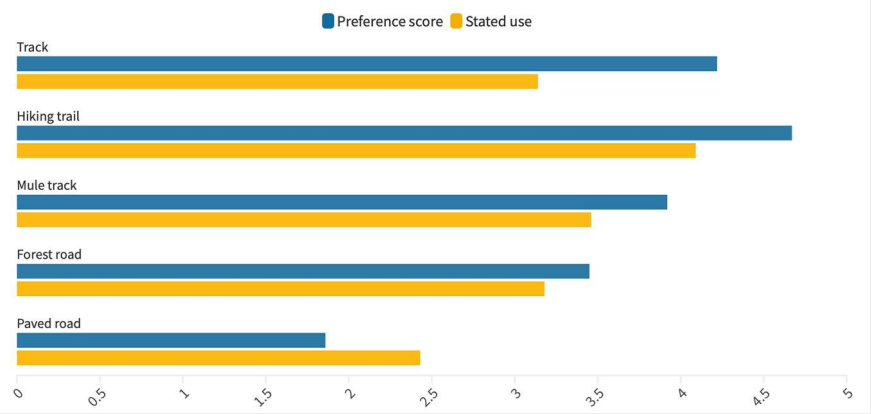

Fig. 1 - Preference *vs.* stated use of accessibility infrastructures. Average of scores for preference of prevailing (in km) trail type compared to the stated use of trail type.

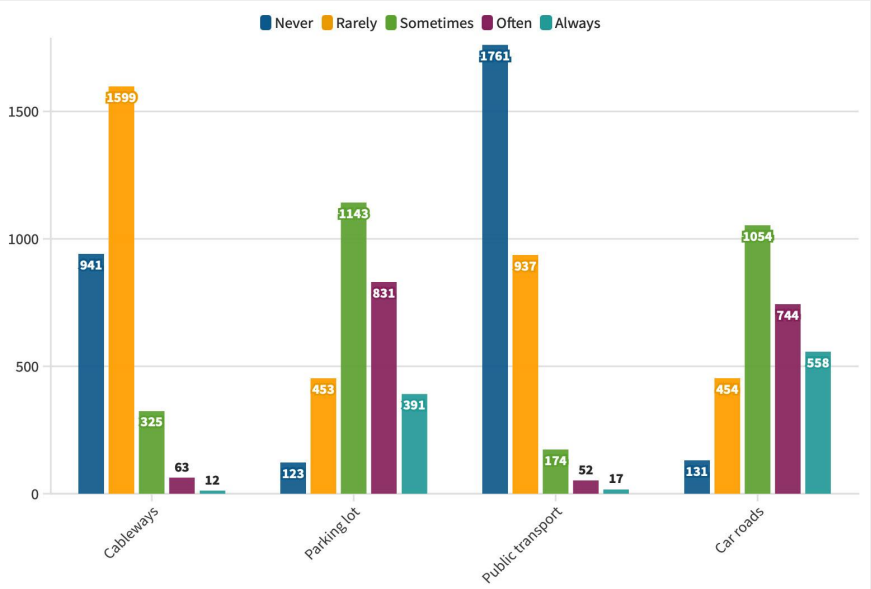

Fig. 2 - Frequency of use of different infrastructures and means of access to mountain areas.

Preferences for Infrastructures

Fig. 1 compares the reported use of trails and the stated preferences of respondents on a Likert scale for the same types of trails. Trail types were defined according to the prevalence (in km) of trail base type (gravel, asphalt, etc.). The results show that the respondents' favourites are hiking trails, followed by mule tracks, forest roads, and tracks without signs. As expected, the least preferred is the paved road. The usage pattern follows similar preferences, except for paved roads which are used frequently though reluctantly. Conversely, tracks without signs are utilized less than preferred.

Mountain accessibility infrastructures and means such as cableways, public transportation, parking lots, and car roads were evaluated in terms of frequency of use. Car roads and parking lots were the infrastructures used the most frequently (Fig. 2). Cableways were rarely used, while public transportation was almost never used (Fig. 2).

We also assessed the three most important characteristics of trails according to the respondents, who chose among eight options (Fig. 3). The results showed that adequate signs along the trail is the most important characteristic (62.07% of the respondents ranked it first), followed by information on maintenance status of the trail (42.71% of respondents ranked it second) and by a description of the trail (27.2% of the respondents).

Mountain huts were rated as the most important factor in trail selection (Fig. 4), while bivouacs were also considered relevant. In contrast, mountain cottages and summer farms were deemed less significant (mainly scored in the "quite important"/"not important" options). Further, Bed & Breakfasts (B&Bs) were mostly rated as "not important at all", "not important" or "quite important" options.

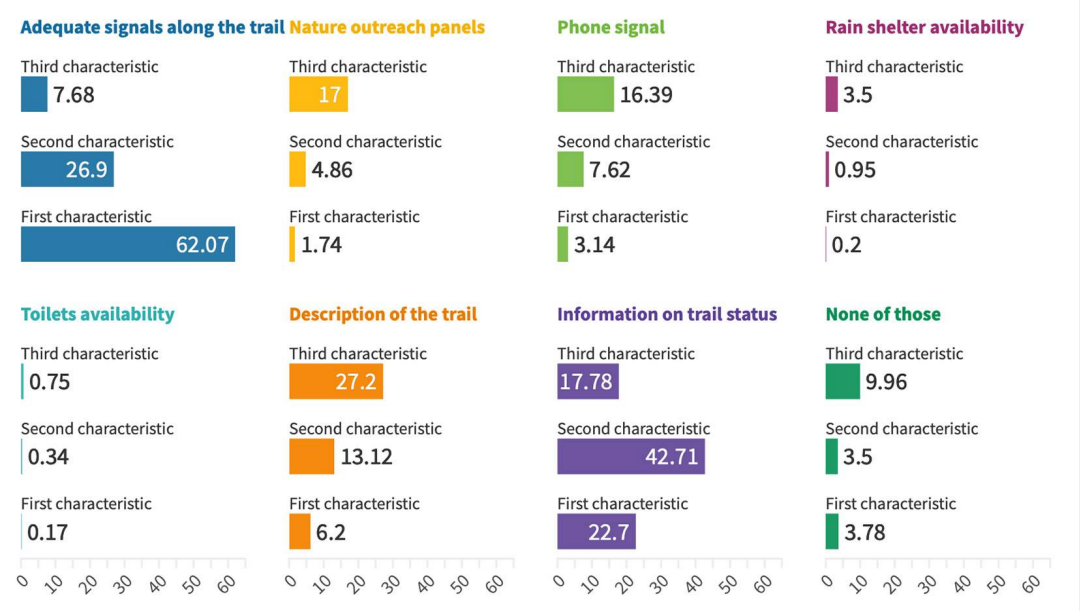

Fig. 3 - Percentage of selection as first, second, or third most important characteristic on a trail for eight options.

Frequency of visits and socio-demographic characteristics

Tab. 2 presents the results of the OLR model used to examine the relationships between the frequency of visits to mountain areas and the sociodemographic characteristics of the respondents. Our findings indicate a significant positive association between a higher frequency of visits and three age groups (25-34, 55-64, and 65 and older) when compared to the youngest age group (18-24). The model also indicates that members classified as "staff" are more likely to visit more frequently than regular members, such as associates. This is reasonable as staff often accompany and guide the groups of associates. Respondents with a diploma are more likely to visit the mountains frequently compared to those with a degree. Retired respondents report going to the mountains more often than employed respondents. In contrast, students indicated that they visit the mountains less frequently than employed persons. Additionally, respondents from northeast Italy visit the mountains more often than respondents from central Italy. Meanwhile, residents in other Italian regions showed a similar frequency of outdoor excursions.

Frequency of mountain bike usage and sociodemographic characteristics

Men are more likely to use the mountain bike than women (Tab. 3). It was noticed that respondents in the oldest age class (≥65) were less likely to use a mountain bike compared to the youngest age class (18-24). We also assessed the relationship between the frequency of mountain visits and the use of mountain bikes. Our findings indicate that individuals visiting the mountains more than once a month are more likely to use mountain bikes compared to those who visit only a few times a year. Additionally, we found no significant associations between mountain biking and factors such as origin, education, employment, or membership in an environmental organization.

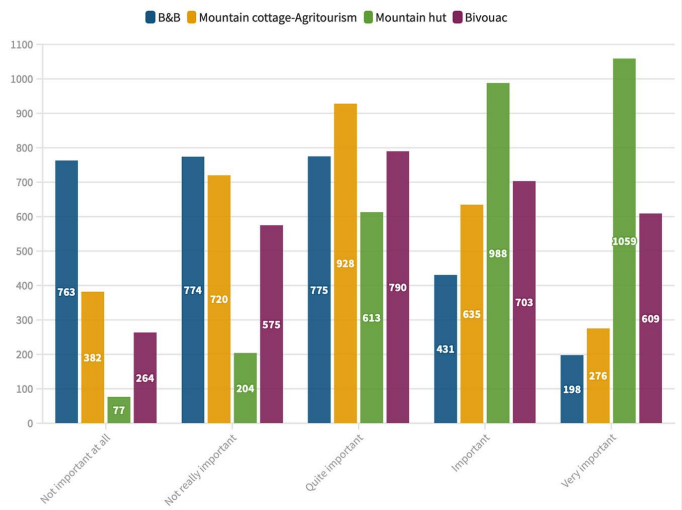

Fig. 4 - Importance (number of answers) of the availability of different types of hospitality infrastructure when choosing the trail.

Frequency of e-bikes usage and sociodemographic characteristics

The results showed that e-bike users are more abundant in the age class 55-64, compared to the youngest age class (18-24) and associates (not staff – Tab. 4). Furthermore, respondents from northeast Italy reported a higher usage of e-bikes than respondents from central Italy. Respondents visiting the mountains more than once per month are more likely to use an e-bike than more occasional respondents. No association was found between the frequency of e-bike use and membership in another environmental organization besides the CAI.

Comments on bike use in mountain trails

The final section of the questionnaire was aimed at collecting additional considerations related to the survey topics. Respondents provided 19 comments regarding the use of bike out of a total of 300 responses. Seven of these comments addressed the

Tab. 2 - OLR model for the frequency of visits to the mountains (AIC = 9380.327).

Category	Reference	Variable	Estimate of coeff.	Std. error	Z value	Pr(>|z|)	Odds ratios (effect size)
Gender	Women	Men	-0.097	0.069	-1.394	0.163	0.91
Age class	18-24	25-34	0.659	0.211	3.133	0.002	1.93
		35-44	0.343	0.222	1.543	0.123	1.41
		45-54	0.289	0.216	1.339	0.181	1.33
		55-64	0.548	0.216	2.538	0.011	1.73
		≥ 65	0.474	0.236	2.007	0.045	1.61
CAI role	Members	Staff	0.351	0.069	5.024	<0.001	1.42
Education	Degree	No degree	0.246	0.068	3.629	<0.001	1.28
Job	Employed	Retired	0.332	0.117	2.83	0.005	1.39
		Student	-0.444	0.214	-2.08	0.038	0.64
		Unemployed	0.569	0.388	1.464	0.143	1.77
Provenance	Central Italy	S	-0.381	0.304	-1.255	0.209	0.68
		NE	0.297	0.096	3.082	0.002	1.35
		NW	0.126	0.092	1.363	0.173	1.13
		I	0.1	0.313	0.319	0.749	1.11
Threshold coefficient		Never|< Once per month	-5.29	0.429	-12.326		
		< Once per month|Once per month	-1.796	0.229	-7.85		
		Once per month|Twice per month	-0.558	0.224	-2.495		
		Twice per month|Once per week	0.843	0.224	3.759		
		Once per week|More times per week	2.393	0.228	10.517		

Tab. 3 - OLR for mountain bike use frequency (AIC = 6030.448).

Category	Reference	Variable	Estimate of coeff.	Std. error	Z value	Pr(>|z|)	Odds ratios (effect size)
Gender	Women	Men	0.531	0.089	5.982	<0.001	1.7
Age class	18-24	Age 25-34	0.154	0.251	0.614	0.539	1.17
		Age 35-44	-0.236	0.269	-0.878	0.379	0.79
		Age 45-54	-0.004	0.262	-0.016	0.987	0.99
		Age 55-64	-0.032	0.261	-0.122	0.903	0.96
		Age ≥ 65	-0.725	0.29	-2.498	0.013	0.48
CAI role	Members	Staff	0.103	0.085	1.201	0.229	1.11
Education	Degree	No degree	-0.101	0.084	-1.199	0.231	1.1
Job	Employed	Retired	-0.02	0.145	-0.142	0.887	0.98
		Student	0.327	0.248	1.315	0.188	1.39
		Unemployed	-0.451	0.487	-0.926	0.354	0.64
Provenance	Central Italy	S	-0.474	0.409	-1.158	0.247	0.62
		NE	0.079	0.119	0.657	0.511	1.08
		NW	0.055	0.116	0.477	0.634	1.06
		I	0.087	0.369	0.234	0.815	1.09
Frequency of visits	< 1 per month	Many times per week	1.615	0.231	6.987	<0.001	5.03
		Never	-0.259	1.139	-0.228	0.819	0.77
		Once per month	0.613	0.246	2.489	0.013	1.85
		Once per week	1.384	0.224	6.174	<0.001	3.99
		Twice per month	0.854	0.227	3.758	<0.001	2.35
Environmental association	No membership	Member	0.057	0.112	0.505	0.613	1.06
Threshold coefficient		Never|Rarely	2.23	0.346	6.452		
		Rarely|Sometimes	2.971	0.348	8.547		
		Sometimes|Often	3.672	0.35	10.486		
		Often|Always	4.981	0.362	13.781		

necessity of regulating both mountain bikes and e-bikes on trails. The primary purpose of such regulation was to prohibit bike usage on hiking trails, citing concerns over safety for hikers and potential damage to the trails. Two comments expressed a dislike for hiking in the presence of bicycles, likely due to the perceived risks associated with cyclists. A suggested measure included limiting the use of mountain bikes and e-bikes on gravel roads. Only one comment supported the use of mountain bikes, highlighting their potential to engage youth in joining CAI. The remaining comments indirectly emphasized the need for regulation of bicycle use on trails.

Discussion

This study explored the characteristics of recreation demand based on the preferences of the most important Italian hiking association members for accessing mountainous areas and forests. The results show that CAI members prefer hiking on trails and mule tracks rather than on paved roads. They also prefer sleeping in mountain huts and bivouacs rather than summer farms or B&Bs, as these accommodations do not have the features that wilderness seekers require. Their desire for a wild vacation in nature may shape the preferences of CAI members toward more unstructured accessibility options. These preferences can be attributed to the significant visual and ecological impact of certain infrastructures, such as paved roads (Carr et al. 2002). These infrastructures often conflict with the concept of wilderness, which is commonly associated with hiking in remote mountainous regions (Boller et al. 2010). The discrepancy between the stated importance and actual use of paved roads suggests that, in many regions, paved roads may be the only access to the start of the hiking trails.

While CAI members prefer hiking in the wild, they seem concerned about safety. Indeed, when choosing trail attributes, they indicate preferences for adequate prior information describing the trail and its maintenance status, signs to guide their excursion on the trail, and reliable mobile phone coverage. These characteristics allow better hiking planning and, ultimately, a safer hiking experience. Safety and preparedness are essential for novice hikers, even those who are physically fit but lack mountain skills (Mykletun et al. 2021).

There is a noticeable difference in expectations regarding the comfort level of accommodation facilities between CAI members and the general public. CAI members tend to have a better understanding of the context in which these facilities, such as mountain huts, are situated, leading to more realistic expectations (Duglio & Beltramo 2014). Therefore, in the framework proposed by Nepal & Chipeniuk (2005), difficult access is a key factor that attracts visitors in this category of tourists, who are similar to amenity users, as it indicates the relative wilderness of the area.

This study also analysed the relationships between the frequency of mountain visits and the profile of recreationists, which is valuable information for decision-making in mountain areas and effectively promoting outdoor recreation. Our results indicated that the CAI staff visits mountains and forests more frequently than other members. This is attributed to their high level of participation, as they organize field trips for associates and engage in educational activities. Regarding sociodemographic variables, we found that education level and occupation are significant predictors of how often individuals visit the mountains. In contrast, age had a nonlinear and less significant impact on frequency of visits. A substantial and positive impact of the age of the respondents was observed with respect to the baseline age of 18-24 years for two age classes, namely the class of re-

Tab. 4 - OLR for e-bike use frequency (AIC = 3310.65).

Category	Reference	Variable	Estimate of coeff.	Std. error	Z value	Pr(>|z|)	Odds ratios (effect size)
Gender	Women	Men	0.026	0.119	0.218	0.828	1.03
Age class	18-24	25-34	0.177	0.414	0.427	0.669	1.19
		35-44	0.124	0.445	0.279	0.781	1.13
		45-54	0.553	0.431	1.285	0.199	1.73
		55-64	0.955	0.424	2.252	0.024	2.59
		≥ 65	0.689	0.452	1.524	0.128	1.99
CAI role	Members	Staff	-0.299	0.122	-2.451	0.014	0.74
Education	Degree	No degree	-0.039	0.118	-0.336	0.737	1.02
Job	Employed	Retired	0.058	0.183	0.316	0.752	1.06
		Student	0.649	0.395	1.643	0.100	1.92
		Unemployed	-2.331	1.634	-1.426	0.154	0.09
Provenance	Central Italy	S	0.149	0.502	0.297	0.767	1.16
		NE	0.363	0.169	2.149	0.032	1.44
		NW	0.046	0.169	0.269	0.788	1.05
		I	0.287	0.502	0.572	0.568	1.33
Frequency of visit	< once per month	More times per week	1.577	0.333	4.73	<0.001	4.83
		Never	0.848	1.168	0.726	0.468	2.33
		Once per month	0.491	0.369	1.333	0.183	1.63
		Once per week	0.883	0.332	2.655	0.008	2.42
		Twice per month	1.251	0.329	3.798	<0.001	3.49
Environmental association	No membership	Member	-0.233	0.159	-1.467	0.142	0.79
Threshold coefficients		Never|Rarely	3.678	0.544	6.763		
		Rarely|Sometimes	4.292	0.546	7.859		
		Sometimes|Often	4.967	0.55	9.029		
		Often|Always	6.169	0.567	10.889		

spondents that fall in the age range of 25-34 years and those older than 65 years. The higher visit frequency among young adults and senior respondents suggests that these two groups have different approaches to mountain environments. Young adults are likely to engage in intense activities such as climbing or challenging hiking, while older people may prefer lighter activities, like walking in nature. This information should be considered when planning infrastructure to accommodate the differing needs of these age groups. For example, communication tools designed for the young visitors may not be as useful or effective for the older individuals, and vice versa. Additionally, gender did not affect the frequency of visits.

Finally, we analysed the use of e-bikes compared to more traditional mountain bikes in relation to the recreationist profile. The use of mountain bikes and e-bikes was relatively less affected by socio-demographic characteristics of respondents. A possible explanation for the non-significance of many determinants is that the sample size of bikers was too small to detect socio-demographic trends. Indeed, the percentage of respondants who never used mountain bikes or e-bikes during their recreational visits accounts for 74% and 89%, respectively. These numbers reflect the low participation of CAI members in biking activities compared to the general population of mountain recreationists. Historically, the CAI has traditionally focused on excursions and mountaineering. However, this trend may change in the future, as e-bikes provide greater accessibility to mountainous areas for less fit people with lower endurance (Mitterwallner et al. 2021). Our findings are only partially consistent with those of Schlemmer et al. (2019). Also, in our study, we found that men are more likely to use any type of bike compared to women. However, older participants, specifically those aged 55-64, were less likely to use e-bikes, and those older than 65 were less likely to use mountain bikes, when compared to the youngest respondents (aged 18-24). In our study, we found that men are more likely to use any type of bike compared to women. However, older participants, specifically those aged 55-64, were less likely to use e-bikes, and those older than 65 were less likely to use mountain bikes, when compared to the youngest respondents (aged 18-24). This trend may be attributed to the fact that cycling in mountain areas has become more popular among younger recreational cyclists, while older generations tend to prefer more traditional cycling activities. It is worth noting here that the CAI staff are more willing to use a mountain bike and less likely to use an e-bike than CAI associates. This could be due to the higher fitness level of staff members who visit mountainous areas more frequently.

We may interpret this finding considering that staff members visit mountain areas more often, so they might be more fit. Additionally, CAI staff might prefer to engage in more traditional activities of mountain users, such as mountain biking, rather than using e-bikes – traditional mountain users often oppose any form of motorized access to these areas (Nielsen et al. 2019). Furthermore, according to Campbell et al. (2021) mountain bikers and frequent hikers, prefer narrow trails or tracks, as confirmed in this study (Fig. 1). The preference for the same access infrastructures may result in increased conflicts between the two user groups. Conflicts that arise from different users sharing mountain access infrastructures can be addressed through various strategies. One potential approach, suggested by respondents' comments, is to regulate mountain bike and e-bike access to mountain trails. Regulation is essential for safety and environmental reasons, and similar needs were assessed in

other countries (Ruckriegle 2017, Pröbstl-Haider et al. 2018, Mitterwallner et al. 2021). An alternative approach involves implementing blanket restrictions, as demonstrated by Hermová et al. (2023). These restrictions can be based on user types or limited to specific seasons or time periods (Schirpke et al. 2020). However, such restrictions may serve as a short-term solution, while well-designed, dedicated trails proved to be more effective in the long run. Trail design shall consider soft measures, such as reducing the trail slope, to help reduce the cyclists' speed, and appropriate management of understory and branch to maintain visibility for all users (Hermová et al. 2023). Additional approaches are the creation of new informative feedback loops (Lopes & Videira 2017) and delivering information along the trails to reduce possible dangerous behaviour (Wilkes-Allemann et al. 2015). These bike management options, insights, and the characteristics of the trails to prioritize could support the management of the frontcountry and backcountry zones conceptualized by Nepal & Chipeniuk (2005).

Members of CAI hold traditional views on recreation activities and the ways used to access mountains and forests, and conservative attitude can be expected from mountaineers. A study conducted by Muhar et al. (2007) in Austria suggested that most mountaineers accept lower comfort levels and seek a closer relationship with nature to escape from daily life. The results of their study indicated that mountain recreationists tend to be conservative in their recreational choices, often preferring traditional hiking and showing reluctance to explore new trending activities, *e.g.*, extreme climbing, paragliding, and canyoning. More importantly, these authors found that mountaineers are generally satisfied with the current conditions of the mountains and tend to oppose management measures that introduce new facilities. In this sense, the present contribution suggests that demand of wilderness of Italian mountaineers is similar to their Austrian counterparts. This is supported by the limited use of mountain bikes and e-bikes of the respondents. Furthermore, it should be considered that CAI members often attend guided excursions, cultural events, and short courses promoted by the association, which increase their awareness of environmental issues and the well-documented impacts of recreation in mountainous areas, and therefore appreciate more "natural" settings with less infrastructure.

Limitations

Some limitations must be considered when interpreting the results of this study. First, the sample analyzed consists of a specific group of mountain users who are influenced by the objectives and values of the association, which may not be shared by all individuals who engage in mountaineering in Italy. As a result, the findings of this study do not represent the entire population of mountain recreationists in Italy. Second, a technical issue related to survey sampling in the survey is the administration method via email, which means that responses are provided on a voluntary basis. This can lead to potential self-selection of respondents within the sample. This aspect is common to several field surveys and is difficult to minimize. Self-selection may occur because mountain lovers, most frequent visitors, and those with a strong attachment to the association might have a greater interest in the topic and, therefore, be more inclined to complete the questionnaire. Staff members likely fall into all these categories. The last limitation concerns the analysis of bike users. This study examined mountain bikers and e-bikers but did not delve into the different characteristics specific to each category. For example, mountain bikers should not be considered as a homogenous group as there can be significant variations in skills, riding style, equipment, motivations, and other features (Zajc & Berzelak 2016). A deeper investigation of mountain cyclists is needed to improve information for decision-makers and environmental managers.

Conclusions

While affiliates of Alpine clubs often seek wild experiences, this may not be true for many other segments of mountain visitors, who may prefer higher levels of comfort. Therefore, further research is needed to understand the perspectives of occasional recreationists. Another important stakeholder group is local communities, whose opinions are both significant and difficult to anticipate. The mountain economy could benefit from increasing visitation; however, pollution and overtourism in mountain villages during peak seasons may negatively impact the living conditions of residents. Finally, the environmental degradation of natural ecosystems increasingly necessitates restrictions in fragile environments like mountains. Our findings provide insights into the preferences and behaviors of recreationists. This understanding can help decision-makers adapt accessibility infrastructures, educate recreationists in different ways, propose new regulations, or implement a combination of these strategies.

Ethics statement

The Ethics Committee of the Department TESAF, University of Padova, granted an ethical waiver to conduct the study.

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Supplementary Material

Tab. S1 – The structure of the questionnaire used in the current study.

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