

Bicycle Parking in Higher Density Developments: A Community Perspective

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Table of Contents

1. <i>Executive Summary</i>	3
2. <i>Introduction</i>	3
3. <i>Literature Review</i>	4
3.1 Relevant Literature	4
3.2 Key Design Considerations	5
3.3 Connection to Literature and Community Partner	5
4. <i>Methods</i>	6
4.1 Survey Creation	6
4.2 Survey Distribution	6
4.3 Interviews	7
4.4 Data Analysis	8
5. <i>Results</i>	8
5.1 Survey Results	8
5.1.1 Bicycle Ownership and Usage Trends	8
5.1.2 Satisfaction with Current Bicycle Parking Facilities	9
5.1.3 Bicycle Storage Preferences	9
5.1.4 Factors Influencing Bicycle Ownership	10
5.1.5 Commuting and Recreational Bicycle Use	10
5.2 Interview Results	11
5.2.1 Inconvenient Bicycle Parking Design	11
5.2.2 Security Concerns	11
5.2.3 Barriers to Bicycle Usage	12
5.2.4 Impact of Better Bicycle Parking	12
5.3 Limitations	12
6. <i>Discussion</i>	13
6.1 Key Findings and Interpretation	13
6.2 Policy Implications and Recommendations	13
6.3 Strengths and Contributions	14
6.4 Recommendations for Future Research	14
7. <i>Conclusion</i>	14
8. <i>References</i>	15

1. Executive Summary

This research examines the potential effects of improving bicycle parking standards in medium/high-density housing on the ownership and use of bicycles by Christchurch residents. The report discusses issues with current inadequate bike parking facilities, which could discourage cycling in Christchurch's growing CBD.

The research question was: “How would the Christchurch City Council’s implementation of higher standards for bicycle parking in medium/high-density housing affect residents' bicycle ownership and usage?”

A mixed-method approach was used to collect data, which included three in-depth interviews and surveys given to 1,180 medium—and high-density households. While interviews examined individual experiences and recommendations for enhancement, the survey concentrated on individuals' current bicycle usage habits and their level of satisfaction with their current bicycle parking facilities.

The main findings show that residents are generally unhappy with the current facilities, especially regarding their security and accessibility. Many survey respondents indicated that insufficient parking deterred them from owning or frequently riding bicycles, and 71% of respondents expressed dissatisfaction with current parking bicycle facilities. Respondents also cited concerns about theft as a major obstacle, making security one of their top issues. The interviews also highlighted that parking facilities that are poorly designed and at inconvenient locations discourage bicycle usage.

Despite these findings, the research had a number of limitations. Software problems impacted the survey results, and just 24 residents answered, yielding a low response rate of 2%, which could affect the generalizability of key findings. In addition, a low number of interviews (3) meant crucial perspectives from professionals such as developers or architects were missed, and therefore not considered in the research.

The focus of future research should be broadened to explore transportation hubs and commercial developments, involving stakeholders such as policymakers and developers, for example Fletcher Building or Williams Corporation. Additionally, future studies should look further into better and more secure parking options for e-bikes and cargo bikes and examine the idea of subscription models for better parking facilities. These focuses should ideally address challenges in new developments and promote sustainable transport and infrastructure.

2. Introduction

Better bicycle parking infrastructure in medium- and high-density residential developments is becoming increasingly important as Christchurch looks to focus on more sustainable urban development. Since the 2010-2011 earthquakes, Christchurch has seen an increase in higher density developments by developers like Fletcher building and Williams cooperation in the CBD. With the city's goals of promoting active and sustainable transport modes such as cycling, the need for infrastructure that

supports these goals has become increased. Now in relation to bicycle parking in medium- and high-density developments, these newer developments are often have smaller or no private outdoor space which when owning a bicycle means there are limited storage options. This is where the current the design and quality of shared bicycle parking facilities become crucial. This report investigates how the Christchurch City Council's (CCC) implementation of higher standards for bicycle parking in these residential areas might influence residents' decisions to own and use bicycles.

The research is based on the following question: "How would Christchurch City Council's (CCC) implementation of higher standards for bicycle parking in medium/high-density housing affect residents' bicycle ownership and usage?" This report will start by exploring the current literature on bicycle parking and cycling infrastructure. Next it will explain the methods used to during the research process. It then will present and analyse data gathered from surveys and interviews. Lastly, the report will offer recommendations to the Christchurch City Council for future policy based on the researches findings.

This research is important because studies have shown that a key component of encouraging regular cycling is safe and convenient bicycle parking (Cannon et al., 2024). Furthermore, it has been demonstrated in international examples that incorporating first-rate bicycle parking into urban planning can boost cycling rates (Nilsson, 2019). Ensuring the required infrastructure is in place is essential to facilitating Christchurch's transition to a more bike-friendly future. The findings of this research will hopefully inform Christchurch City Council's future policy decisions.

3. Literature Review

3.1 Relevant Literature

The research across many sources shows the two most important factors of bicycle parking, security and accessibility. Secure design is the first and most common factor that determines people's desire to use bicycle parking. (Fournier et al., 2023) Opaque walls, motorized doors, CCTV cameras, and other traditional security features such as key cards or pin codes to enter are valuable in creating secure cycle parking. Location is also important in creating safe cycle parking (Chen, et al. 2018). Where the parking is in relation to peoples travel is important. Planning for central areas that have a large amount of visibility from the people within the housing complex. Placing the bike parking in a place where people will feel safe walking to and from and having appropriate lighting.

An accessible design has overlap with security but is a bicycle parking that is usable by all people within the community that will be using this. Parking options do not require too much lifting or bending, as these can be difficult for those with certain disabilities. (Standen et al., 2021) Some bike options being far heavier than others with a traditional bicycle weighing around 15kg, and an average electric bicycle weighing about 25kg.

Christchurch's current bicycle parking options are mostly made up of two main options, these being the Bike Room and the Sheffield parks which both have positives and negatives. Bike rooms are usually more secure, with less exposure to the weather and harder to see from the outside. (Smith & Bigazzi, 2019) Sheffield bike parks are less secure, while being cheaper to build, often being more accessible and having a larger number of parking options for those who are using them. The option to lock the wheel and the frame is a necessity to feel safe about their bike parking.

To see large-scale shifting to using cycling over car-based transport, there needs to be a culture shift. The research shows that to encourage a culture shift of any form, making the shift as easy as possible is one of the most successful methods. In terms of developing cycling parking, this leads towards creating user-friendly parking that is barrier-free. (Buehler, 2012)

3.2 Key Design Considerations

When developing ideas for bicycle parking options for the future there are a few aspects of development that the research shows a higher usage. When a development is run past the community in its design, and the community is allowed to give their opinions on the project there is a higher likelihood of it being used. (Jahanshahi et al., 2023) As the goal of bicycle parking is for it to be used, any way to increase usage is valuable, and useful for the community. Developing solutions to any issue, placing a templated solution on any and all issues does not encourage usage from specific communities. Their research suggests that flexible, community tailored parking solutions are most effective in encouraging cycling usage and ownership.

This was something that helped shape our research toward understanding what the people in the community wanted out of cycling parking, and what their opinions were on the current situation. Communication and learning from the people who are using and want to use these were important to create these usable parking options. The people who engage with our research would hopefully be the ones to begin the cultural changes as they are the ones who want to see changes in the bike parking situation in medium and high-density housing.

3.3 Connection to Literature and Community Partner

Our Question is *"How would Christchurch City Council's (CCC) implementation of higher standards for bicycle parking in medium/high-density housing affect residents' bicycle ownership and usage?"* With Aotearoa slowly moving towards a more cycling country the issue of where people park their bikes is becoming a growing area of development and research. (Pearson, et al. 2024) There are many other positives to a country and city that used cycling as its main mode of transport including, mental health benefits, environmental benefits, along with sound and visual improvement for those using transports and those who work, live, or walk alongside the roads.

With the shift from low density housing to the medium and high-density housing that is currently being constructed in the centre of the city we are beginning to see the lack of car parks available for people living in these new houses. (Waka Kotahi NZ Transport Agency, 2022) For these people to shift from cars to bicycles is required, which shows the need for this development into cycle parking.

It is shown that when there are no good cycling parking options, then many people will be forced to park their bikes in less-than-ideal situations. (Pearson, et al. 2024) These can either be inside their own homes or on a deck or a fence. With the lack of security that parking a bike outside, not in a designated parking site, the risk of theft can be a large restriction in people owning and using a bike in these medium and high-density developments.

4. Methods

To understand the opinions and perspectives regarding bicycle parking, two main data-gathering methods were employed. These were the distribution of an online survey and the completion of interviews.

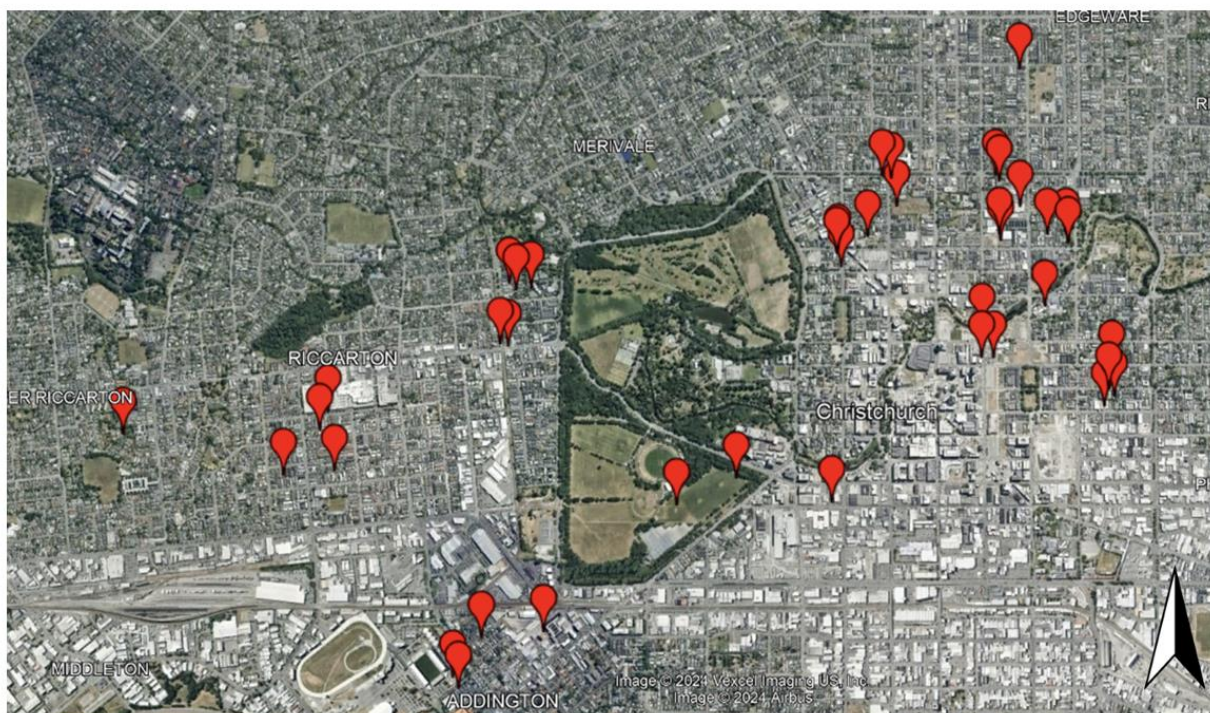
4.1 Survey Creation

To access the opinions of residents in higher-density housing, we chose to create and distribute a survey. This survey contained questions regarding people's current transport habits. Essentially, the survey sought to gather residential opinions regarding the state of existing bicycle parking facilities at their development. Finally, the survey aimed to find what features were desired in cycle parking. Questions including one asking respondents to rank the importance of various cycle-parking features were designed to see what parking facilities people wished to have at their residence. Having designed a set of questions, they were compiled through the online surveying tool Qualtrics. Following a brief pilot period wherein the survey was tested to identify any faults, the next phase of distribution was ready.

4.2 Survey Distribution

The first step to distribution was to identify an ideal sample to target the distribution at. We aimed to gather information from residents of medium/high density developments. Accessing every high-density location in Christchurch would have been too ambitious, so instead a smaller list was compiled which that reflected a fair representation of the broader population. Since most higher density developments are in the central city, our distribution effort was cantered here. This made the physical distribution less time-consuming and ensured some of the denser developments and those where car parking is not provided were included. The physical distribution of these surveys was carried out via letterbox delivery. A flyer was which contained a description of our project alongside a QR code. The code, when scanned, linked directly to the Qualtrics survey. Alongside that code, instructions for accessing the survey physically were included, in case someone preferred a physical copy. This flyer was then dropped in the individual letterboxes of the developments identified. Over the course of a week, 1180 surveys were distributed across 44 separate locations Figure 1 shows each of these locations with the exception of three in Papanui.

Figure 1.



Map of medium/high density development locations of survey distributions within Christchurch City.

4.3 Interviews

To gather more in-depth perspectives beyond the surveys, we carried out a series of interviews. The goal was to gain further insight into the trends captured through the survey. For example, where the survey asked whether respondents were satisfied with their existing bicycle facilities, the interviews gave a chance understand why they are satisfied or not. Interviews also helped to understand the specific challenges and experiences faced by residents in regard to their bicycle storage. Those individual perspectives are vital in generating informed recommendations for the Christchurch City Council.

The first step toward completing these interviews was to identify potential interviewees. To do this, a question was included at the end of the survey, asking if they were willing to assist with a short interview. Through this, numerous individuals were identified who were willing to participate, who were residents of high/medium density developments. By organising interviewees this way, the need for further fieldwork was removed. This method does have one major drawback, in that it likely only sourced those interested in the cycling already and thus may reflect a minority of the population who have an existing interest. However, other approaches such as street interviews or door knocking may have resulted in that same issue. With candidates established, the two resident interviews were organised according to the desired time and place of the interviewee. Each interview was then carried out face to face or on zoom by two group members and lasted 15-30 minutes.

To complement the residential perspectives gained from these interviews, we also reached out directly to experts in the fields of transport, urban planning and property development. The goal of interviewing experts in these fields, was to gain insight into

what prior decisions have been made and why. Furthermore, the outside perspectives they hold when combined with resident perspectives allows for a broader pool of knowledge to draw from when making conclusions and recommendations. In the end only one interview with a transport and urban planning expert took place.

4.4 Data Analysis

The next step was to analyse the data which had been gathered. The analysis of survey data was largely completed through excel. Exporting our raw data into a table, we then identified a series of trends within it, converting some of the more significant into graphs and charts. Having established those trends, we then compared them with the thoughts of our interviewees. Overlaying the specific ideas and experiences gathered through interviews onto the broad trends of the survey data allowed for conclusions regarding the research question to be made.

5. Results

5.1 Survey Results

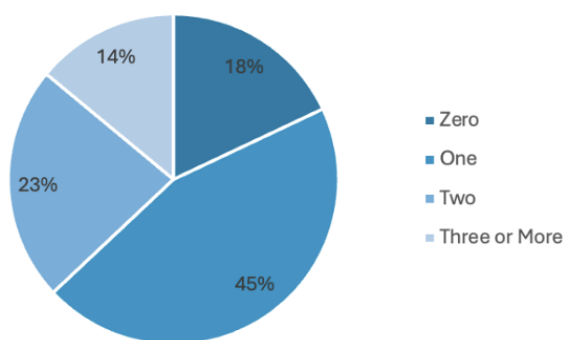
The survey results give valuable insights into bicycle parking and usage habits and experiences of residents in medium/high density housing in Christchurch. The survey focused on key themes like usage patterns for commuting and recreation, current parking satisfaction levels and storage habits.

5.1.1 Bicycle Ownership and Usage Trends

Bicycle ownership trends varied, as seen in Figure 2, 14% of participants own three bikes or more, 23% own just two bikes and 45% own just one, as . Respondents also own a variety of bicycle kinds, which can be seen in figure 3, with a smaller, yet significant percentage having electric bikes (17%) and cargo bikes (6%), while the majority own road bikes (44%), mountain bikes (28%), and hybrid bikes (33%). These ownership trends signal that different cyclists need accessible solutions for their storage and cycling needs because e-bike and cargo bike requirements are different from those of conventional bikes.

Figure 2.

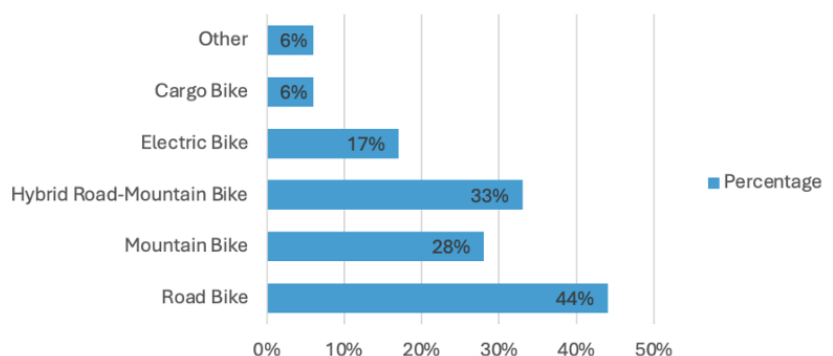
How Many Bicycles do you own?



A chart showing number of bikes owned by medium/high density residents surveyed.

Figure 3.

What type of Bicycle do you own - Selected Choice



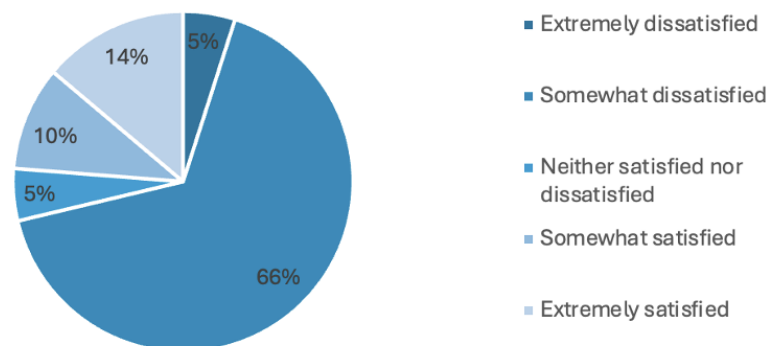
A graph showing the percentages of different types of bicycles that medium/high density residents surveyed owned.

5.1.2 Satisfaction with Current Bicycle Parking Facilities

The survey also revealed a resounding lack of satisfaction among respondents with their current bicycle parking facilities, which can be seen in Figure 4. 71% of respondents were "somewhat dissatisfied" or "extremely dissatisfied," suggesting that discontent with the current facilities was common. Just 24% of respondents said they were satisfied, and only 14% said they were "extremely satisfied." This discontent indicates that many residents believe the parking options their developments provided are insufficient or badly designed, which may discourage people from owning or using bicycles, particularly frequent commuters or users.

Figure 4.

How Satisfied are you with your Current Bicycle Parking Facilities



A chart showing satisfaction levels with current bicycle parking facilities for medium/high

5.1.3 Bicycle Storage Preferences

Regarding respondents' storage patterns, as can be seen in Figure 5, 29% of respondents identified that they store their bicycles on porches or outside their apartments, while nearly half (47%) of respondents said they kept them inside their apartments. Just 12% of respondents used the designated bike parking facilities, while 6% of respondents kept their bikes in their own garages. This trend could highlight a possible gap between the number of allocated bike parking spots and residents' true needs for storage, which could increase discontent. More importantly it could suggest that the current provided facilities are inadequate or not accessible, as many residents are forced to use less convenient or secure storage methods.

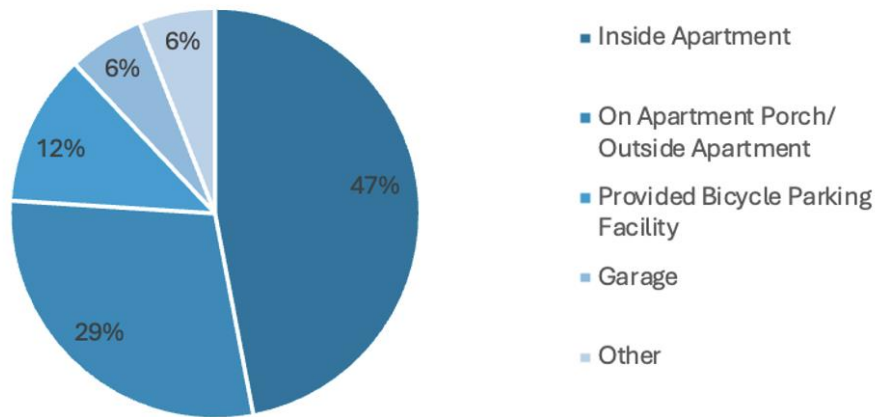
5.1.4 Factors Influencing Bicycle Ownership

The need for secure and easily accessible infrastructure was further highlighted by the survey's examination of the factors influencing bicycle ownership, results of which can be seen in Figure 6. With 67% of respondents selecting it, the most commonly mentioned factor was the availability of secure bike parking. The lack of suitable parking for vehicles was indicated by 60% of respondents as a barrier. 47% of respondents were influenced by fears over on-road safety, suggesting that in order to promote ownership, bicycle infrastructure must also address safety. For 40% of respondents, the cost of buying and maintaining bicycles was also significant. These

results demonstrate that promoting bicycle ownership amongst medium/high density residents requires a mix of secure parking, safety upgrades, cost factors, and broader infrastructure improvements

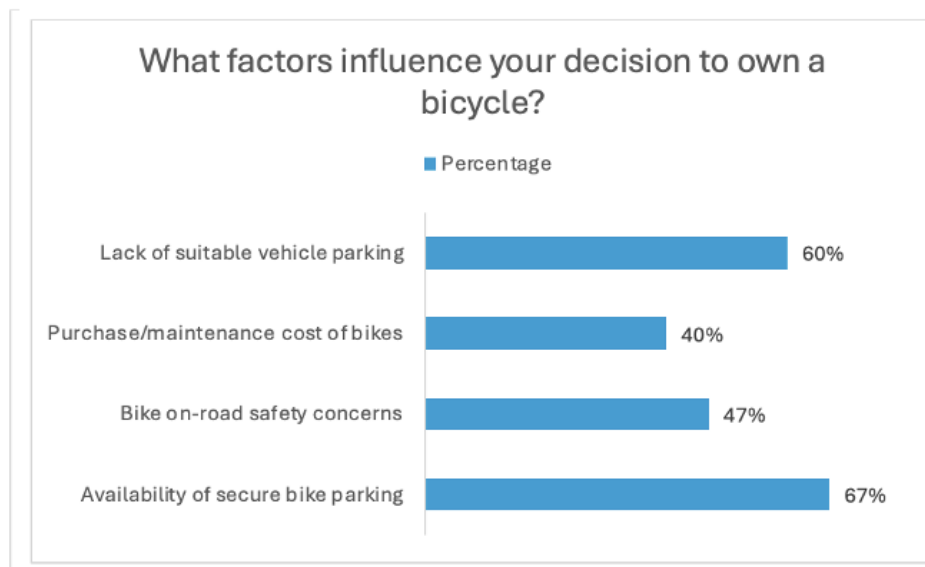
Figure 5.

Where do you currently store your bicycle(s)?



A chart showing where medium/high density residents surveyed currently store their bicycle(s).

Figure 6.



A graph showing factors that influenced medium/high density residents, options were provided.

5.1.5 Commuting and Recreational Bicycle Use

Figure 7 shows that 66% of those surveyed said they currently commute by bicycle either every day or several times a week. This suggests that among the survey participants, cycling is a popular form of transportation. However, 17% of

respondents stated they never commute by bicycle. Whereas, Figure 8 shows that 50% of respondents said they used bicycles either daily or two to five times a week for recreational purposes, 33% said they did so at least once a month, and 11% said they never used it recreationally. These numbers imply that although though a large number of residents ride bicycles on a regular basis, their use may be restricted by parking or safety concerns, which could be investigated further in further research.

Figure 7.

How often do you use a bicycle for commuting?

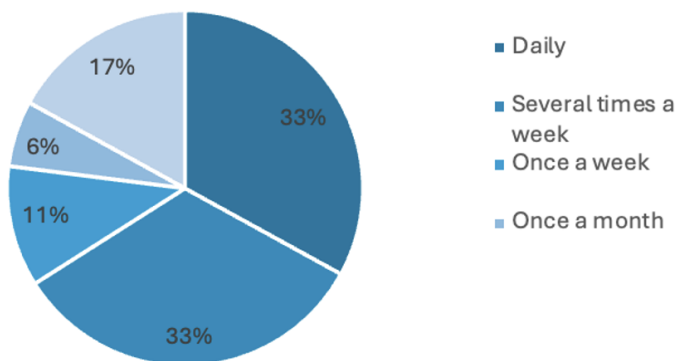
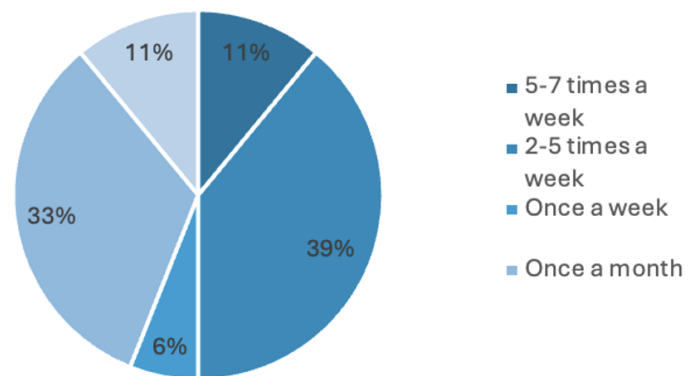


Figure 8.

How often do you use a bicycle for other activities (eg. recreation,)



A chart showing how often medium/high density residents surveyed use their bicycle(s) for commuting.

A chart showing how often medium/high density residents surveyed use their bicycle(s) for other activities like recreation.

5.2 Interview Results

The interviews provided an opportunity to delve deeper into the experiences of residents with regard to bicycle parking in high-density housing, highlighting the difficulties they encounter and their viewpoints on possible improvements. Design issues, security concerns, and barriers to regular bicycle usage due to inadequate parking were among the main topics of discussion.

5.2.1 Inconvenient Bicycle Parking Design

Participants' dissatisfaction with the current bicycle parking design was a recurring theme. Residents complained about tight areas and badly designed layouts. The lockers were "on the opposite end of the building" from their apartment, requiring a long trip, according to one participant, who emphasised the difficulty. Another interviewee pointed out that the lockers were "functionally useless," deterring frequent bicycle use, because they lacked useful features like pull-out trays.

5.2.2 Security Concerns

Many participants raised serious concerns about security, believing that inadequate security measures in the current bicycle parking area contributed to their fears of theft. One resident voiced concerns regarding security, stating that even with key entry, they

didn't feel secure. Those interviewed had differing opinions on the type of bike rooms wanted, with one preferring that the bicycles be visible through mesh walls so they could check on the bicycles themselves, with another wanting solid walls so those walking by couldn't see the bikes and hence was less likely to be stolen. However, they all thought that better features, such as gated secure rooms or controlled entrance, could be crucial in attracting residents to commute by bicycle more frequently.

5.2.3 Barriers to Bicycle Usage

According to a number of interviewees, regular cycling was discouraged by the condition of bicycle parking. The present layout eliminated "one of the easiest things about cycling," according to one resident, because the facilities were inconveniently placed far from their apartments. Another interviewee said that getting to their bike was "a bit of an ordeal," which made riding a bike less desirable than using other forms of transportation. These obstacles discouraged residents from using bicycles for daily transportation.

5.2.4 Impact of Better Bicycle Parking

Many interviewees thought that their cycling habits might be positively impacted by better bicycle parking. According to one resident, adding a dedicated bicycle park in their development would undoubtedly increase bicycle usage. Another stressed that having safe exterior parking would help make more room inside their apartment, which would encourage them to ride their bicycle more often. These responses suggest that in high-density housing developments, thoughtfully and well-designed parking could help to promote cycling as a more frequent mode of transport in Christchurch.

5.3 Limitations

Our research encountered a number of limitations that could have impacted its generalizability. First, the data's representativeness is limited by the low survey response rate, with only 24 responses out of 1,180 letterbox drops, which equates to a 2% response rate. Furthermore, just three interviews were conducted, and although they provided insightful information, crucial viewpoints on bicycle parking are missing due to the absence of participation from essential stakeholders like developers, architects, or council members. The reliability of the survey data was further impacted by technical problems; survey software issues prevented responses to 8 out of the 20 questions, depriving us of important and insightful data. For example, data on the type of bicycle parking residents preferred was not able to be gathered as a result. Another factor was the time limits; the survey's QR code unexpectedly expired early after two weeks, which likely would have decreased participation. These limitations draw attention to the difficulties in collecting accurate and representative data, which could have an impact on the generalizability of our findings.

6. Discussion

6.1 Key Findings and Interpretation

This research sought to explore how the Christchurch City Council's (CCC) implementation of higher standards for bicycle parking in medium- and high-density residential areas could influence bicycle ownership and usage. Through a combination of surveys and interviews, it became evident that current bicycle parking facilities are inadequate, with 71% of respondents expressing dissatisfaction and many highlighting security and accessibility as significant concerns. The results of this research align with global findings, such as those outlined by Koraput (2024), which suggest that infrastructure deficiencies, particularly related to secure and accessible parking, are significant deterrents to increased cycling uptake. One of the most significant findings is that a lack of secure bicycle parking directly impacts residents' decisions to own and use bicycles. Most respondents (67%) indicated that poor parking options deter them from owning a bike, while others cited inconvenience as a critical factor influencing their decision to cycle. This is consistent with findings from international studies, which emphasise the importance of secure, accessible, and well-designed cycle parking in encouraging bicycle use (Egan et al. 2023).

6.2 Policy Implications and Recommendations

Given the apparent dissatisfaction with the existing infrastructure, it is evident that CCC needs to improve its standards for bicycle parking, particularly in some areas. These findings strongly support the recommendation to add secure, accessible, and well-designed bicycle parking requirements into the Christchurch District Plan, similar to international examples such as those in Amsterdam and Copenhagen. The study by Nilsson (2019) on Copenhagen highlights how integrating bicycle infrastructure into urban development plans contributes to increased cycling rates. Applying similar standards in Christchurch could address current parking inadequacies, promote sustainable transport, and reduce car dependency, aligning with the Greater Christchurch Urban Development Strategy's goal of fostering active transport in 2016.

To enhance bicycle ownership and usage, CCC should adopt a multi-tiered approach, ensuring that all new developments include provisions for long-term, secure parking that caters to different types of bicycles, including e-bikes and cargo bikes. This aligns with recommendations in the "Cycle Parking Planning and Design" guidelines, emphasising the need for varied parking solutions to meet diverse user needs. These standards should mandate that cycle parking be located within minimum distance of building entrances, be weather-protected, and provide adequate lighting and security features. Such measures would address the concerns of residents who cited inconveniently placed and insecure parking. Moreover, the city should look to international examples of building codes that mandate higher standards for bicycle parking. Their research demonstrates that cities with stricter cycle parking regulations see higher cycling rates, further underscoring the importance of policy intervention to encourage sustainable transport choices.

6.3 Strengths and Contributions

A key strength of this research lies in its mixed-methods approach, combining quantitative survey data with qualitative insights from interviews. This approach allowed a more nuanced understanding of residents' specific needs and challenges in Christchurch's high-density areas. While the survey data provided a broad overview of dissatisfaction with current bicycle parking facilities, the interviews offered more profound insights into the reasons behind this dissatisfaction, such as security concerns and poor accessibility. Additionally, this research contributes to the local context by providing specific recommendations that can be directly applied to Christchurch. By comparing global examples of best practices in cities like Amsterdam, Portland, and Copenhagen, this research offers a clear pathway for CCC to improve its bicycle infrastructure in a contextually relevant way and adapt to user preferences.

6.4 Recommendations for Future Research

Future research should focus on expanding the scope of this study to include commercial developments and public transport hubs, as the availability of bicycle parking in these areas can further promote cycling as part of a daily commute (Cannon et al., 2024). Additionally, future studies should specifically cater to the increasingly popular e-bikes and cargo bicycles. An area of interest identified in this study is the willingness of some residents to pay a regular subscription fee for better residential parking services or infrastructure. This model meets the demand for high-quality bicycle parking and provides a sustainable approach to fund the maintenance of these facilities. Exploring the feasibility and effectiveness of such subscription models in future research could offer valuable insights into creating self-sustaining infrastructure. Further studies should also aim to engage with the developers of the medium/high density developments, such as Fletcher Building and Williams Cooperation to explore their challenges in incorporating higher bicycle parking standards into new developments. This could provide a better understanding of the barriers to implementing these standards and help inform targeted policy recommendations.

7. Conclusion

This research illustrates the notable effects that inadequate bicycle parking in medium- and high-density developments in Christchurch has on residents on bicycle ownership and usage. One of this researches key findings was that 71% of survey respondents were dissatisfied with their current bicycle parking facilities, which they expressed were based on security and accessibility issues. The research also found that the majority of respondents resort to keeping their bicycles on porches or inside of apartments, suggesting that provided parking facilities are unsuitable for their needs. These findings show how poor shared bicycle parking facilities make create unnecessary barriers when owning a bike which in turn discourages regular ownership of bicycles and therefore in turn discourages bicycle usage. It is for this reason that the findings of this research support the need for the introduction of “higher standards” of bicycle parking in medium/high density developments in the Christchurch City Council’s district plan. Future research on this topic should look to explore what actual “higher standards” are required and should address the identified need for more accessible and secure bicycle parking that accommodates the rising demand for cargo

bikes and e-bikes. It is important to note that while this study offers insightful conclusions and recommendations, their reliability and generalizability is impacted and limited by the low survey response rate and technological difficulties experienced. Ultimately, overcoming such issues is essential to creating a cycling culture that encourages bicycle ownership and usage in Christchurch which hopefully in turn will help create a more sustainable urban environment in Ōtautahi.

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