

Cycling for Older Adults



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This paper is based on a master's thesis in Urban Ecological Planning at the Norwegian University of Science and Technology (NTNU) in Trondheim with *Thomas Alexander Sick Nielsen* and *Jarvis Suslowicz* as supervisors. Find the full thesis [here](#).



SUMMARY

This article explores how to improve cycling for older adults in Trondheim, emphasizing inclusive transportation amid an aging population and growing environmental concerns. By exploring sustainable development, inclusive mobility, active mobility, age-friendly cities, and universal design principles, the research argues that adequate cycling infrastructure is crucial for encouraging behavior change and ensuring the right to move freely within urban environments. The study examines potential barriers faced by cyclists, with a particular emphasis on older adults, such as narrow pavements, poor winter maintenance, inadequate signage and marking, the shared use of bike lanes with cars or pedestrians, and confusing technology and

intersections. Findings indicate that some challenges, such as safety concerns, are experienced across all age groups, though they often affect older adults more acutely. This highlights the need for cycling infrastructure and planning to consider the needs of all age groups, particularly older adults, from the outset. The findings also indicate that older cyclists have specific needs that should be taken into account during planning, such as proximity to attractive destinations, as they often cycle for errands like shopping. Additionally, the study advocates for dedicated bike lanes that are not shared with cars or pedestrians.

Addressing these challenges with universal design and age-friendly principles can enhance health, support better aging, and contribute to environmental sustainability. Creating inclusive, age-friendly

cycling infrastructure benefits both individuals and the broader community.



INTRODUCTION

Norway has long prioritized sustainability and public health, with cycling emerging as a key focus in its transportation plans. The National Transport Plan 2022–2033 highlights cycling as a critical element in reducing emissions, improving public health, and enhancing urban mobility. This plan aims to increase the cycling modal share in urban areas to approximately 20% and nationwide to 8%, reflecting the government's commitment to facilitate for active modes. Investments are being directed toward cycling infrastructure, including improved cycle paths and integration with public transport, to make cycling a safer and more attractive option. (Norwegian Ministry of transport, 2020–2022). Despite these efforts, a notable gap remains in addressing the specific needs of older adults. While general strategies for inclusivity and accessibility are outlined, (Norwegian Ministry of transport, 2020–2022) (Norwegian Public Roads Administration, 2003) the focus on cycling for seniors is insufficient. The current plans often fail to explicitly address age-specific considerations

that could enhance cycling experiences for older individuals. This oversight poses a challenge, as an aging population (United Nations, 2019) requires tailored solutions to ensure that cycling remains a viable and beneficial mode of transport for them. Bridging this gap is crucial for making Norway's cycling initiatives truly inclusive and ensuring that all demographics can equally benefit from the country's sustainable transportation goals. (Syklistforeningen, 2024).

In transportation and mobility subjects, "Social Practice Theory (SPT)" (Reckwitz, 2002) and the "Right to Move" (Preston and Rajé, 2007) theory are indispensable for examination. According to SPT, mobility-related activities such as cycling behaviors are shaped by the interplay of social norms, practices, and contextual factors, highlighting the need for systemic changes to encourage sustainable mobility (Cohn, 2014). Meanwhile, the "Right to Move" theory underscores the necessity of accessible transportation infrastructure to support social inclusion and improve well-being, particularly for older adults (Preston and Rajé, 2007) (Antonucci et al., 2012). Thus, integrating SPT's emphasis on shifting social practices with the "Right to Move" theory's focus on equitable infrastructure can

ensure that cycling becomes a more common and accessible option, promoting both systemic change and enhanced mobility for all, especially older adults.

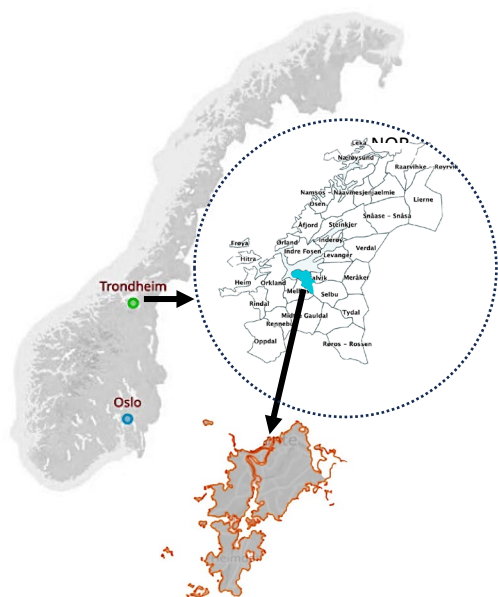
Inclusive mobility and active mobility are interlinked concepts crucial for achieving sustainable urban environments. Inclusive mobility ensures equitable transportation access for all, addressing disparities faced by disadvantaged groups and the elderly, who often encounter barriers such as high costs and inadequate infrastructure (Gallez and Motte-Baumvol, 2017). Active mobility, which includes walking and cycling, complements this by offering environmentally friendly and health-promoting alternatives to motorized transport. It helps reduce air pollution, congestion, and CO₂ emissions, while also combating physical inactivity—a significant health risk (Europe, 2019). Integrating active mobility within an inclusive framework enhances accessibility, ensuring that transportation systems support diverse needs, including those of older adults and individuals with disabilities.

As urban populations age and the need for sustainable and inclusive environments intensifies (United Nations, 2019), the principles of universal design and active aging are crucial in shaping cities that support

all residents, particularly older adults. Universal design aims to create environments and products that are accessible and usable by people of all abilities without the need for adaptation, emphasizing features like equitable use, flexibility, and minimal physical effort (Story et al., 1998). This approach aligns with the WHO's concept of active aging, which promotes health, participation, and safety to enhance the quality of life for older adults (World Health, 2007). An age-friendly city integrates these principles by ensuring that urban infrastructure—such as cycling paths, green spaces, and transportation systems—is designed to accommodate diverse needs and abilities, improving independence and reducing barriers for older adults (Van Hoof et al., 2021). Effective urban planning not only addresses physical accessibility but also supports mental health and social engagement, recognizing that age-friendly environments benefit all age groups and contribute to a more inclusive society (World Health, 2002) (Chao, 2017). By combining universal design with active aging principles, cities can better support the well-being and active participation of their aging populations, creating spaces that are both functional and inviting for everyone.

Context:

Trondheim, situated in Norway's Trøndelag region,



Figur 1: Trondheim 's location in the country and county levels, (Statistics Norway, 2024)

is experiencing population growth and an aging demographic, with the number of elderly residents expected to rise by 2050 (Trondheim Kommune, 2024).

This demographic shift necessitates strategic urban planning to support sustainable mobility and accessibility. The city's cold, temperate climate and hilly terrain present challenges for cycling, yet Trondheim maintains a robust cycling culture with ongoing investments in more than 150 km cycle network to enhance connectivity and address seasonal weather impacts (Miljøpakken, 2014). The Trondheimsløftet strategy emphasizes reducing travel distances

and promoting eco-friendly transport modes, aiming to integrate cycling and public transport with urban development (Trondheim Kommune, 2024). Additionally, universal design principles have been applied to improve accessibility for all residents , though there is a noted gap in addressing the specific needs of elderly cyclists (Trondheim Kommune, 2013). While older adults are considered in public transportation plans, such as bus services, and in entrances, public spaces, and outdoor areas they are largely missing from cycling plans, with little attention given to their specific requirements and challenges. These efforts reflect Trondheim's commitment to creating an inclusive and functional urban environment that supports both current and future residents.



METHOD

This study integrates both quantitative and qualitative approaches to explore how to improve cycling activity for older adults. The methods were designed to assess whether there are differences in the challenges and needs of older adults compared to younger individuals when it comes to cycling. The quantitative aspect involved a structured, mixed-format questionnaire that covered topics

such as cycling frequency across age groups, physical condition, and the purposes of cycling. Data from this survey were analyzed using tools like SPSS and Excel to identify patterns and correlations. In parallel, qualitative methods—such as informal interviews, expert interviews, and open-ended survey questions—offered deeper insights into the reasons behind these perceptions and behaviors. This combined approach aims to identify challenges and potential solutions to make cycling more accessible and appealing to older adults.

Quantitative Methods:

The quantitative methods in this study aimed to numerically analyze the cycling behavior in Trondheim, in different age groups, with a specific focus on older adults. A structured questionnaire was used to gather data on demographics, cycling frequency, satisfaction with cycling infrastructure, and safety perceptions. The questionnaire targeted five distinct age groups ranging from under 30 to 79 years old, but for the most parts of the analysis, these groups were often combined into broader categories to compare younger and older cyclists.

- Survey

A mixed-format questionnaire titled "Evaluating Cycling in Trondheim"

was used to gather data on cyclists habits, perceptions, and concerns and challenges. The survey featured 20 questions in both Norwegian and English to ensure broad accessibility and targeted five age groups ranging from under 30 to 79 years old. For further analysis, these groups were consolidated into two broader categories: under 50 and 50 and above. The questionnaire was distributed online via Google Forms, using QR codes for outreach, and in physical form through flyers and posters around Trondheim.

A total of 166 responses were collected, with 158 valid responses after excluding incomplete submissions. Data was analyzed using SPSS and Excel to perform descriptive and comparative statistical analysis, focusing on demographics, cycling frequency, and satisfaction with cycling infrastructure and safety. This analysis aimed to uncover trends and correlations, allowing the study to systematically assess differences in cycling activity between younger and older respondents, particularly in relation to infrastructure satisfaction and safety concerns.

Qualitative Methods:

This study utilized informal interviews with older adults and structured interview with expert, complemented by open-ended questions in the

questionnaire. Thematic analysis was used to identify patterns and themes in the qualitative data.

- **Interview:**

Informal interviews were conducted with seniors in three locations—Valentinlyst, Solsiden, and Trondheim Public Library—to explore their cycling experiences and reasons for reduced engagement if it was a case. Structured expert interview was conducted with municipal official to understand local policies and strategies for promoting senior cycling.

- **Open-ended Questions:**

Two open-ended questions in the questionnaire allowed participants to provide detailed feedback on cycling safety and other relevant issues. Responses were analyzed by categorizing comments into themes, with a focus on differences between younger and older cyclists.

- **NVivo Analysis:**

NVivo software was used to analyze textual responses from open-ended questions, facilitating the organization and coding of qualitative data. The analysis aimed to identify key themes and patterns related to cycling safety and challenges, with results presented in hierarchy charts.

- **Limitations:**

This study faced several limitations that impacted its findings. One major challenge was locating and engaging senior cyclists, especially since the research was conducted during a rainy and snowy period, making it difficult to find participants. As a result, there was low engagement from older adults and age groups had to be merged for analysis. The limited participation of older cyclists further reduced the accuracy of the findings, as most respondents were younger, active cyclists. While the study attempted to make comparisons within each age group, the results would have been more accurate if it had more seniors participated.

Additionally, the broad advertisement of the questionnaire allowed anyone to respond, meaning there was no control over who completed it. This lack of control could have impacted the relevance of the responses. The online nature of the questionnaire posed another challenge, with older adults often reluctant to participate, despite efforts to encourage their involvement. Language barriers and adverse weather conditions further delayed data collection and hindered the inclusion of older cyclists. Engaging cyclists on-site was also difficult, as they were often unwilling to stop during their rides. Moreover, the time constraints of a master's thesis limited the depth of

exploration into several aspects. Future research could address these gaps and gather more comprehensive data.



RESULT

Quantitative analysis:

This section investigates the first seven questions of the questionnaire to offer an overview of respondents' demographics, including age and gender distribution, as well as their cycling habits. It also explores the motivations and objectives driving their cycling activities, shedding light on how these factors influence their engagement with cycling.

Characteristics and Cycling Habits :

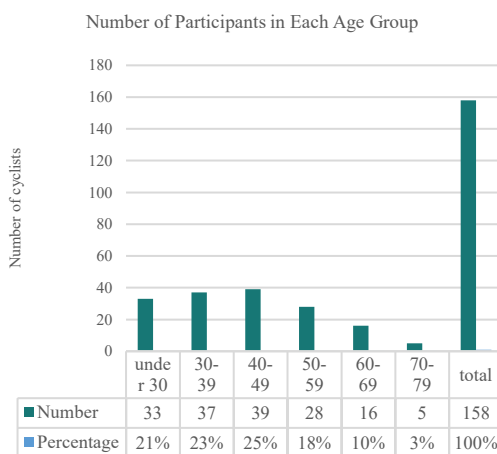
Age
Gender
What describes your physical activity the best
Do you have access to a bike that you can use
How often do you cycle
What are/were the primary reasons for your cycling activities
What is/was the primary purpose of your cycling activities

Most of the respondent population falls within the age groups of 30-49, with the highest percentage being in the 40-49 age group as it is illustrated in figure 2.

The proportion of individuals participated in this questionnaire

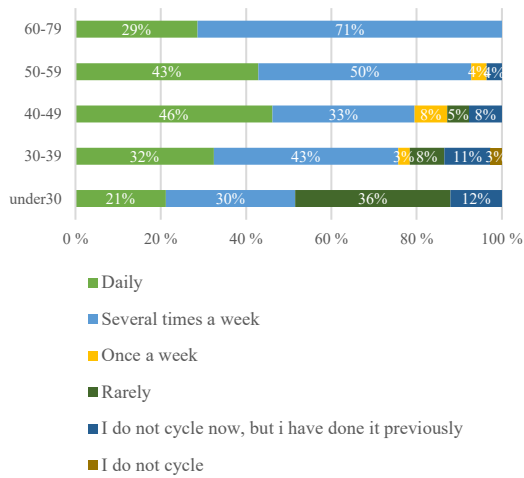
generally decreases as the age increases beyond 50, with a significant drop in the 70-79 age group.

To ensure more precise results for the upcoming analysis, the age groups 60-69 and 70-79 have been consolidated into a single category due to the small number of participants above 70.



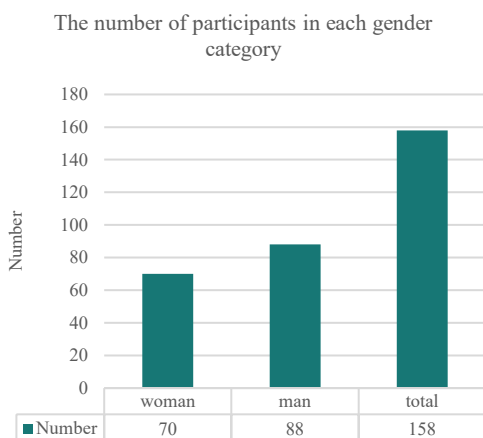
Figur 2: Illustration of the number of participants in each age group, author

Figure 3 illustrates that among respondents, 46% of those aged 40-49 cycle daily, the highest frequency observed, while participants in other age groups typically cycle several times a week.



Figur 3: Cycling activity across each age group of participants, author

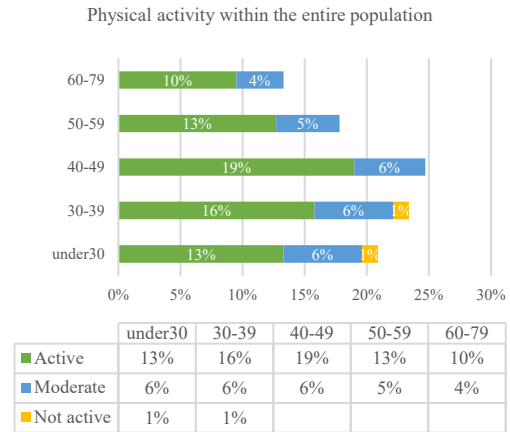
Gender differences are also apparent in the repondent population, with men cycling more frequently than women. Specifically, men are more likely to cycle daily, while women often cycle several times a week. Notably, a larger proportion of women reported having cycled in the past but not currently, highlighting a potential area for further exploration.



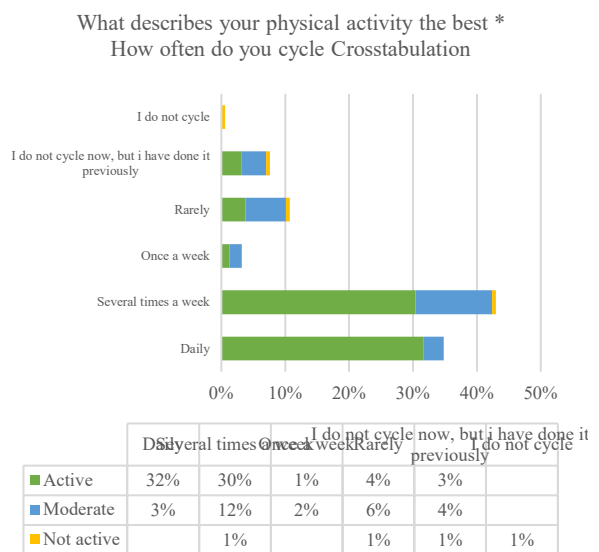
Figur 4: illustrating the number of participants based on gender, author

Physical activity levels also correlate with cycling frequency. Active

individuals are more likely to cycle daily or several times a week.



Figur 5: Activity level of individuals across age groups, in the sample, author



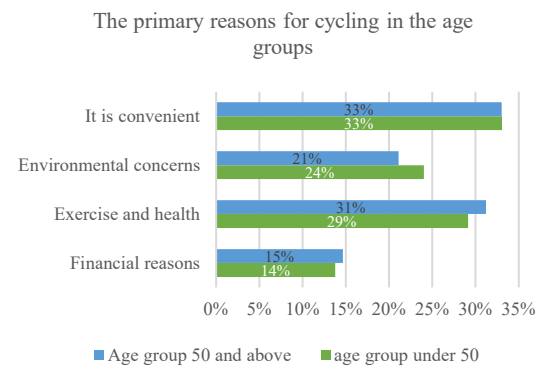
Figur 6: Crosstab of physical activity of the age groups within the entire sample population and frequency of cycling, author

This aligns with literature indicating that increased physical activity promotes regular cycling and that decreased activity levels in older adults reduce their cycling frequency (Kahlmeier et al., 2021) (Bokolo, 2023). Promoting physical activity is

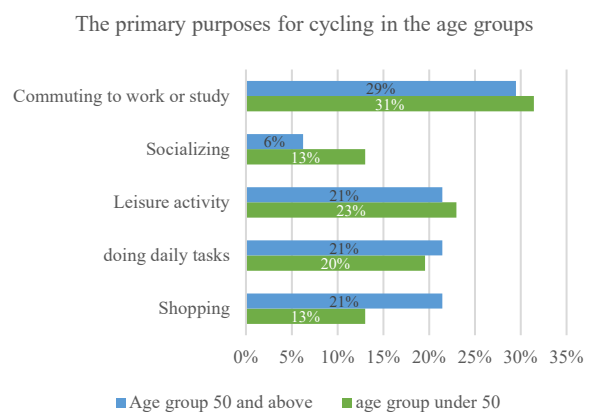
crucial for improving a cycling culture, as excessive car reliance undermines this goal (Rosenbloom, 2004). Norway's focus on active living suggests potential for increased cycling in the future.

Reasons and purposes of cycling within the sample population:

In this section, the analysis of cycling motivations and purposes reveals that exercise, health, and convenience are the top reasons for cycling across both younger and older age groups in Trondheim, with 33% of respondents in both groups citing convenience. Exercise and health are slightly more important to older adults, reflecting their higher physical activity levels, while environmental concerns are more important for younger cyclists. Financial reasons play a minimal but consistent role across age groups. Commuting to work or study is the most common purpose for cycling, especially among younger participants, while older adults tend to use cycling more for shopping and daily tasks. The data highlights the importance of cycling for older adults, especially as a means of improving health and managing daily activities, reinforcing the need for urban planning that supports age-friendly environments with mixed land use to encourage cycling among older populations.



Figur 7: Proportion of reasons that participants cycle, author



Figur 8: proportion of the purposes and goal that participants cycle, author

Evaluation of participants Perception of Cycling environment in Trondheim Across Different Age Groups focusing on older adults:

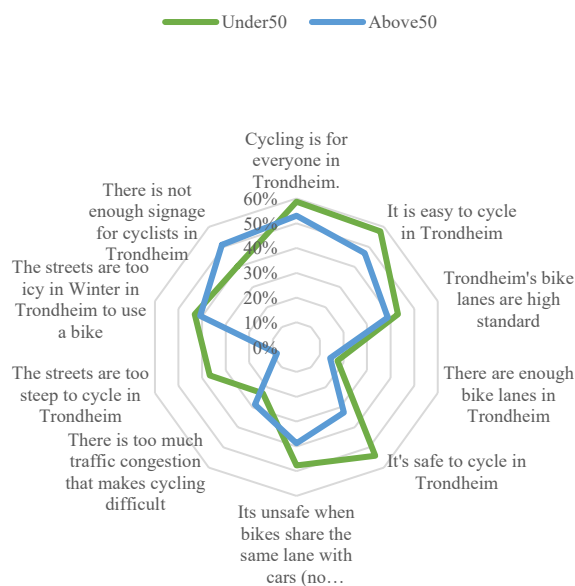
Participants are divided into two age groups to align with the study's aim of understanding older adults' cycling experiences and identifying challenges they face. The analysis focuses on two cohorts: those younger than 50 (under 30, 30-39, and 40-49) and those aged 50 and above (50-59, 60-69, and 70-79). This comparison aims to uncover differences in perceptions of cycling

in Trondheim. Participants were asked to agree or disagree with a series of statements to assess their views on cycling.

Cyclists' Perception

Cycling is for everyone in Trondheim
It is easy to cycle in Trondheim
Trondheim's bike lanes are high standard
There are enough bike lanes in Trondheim
Its unsafe when bikes share the same lane with cars (no dedicated lane for bikes).
There is too much traffic congestion that makes cycling difficult
The streets are too steep to cycle in Trondheim
The streets are too icy in Winter in Trondheim to use a bike
There is not enough signage for cyclists in Trondheim

To illustrate this, radar chart (Figure 9) was generated using the mean scores for "quite agree" and "totally agree" responses, based on data analysis from SPSS. These charts provide a detailed view of the agreement levels across various aspects of cycling safety, enabling a comparison between the different age groups. It's important to note that the mean scores were calculated within each age group's population (participants in each groups), rather than across the entire sample population.



Figur 9: Radar chart illustrates of an agreement to statemnnets on cycling in Trondheim between age groups "under 50" the green line and "above 50" the blue line, author

The comparison of the mean responses shows that individuals under 50 are more likely to agree with the statement that cycling is for everyone in Trondheim. Younger cyclists also showed stronger agreement that it is easy to cycle in the city.

Regarding the quality and standards of bike lanes, both age groups expressed concerns, though there was a slightly more positive attitude among those under 50. Interestingly, both younger and older cyclists disagreed that there are enough bike lanes in Trondheim.

Safety perceptions differed, with more individuals under 50 agreeing that cycling in Trondheim is safe.

However, according to the result of this section, younger cyclists expressed more concerns about sharing bike lanes, preferring dedicated lanes for improved safety and convenience. While the older cyclists seemed to be more accepting. This could mean that younger people are more sensitive to safety risks, while older adults might be more used to the current infrastructure. Traffic emerged as a mutual concern across both age groups, as did the issue of steep streets and icy bike lanes during the winter. Additionally, cyclists over 50 found the signage and markings for cyclists in Trondheim to be inadequate.

Qualitative analysis:

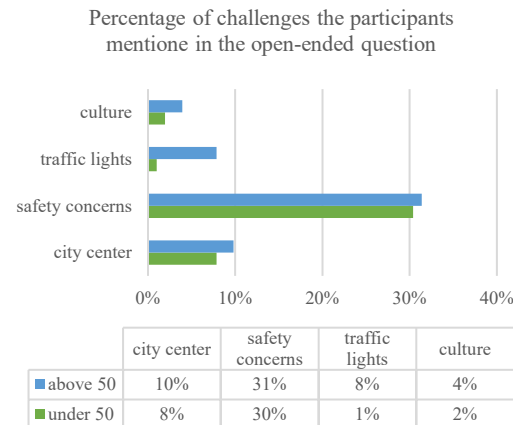
The qualitative analysis examines data from interviews, surveys, and open-ended questionnaire responses using NVivo and Excel. The focus is on identifying barriers and challenges faced by cyclists, especially older adults in Trondheim.

Open-ended Questions:

Two key questions were asked in the last part of questionnaire aiming for identifying further detail contributing to cyclists feeling unsafe or challenging in Trondheim. Responses were categorized into themes (generated codes in NVivo) such as infrastructure, safety, and maintenance, city center, traffic lights

and culture of cycling. A total of 153 points were extracted from the comments to these questions, with 102 points coming from individuals aged 30-49 and 51 points from individuals aged 50-79. It's important to note that these numbers represent the points extracted from the comments, not the number of respondents. For example, a single respondent might have made multiple points, each assigned to different themes. First, the responses were analyzed by comparing the highlighted points between the two age categories.

- Age Groups Comparison:



Figur 10: Proportion of the problems mentioned by the participants to the last two questions, within each age group, author

Safety concerns rank high among both age groups, with 30% of individuals under 50 identifying safety as a major issue. For those over 50, safety concerns are even more pronounced, making up 31% of their total concerns, likely due to

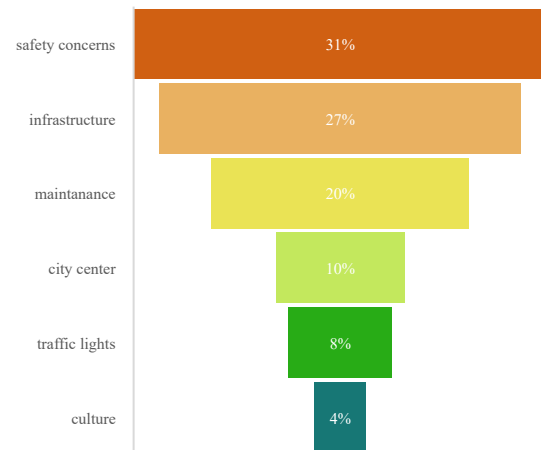
increased vulnerabilities with aging. Traffic lights, only 1% of younger participants find traffic lights to be a concern, while 8% of older individuals identify them as a significant issue, likely due to challenges with visibility and timing at intersections.

Concerns about the city center are relatively low but notable. For younger cyclists, 8% express concerns about congestion and accessibility, while older individuals report slightly higher concerns at 10%, reflecting challenges with navigation and urban density. Cultural concerns, though minor, are slightly more prominent among older adults 4% compared to younger participants 2%, suggesting that older adults place a greater emphasis on cultural heritage and community activities.

- Key concerns within participants aged 50 and above

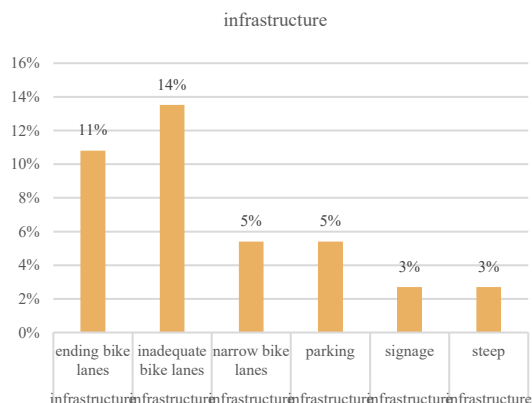
This part focuses on the analysis of issues reported by individuals aged 50 and above reveals several critical areas of concern. For participants aged 50 and above, isolating their answers and analysis them within their population, show that safety (31%) and infrastructure (27%) remain critical concerns. The older group emphasizes the need for improved cycling infrastructure,

regular maintenance, and safer intersections.

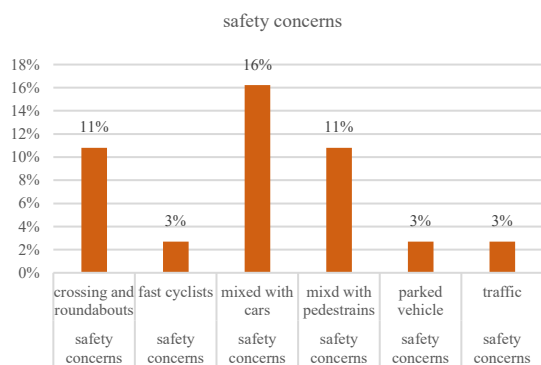


Figur 11: Funnel chart generated in Excel showing the issues mentioned by participants aged 50 and above, ranked from the highest percentage to the least, author

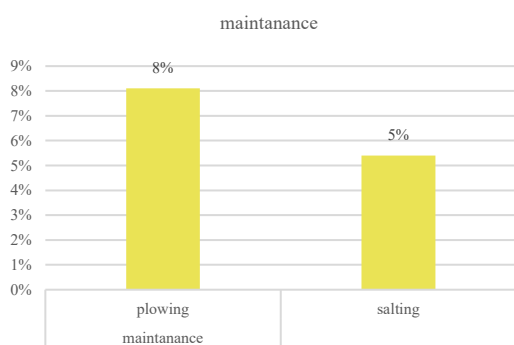
In the following section, these issues as the main codes will be broken down into sub-codes presented. It shows that Safety concerns, particularly cycling near cars and pedestrians, roundabouts and intersections, are heightened for the older cyclists. Infrastructure problems like fragmented cycling paths and inadequate bike lanes are major challenges, along with winter maintenance issues like plowing and salting.



Figur 12: Illustration of the percentage of each sub code about infrastructure with the entire participant population aged 50 and above



Figur 13: Illustration of the percentage of each sub code about safety concerns with the entire participant population aged 50 and above



Figur 14: Illustration of the percentage of each sub code about maintanance with the entire participant population aged 50 and above

Interview:

The expert interview highlighted Trondheim’s strategic focus on

increasing the cycling modal share from 7.5% to 15% by 2025. and improving cycling infrastructure, especially through the "Miljøpakken" aimed at reducing car traffic. Despite strong efforts and political focus, there remains a challenge in meeting the ambitious goal to double the cycling share by 2025. The city's cycling strategy prioritizes women and youth, with little mention of seniors in key documents, which raises concerns about inclusivity. Infrastructure design manuals do not specifically address the needs of older adults, although a broader societal plan aims to transform Trondheim into a better place for all. Winter maintenance was another critical area discussed, as it greatly impacts cyclists. While the city has made progress in clearing snow and maintaining roads during winter, challenges like the use of salt and its damaging effects on bicycles remain contentious issues. In contrast, the informal interviews with seniors revealed a disconnect between the city’s initiatives and the lived experiences of older adults. Seniors expressed concerns about safety, infrastructure gaps, complicated technological initiatives and limited accommodation of their needs in the city’s cycling framework. These interviews underline the importance of creating cycling-friendly environments that not only

encourage physical activity but also support social interaction, particularly for older citizens facing isolation.



CONCLUSION

Cycling is crucial for health, well-being, and sustainability, yet failing to promote it incurs significant costs, including increased reliance on cars and higher healthcare expenses. Despite its importance, the needs of aging cyclists are often neglected in planning. While governments acknowledge aging populations in official documents, practical implementation falls short, with limited detail and focus on elderly needs.

In Norway, official plans for elderly cyclists refer to broad frameworks like age-friendly city principles and universal design but lack specific detail. Current initiatives primarily target younger cyclists, leaving older adults' needs insufficiently addressed. True universal design aims to create accessible environments for everyone, but elderly cyclists' specific needs are often overlooked.

This study highlights that while many challenges faced by older cyclists overlap with those of younger ones, they tend to be more pronounced for older individuals. Issues such as the

need for clear signage, separation from pedestrian areas, and better winter maintenance are critical for older adults. Some unexpected findings suggest older cyclists may not view icy or steep streets as major barriers, possibly due to different cycling behaviors or preferences.

Older cyclists also struggle with confusing traffic lights and intersections, reflecting broader issues in design and planning. Norwegian plans advocate for dense, compact land use to support age-friendly cities, and older adults have the tendency to cycle over driving when infrastructure is suitable. However, challenges like inadequate winter maintenance, disjointed organizational efforts, and security concerns need addressing.

An age-friendly city, supportive of all residents, inherently supports cycling and can reduce public health costs and reliance on other transport forms. Integrating universal design principles and enhancing coordination among organizations are essential for creating inclusive and effective cycling infrastructure.



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