Future Change in the number of 80+ Years Old Users Using 24 Hours Long Term Care in all the municipalities of Norway

The document assess the change in number of users using LTC in Norway from 2023 to 2050

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Economics and Policy Masters Thesis

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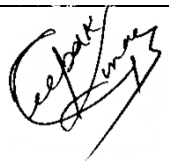
31-July-2023	
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Abstract

The research topic is assessing the change in the number of users aged 80 years or older for long-term care usage (24-hour care), prediction, and forecasting the number of users in all 356 municipalities of Norway. The methodology involves combining the Statistics Norway (SSB) population predictions and taking the current proportion of the services to make projections as a product. The investigation studies and compares the number of users with the predicted future needs at the municipality level.

Long-term care deals with the complex needs required of the patients because of illness, disability, or any condition that requires special treatment. Previous literature mainly focuses on short or medium-term forecasting of healthcare services. Due to the variation in the percentage change of users in the last seven years, it is necessary to estimate realistic changes in the number of users in the upcoming years. The estimate will enable the policymakers to make an informed decision about resource allocation or appropriate actions to cater to the most needy population.

Therefore, the thesis evaluates Long-term Care (LTC) or 24-hour care services users aged 80+ years at the municipality level and recommends linking the forecasted numbers to the expenditures and services required according to the caseload.

The study further outlines the expected number of patients at the municipality level, which can ultimately be used to forecast the spending/expenditure by linking the services required by them. The findings help discuss long-term policymaking to allocate resources or make necessary changes at the municipality level.

The study's main findings are the increased number of users in municipalities with Centrality Index 5 and 6 (1 Centrality Index being closer to Urban areas and more facilities and 6 to the farthest). Municipalities far from the urban areas will observe the most significant user change, with fewer facilities that cater to higher LTC users.

Following the findings above, it is established that Norway will face a massive change in users for 24-hour long-term care, especially institutional care, i.e., 2.5 times regardless of the type of service. However, the percentage change ranges from 42% to 342% depending on the service type and the findings' determinants. Furthermore, the study finds a correlation between average household income, primary education, and centrality index, which states that income and CI are statistically significant—finally, the study lists policy-level recommendations.

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Abbreviations/Acronyms

Abbreviation/Acronym	Description
ADL	Activities of Daily Livings
AU	Absolute Users
CI	Centrality Index
CIU	Change in Users
CL	Confidence Level
COVID-19	Corona Virus Disease 2019
EU	European Union
FTS	Full-Time Service
GDP	Gross Domestic Product
IADL	Instrumental Activities of Daily Livings
IPLOS	Individual-Based Nursing and Care Statistics Registry
IR	Institutional Residents
LTC	Long-Term Care
LTCF	Long-Term Care Facility
MA	Main Alternative
NOK	Norwegian Kroner
NPR	Norwegian Patient Registry
OECD	Organization for Economic Cooperation and Development
RD	Resident Dwellings
Reg	Regression
RHA	Regional Health Authorities
SA	Strong Ageing
SD	Standard Deviation
SE	Standard Error
SSB	Statistics Norway
US	United States
WA	Weak Ageing

Chapter 1: Introduction

As a social welfare state, Norway provides universal public services, including social insurance, conditional universal healthcare, and social assistance for those who cannot support themselves (Loyland et al., 2010). Therefore, Norway's healthcare system emphasizes real-time health-related data to make informed and timely decisions. The recent pandemic (COVID-19) enabled the system to collect, process, and disseminate information to all health facilities in real-time (Skagseth et al., 2023).

Real-time information is necessary to monitor the Norwegian universal healthcare system, which provides a complete package (variety of services) to the whole population (Skagseth et al., 2023). The public healthcare system is semi-decentralized and relies on taxes (85.5% of current healthcare expenditure); the benefits are free or low-cost. At the same time, private healthcare services are expensive and at the disposal of the patient's expenses and affordability (Norbye and Skaalvik, 2013). Both systems ensure equal access and free will to choose service providers and are politically decentralized, making them an efficient and excellent approach. Norway has the highest per capita GDP and similarly spends higher on health expenditure, i.e., over US $7,217 PPP in 2019 (Debesay et al., 2019).

The higher health expenditure means more resources for healthier life, which makes the Norwegian healthcare mechanism efficient as the public healthcare structure comprises four Regional Health Authorities (RHAs) responsible for public hospitals (specialized treatment) and municipalities looking after primary and long-term care (Frisk et al., 2022).

Enabled by real-time information, the Norwegian healthcare system can constitute a mechanism to channel long-term care for the general population. The Norwegian healthcare system faces a paradigm shift in utilizing services by different age groups (Brkic et al., 2021).

There are two broad categories for healthcare utilization: Hospitals and home and community-based Care. The Norwegian Patient Registry (NPR) is responsible for hospital claims and maintains detailed information on patients and referrals. At the same time, municipalities fund home and community-based care from their global budget. The informal home and community-based care costs are unavailable while all municipalities maintain records of patients who have applied for and/or received treatment. Data utilization mainly includes research, quality assurance, planning, and primary sources of policy making. The information system is the Individual-Based Nursing and Care Statistics Registry (IPLOS) (Bjornelv et al., 2022).

The research topic is assessing the change in the number of users aged 80 years or older for long-term care usage (24-hour care), prediction, and forecasting the number of users in all 356 municipalities of Norway. The methodology involves combining the Statistics Norway (SSB) population predictions and taking the current proportion of the services to make projections as a product. The investigation studies and compares the number of users with the predicted future needs at the municipality level.

Long-term care deals with the complex needs required of the patients because of illness, disability, or any condition that requires special treatment. Previous literature mainly focuses on short or medium-term forecasting of healthcare services. However, policymakers need long-term forecasting to allocate resources for long-term solutions. According to the available data[1], an analysis done for Oslo indicate a significant percentage change in all types of services: Home Based Services, Institutional Services, Daytime Activity Program, and Other Services. Table 1 below highlights the service utilization change in the last 06 years for Oslo municipality.

Table 1: Change in Users of Different Age Groups in Oslo, Norway[1]

Oslo	Total	0 – 66y	67-79y	80+y
Home-based services				
Change in Users from 2015 to 2022	783	1114	519	-850
% Change base year 2022	4%	13%	14%	-15%
% Change base year 2015	5%	15%	16%	-13%
Institutional services				
Change in Users from 2015 to 2022	-157	614	108	-879
% Change base year 2022	-3%	45%	10%	-32%
% Change base year 2015	-3%	81%	12%	-24%
Daytime activity programmes and other services				
Change in Users from 2015 to 2022	1852	781	1129	-58
% Change base year 2022	13%	21%	35%	-1%
% Change base year 2015	15%	27%	53%	-1%

The above table indicates that Oslo, Norway, is facing a change in users for different healthcare services. On average, there is an increase of 5% in home-based services, a decrease of 5% in institutional services, and a 12% increase in other services.

[1] Source: https://www.ssb.no/en/statbank/table/12003

The study intends to add to the literature to understand better the shifting of the caseload at the municipality level and recommend policies to allocate resources accordingly. The descriptive analysis indicates a need for further investigation, and therefore, the analysis was further extended for the entire country.

A similar exercise for the entire country, including Oslo below, indicates a variation in percentage change:

Table 2: Change in Users of Different Age Groups in Norway[1]

Entire Country	**Total**	**0 - 66y**	**67-79y**	**80+y**
Home-based services				
Change in Users	15459	13724	6114	-4379
% Change base year 2022	7%	13%	14%	-6%
% Change base year 2015	8%	15%	17%	-6%
Institutional services				
Change in Users	-2805	769	1212	-4786
% Change base year 2022	-6%	13%	12%	-17%
% Change base year 2015	-6%	15%	14%	-15%
Daytime activity programmes and other services				
Change in Users	19442	2695	9380	7367
% Change base year 2022	14%	7%	32%	10%
% Change base year 2015	16%	7%	46%	12%

Due to the variation in the percentage change of users in the last seven years, it is necessary to estimate realistic changes in the number of users in the upcoming years. The estimate will enable the policymakers to make an informed decision about resource allocation or appropriate actions to cater to the most needy population.

Therefore, the thesis evaluates Long-term Care (LTC) or 24-hour care services users aged 80+ years at the municipality level and recommends linking the forecasted numbers to the expenditures and services required according to the caseload.

The study further outlines the expected number of patients at the municipality level, which can ultimately be used to forecast the spending/expenditure by linking the services required by them. The findings help discuss long-term policymaking to allocate resources or make necessary changes at the municipality level.

The chapters in the study will explore the different aspects of the study as explained in the table below:

Table 3: Chapters Description

Chapter 1: Introduction	Chapter 1 introduces the research and articulates the study's topic, research question, objectives, and rationale. It also defines the need and flow of the document.
Chapter 2: Theoretical Framework/ Literature Review	Chapter 2 identifies the current study's existing literature, gaps, and needs. Therefore, the study identifies the favourable and unfavourable articles. The study further explains previous studies' contradictory points and any discussion points. The chapter connects the dots between different findings and conclusions.
Chapter 3: Research Methodology	Chapter 3 describes the methodology to answer the research question and fulfill the study's objectives. It also articulates the decisions based on the available data, restrictions, and analysis limitations. It includes data inclusion and exclusion criteria and the weightage of using a particular approach on other scientific methods.
Chapter 4: Research Findings	The chapter displays the new evidence and findings after the data analysis. The chapter includes a presentable form of the results concisely and concretely. The chapter also demonstrates the approaches used to extract the results and shape the findings to meet the objectives and answer the research question.
Chapter 5: Discussion and Conclusion	The chapter discusses the key points from the findings and connects different results from different analyses. The chapter concludes the overall research, highlights the future need for evidence, proposes the approach and gaps not fulfilled by the study, and lists all the limitations. Furthermore, the chapter builds the ground for exploring new areas to fill the gaps, use the results, and find more appropriate and accurate future research gaps.

Chapter 2: Theoretical Framework

Chapter 2 intends to create a theoretical framework to explain the procedure of finding the literature gap and the study's need. The theoretical framework identifies the linkages between different aspects and explores the possibility of creating new connections or strengthening the linkages with new evidence. The chapter addresses the overall scenario and then breaks it into specific needs and gaps. From the global perspective to actual contextual influences in Norway, this chapter provides comprehensive material to understand the current situation and the need to project the change in the number of users for the future. The literature review focuses on the current global long-term care and investigates the same topic in the targeted country, Norway.

Literature Review of Long-Term Care - Global Context

Globally, long-term care has many definitions. The global context section intends to highlight a few to examine the crux of the definitions. Healthcare institutions, agencies, organizations, and other stakeholders define long-term care as assisting individuals to cope and perform their functions to manage daily routine activities such as endeavoring, dressing, showering, walking, and using toilets (Williams et al., 1997). It can also be defined as dealing with the complex needs required of the patients because of illness, disability, or any condition that requires special treatment (Melin and Hymans, 1977). Similarly, the needs of the patients who require continuous care to perform their basic day-to-day activities are among the most straightforward definitions (While et al., 2017).

The need for long-term care varies from country to country. Therefore, the provision of services depends upon the population pyramid, the ratio of older populations, and disability rates (Barker et al., 2018). However, countries with younger populations may be required to focus it on later. Moreover, avoiding long-term care and restraining the cost allocation in the healthcare budget is inevitable. Sooner or later, the countries must strategize to cope with this emerging phenomenon (Akiyama et al., 2018).

Long-term care differs from conventional healthcare and disability programs required at later stages of life, but most of them excluded from the public health insurance systems and welfare states by social insurance schemes (Walker et al., 2016). Therefore, there is a considerable burden of cost-sharing by users worldwide. However, the cost-sharing by users is not consistent worldwide and depends upon the availability of informal care at home by family members and relatives in extended families. Moreover, it changes rapidly as the joint family system moves towards nuclear families. Currently, Asian countries like China, Japan, India, Pakistan, Malaysia, and Thailand rely on commitments and devotion towards elderly family members, and the governments of these countries introduce the intervention accordingly

(Rudnicka et al., 2020). However, the scenario might change in the future; it may take two or more decades, but ultimately, the shift is unavoidable. The shift in the paradigm poses a substantial increase in the need for long-term care worldwide and demands additional resources to tackle the situation (Rudnicka et al., 2020). The need for additional demands means more consideration towards allocating public funds in welfare states and the inclusion of LTC in social insurance schemes (Feng et al., 2020). A predictable growing population leads to an increase in older people and less functionality according to age in the coming years, in addition to people with long-term conditions, which is a known challenge to growing economies, yet the nations keep avoiding long-term care needs. The significant regions currently affected by this phenomenon are the developed countries in Europe, The US, Japan, and The UK (Ariaans et al., 2021). However, it is bound to happen to developing and underdeveloped countries sooner or later. The other reasons developed countries face this issue are less fertility rate, population growth, and limited support or care by family members. However, the social welfare states have a solid system to take care of the elderly in these states as an advantage, while developing and underdeveloped countries lack this mechanism completely (Fang et al., 2020).

Consequently, the growing need for long-term care is not a good sign for middle-lower income countries as it demands more resource allocation. On the other hand, the lack of evidence about LTC's demand increase, adequate measures, proper understanding and financial burden is another challenge to arranging or estimating finances (Matsuda et al., 2013). Subsequently, after recognizing the need for LTC and estimating the finances, there is a requirement for global guidance, feasible reforms and funds allocation according to the availability of financial condition of the countries (Saunders et al., 2023). Due to massive diversification in the economies, it is impossible to roll out a unanimous or standard approach to addressing long-term care worldwide. Therefore, it requires country and context-specific approaches to design interventions, policy changes and selection of care services. The care services and support category may vary depending on the family members' commitment level, affordability, and local social norms and practices (Miyawaki et al., 2020). An equity-based approach helps grow economies and manage their financial constraints accordingly. The growing economies cannot afford to allocate a significant chunk and therefore require tailored mechanisms to keep their GDP efficiently functional (Salinas-Rodriguez et al., 2019).

Long-term care spending against the share of GDP will increase twice by 2050 due to the paradigm shift from informal care to adequate formal care, which will demand a significant allocation of funds to cater for the population (Asaria et al., 2023). The European Union (EU) has estimated an increase from 1.6% to

2.2% of GDP by 2040 and a further increase to 2.5 by 2050. Similarly, the Australian government spent 0.9% of its GDP on aged care services in 2014-15, and according to estimations will increase to 1.7% by 2055 (Jakovljevic et al., 2019). The significant increase in the share of GDP will certainly require public interventions in the future. However, it is necessary to understand the global context of long-term care and its needs.

Global Evolution of Long-Term Care in Health Systems and Demand for Public Interventions

With a common understanding, it was obvious to look after the older people of families at home, and therefore, long-term care was not taken as a part of the healthcare system in the 20th century. However, changes in the social care system, family commitments, and gender roles in the last few decades have generated a global gap between needs and demands (Dyer et al., 2020). The supply and demand gap was the leading cause of reconsidering the public health sector to mitigate the additional financial burden on the aged population and provide safe and easy access to healthcare services (Matsuda et al., 2013). The safe and easy access included affordability through safety nets, services readily available to address unmet needs, and the population (older, disabled people and their family members) being aware of the interventions (Korfhage, 2019). However, affordability of the care services was the main focus of the interventions due to the high risk of bankruptcy among older adults as a general experience (Bonnet et al., 2019).

One of the underlining factors of increased demand is the change in gender dynamics. The gender dynamics here refer to women's empowerment by including them in the mainstream. Previously women were the primary caretaker of older people in households and were expected to provide informal care. However, eliminating gender inequalities being the primary focus, the nations did not consider the forming gap in long-term care (Kiely et al., 2019). At the same time, other indirect reasons for the long-term reforms and public interventions are low productivity by the employees having long-term care patients at home and overutilization of the healthcare system by the older population like occupying hospital beds (Bottery et al., 2019).

Considering the above developments and changes in society and the needs of the specific population, either older or disabled, there was a strong need to take action to overcome the challenge. In 1968, the Netherlands became the first to introduce social protection for a long-term care system. Followed by Israel (1988), Austria (1993), Germany (1995), Luxembourg (1999), Japan (2000), Scotland (2002), and Spain (2007). However, Germany reformed it in 2008, Japan in 2006, Spain in 2012, and the Netherlands in 2015 (Alders and Schut, 2019).

The social protection long-term care systems and reforms were not identical due to the diversification discussed earlier. Each country assessed their own needs, availability of resources, cultures, economic development and population pyramid (Ikegami, 2019). However, the changing needs of the population are vital to monitor. Therefore, each country has a surveillance system that assesses the changing requirements and access to social protection coverage for long-term care. These assessments mainly focus on the existence and severity of hardships with Activities of Daily Living (ADLs)/Instrumental Activities of Daily Living (IADLs), cognitive and other shortcomings (Jeong et al., 2020).

Among the Organization for Economic Cooperation and Development (OECD) member countries, Japan, Italy and Spain have the highest number of older populations due to high life expectancy, low fertility rates and improved technology in the healthcare sector. Korea might overtake Italy in 2036 due to its fastest incremental rate (3.3%) in the ageing population (Fang et al., 2020). Similarly, low- and middle-income countries face identical challenges where fertility rates are reducing and life expectancy is increasing. India, China, Thailand, South Africa and other developing economies have a larger bar of older populations in their population pyramid (Banerjee et al., 2021). According to the United Nations, the older population (65 or older) will increase by 2.1 times in the next 30 years. Most of the older population will live in Eastern and Southern Asian Countries like China and India. The estimated older population (800+ million people) living in these two countries will be more than 50% of the world's population (1.5 billion older people) in 2050 (Roig and Maruichi, 2023). The increase in demand in China, India and other developing countries poses an immense challenge for them due to their poor infrastructure, lack of social protection systems, and poor healthcare facilities.

In line with the above, it is necessary to understand a need and advocate for allocating resources to tackle the anticipated financial, physical, and informational needs is necessary—especially the financial needs where significant structural clarifications like determination of support modality (in cash or in-kind), funding sources, funding allocation, payment procedures, and payment tracking will be needed. Similarly, Selecting services, care types, and information management will play a vital role in recording the changing needs.

Apart from the considerations mentioned above, it is also necessary to look into the households' income and literacy, especially in developing countries like India and China and the rest of the world (Mei et al., 2023). These two variables are vital in accessing the LTC and mitigating the "Mathew Effect."

European Context of Long-Term Care

Like the global context, the European Commission (2020) defines long-term care as the service and assistance available for the population dependent on performing their routine and necessary activities due to mental and physical disability over a prolonged time (Organization, 2022).

According to the OECD, the public protection systems in high-income countries have a 60% cost coverage for long-term care. Again it depends on the country's resource allocation and homogenous needs. However, paying for LTC services is a known financial burden to households and a significant concern even in European countries (Hashiguchi and Llena-Nozal, 2020). Indeed, the European Pillar of Social Rights under principle 18 articulates the right to access affordable and quality long-term care services, specifically home and community-based care but 75% of the older inhabitants of the European Union (EU) paying for any long-term care service (LTC), either low, moderate or severe, from their household income can lead them below the poverty line (Grabowski, 2021).

To overcome this, Europe has played a vital role in recognizing and developing a social protection long-term care system, as the Netherlands introduced in 1968. By 2015 Only Japan and Israel were the non-European countries who reformed it along with numerous European countries like Germany, Austria, Spain, Scotland and Luxembourg (Alders and Schut, 2019).

As mentioned earlier, the European Union (EU) has estimated an increase from 1.6% to 2.2% of GDP by 2040 and a further increase to 2.5 by 2050. Moreover, a study conducted in 2019 revealed that 47.2% of the Europeans aged 65 or over were unsatisfied due to their unmet needs for personal care and day-to-day activities (Grabowski, 2021).

Similarly, England has experienced an increase in the older age population who has demonstrated independent living, and at the same time, there is an increase in a population who require continuous support. The proportion of older people living with no ADL limitation increased from 68% to 75% from 2006 to 2018 (12 years). Similarly, individuals with conditions (two or more) also increased from 30% to 38% in 09 years from 2006 to 2015 (Powell, 2022).

Currently, Europe, Italy and Spain have the highest number of older people with low fertility rates and high life expectancy due to improved healthcare systems and technological advancement (Jakovljevic et al., 2019). However, even in Europe, informal care caters to more people requiring long-term care. The European Commission 2021 stated that 12-18% EU population is receiving informal care (at least once per week) (Roig and Maruichi, 2023). The same report links the prevalence of informal care to household

income as the most crucial variable to substitute between the services (Ikegami, 2019). The traditional informal care providers used to leave their jobs to provide informal care to a close family member.

On the contrary, informal Care in Europe is declining due to a preference for employment by traditional caregivers at home and shifting family members to proper formal care. The shifting scenario burdens most countries' healthcare systems (Dyer et al., 2020). However, over 30% of European households still cannot afford proper care, despite multiple members working (Kiely et al., 2019).

As discussed earlier, European countries like the Netherlands, Germany, and Austria were among the pioneering countries to acknowledge the need for long-term care and introduced interventions and later reforms. Mandatory LTC insurance is one of the salient features in tackling the LTC needs in European countries. However, despite the availability and affordability of formal care, the services are less subsidized due to late identification of the need and need further exploration for understanding and adequate support (Korfhage, 2019).

Long-Term Care in Norway

In line with the literature review, Norway is among the high-income countries with a growing ageing population, a specially-abled population, and chronic and long-term diseases (Deraas et al., 2011). According to the European Commission 2021, Norway, with a population of 5.3 million, has 40,493 beds for long-term care, which is significantly higher for a small population than other European countries. Similarly, the population above 65 years was 15% and expected to increase (Deraas et al., 2011). Additionally, the population using 24-hour care services (institutional or home-based) is expected to be doubled in the next three decades, and simultaneously, a decrease in the residents taking care of them (Lowndes et al., 2021). Long-term care facilities (LTCFs) require optimum and competent care with specialized healthcare providers, and with the increase in demand for LTC, unlicensed or unqualified persons have started providing direct patient care (Mcarthur et al., 2013).

Norway lacks national guidelines for staffing at nursing homes for LTC. Therefore, the allotment of nurses to patients is inconsistent and entirely varies on the availability of licenced and non-licensed staff. The ratio of unlicensed staff increases to 47.6% to care for patients seeking long-term care, while it remains around 29.6% on weekdays (Kjos et al., 2008).

However, the approach may be sufficient to cater to the short-term need, but taking care of older patients or people with disabilities requires interaction between patients, providers and organizations. In line with the above, Norway also lacks regional and national systems to report LTC clinical outcomes, whereas

municipalities only report annually on costing, production, staff availability, and structural data in the national database (Gravningen et al., 2022). The recent paradigm shift towards LTCFs from informal care may lead to a shortage of health personnel in future and potentially threaten a sustainable healthcare system (Lowndes et al., 2021).

Currently, the long-term care system in all the municipalities of Norway is under the publically funded healthcare system, with services available on a copayment basis depending upon the needed care. The LTCFs operated by nurses are the municipal LTC's gatekeepers; these facilities and nurses refer the patients for services (Eika et al., 2014). On the contrary, as stated by OECD, Norwegian municipal LTC is inadequate in providing optimum services to patients and often refers non-acute cases to general hospitals, increasing the cost for acute and chronic diseases (Lowndes et al., 2021). However, this minor hospitalization can also benefit the early detection of health conditions and needs, ultimately leading to improved monitoring and treatment. These admissions can go both ways, but it seems they are an additional burden to general hospitals (Deraas et al., 2011).

Additionally, LTC services at Norway's municipal level vary because of socio-economical and demographical reasons but ultimately cater to long-term care patients with comparable medical and functional needs. Therefore, it is hard to assess the differences in quality of care or any systematic differential (Kjos et al., 2008). However, in the variations of the services, setting a procedure to monitor the progress and quality of care is evident. Therefore, the Norwegian Institute of Public Health manages national surveillance for healthcare-associated infections (HAI). Hospitals and LTCFs are bound to conduct a point prevalence survey twice a month to create baseline values over time and measure the control and regulations (Gravningen et al., 2022).

Such surveys contribute significantly to the evidence and setting trends over time. Consequently, they are essential but not sufficient. Therefore, innovative and comprehensive approaches are needed to fill the informational and evidence gap. The new evidence allows policymakers to make informed decisions and allocate or divert resources accordingly.

Need for Research in Norway

In line with the above findings, it is evident that dealing with LTC is crucial, challenging and changing over time (Gjesdal et al., 2018). Therefore, it is vital to fill the evidence gap due to several factors. One of the primary reasons to generate more evidence is to have an informed decision due increase in the ageing population, disabilities among the inhabitants, the presence of topographical barriers like fjords,

hills/mountains, and disconnected road networks and the financial burden on the healthcare system (Kjos et al., 2008).

Norway has taken significant steps to provide services for LTCs in the last few decades. However, Norway could not develop standard national guidelines for LTCs staff, monitoring care, reporting the data and mechanisms to record improvement over time (Sperre Saunes et al., 2020). Furthermore, Norway lacks evidence regarding long-term care due to limited research conducted in the past. Public healthcare institutes have recently recognized the importance of generating evidence to fill the gap, as the LTC packages vary in municipalities, although the functionality and services remain the same (Ramirez Lizardi, 2022).

Research must cater to the availability, accessibility, affordability, and utilization of the services. As discussed earlier, the country has a system to serve long-term care. However, the usage in the future is not determined. Therefore, the central area of research is the changing needs in the future, financial obligations and funds allocation. Subsequently, estimating the number of users for the next two to three decades is essential before analyzing costs, financial constraints and allocations.

Focusing on utilizing LTC components and reviewing the available articles and information, the study found an immense gap in determining the number of users, especially 80 or more years older people in Norway. The reviewed studies focused on the 65+ years of population and hardly targeted the oldest population, in this case, 80+ years, creating room to research more. The initial step is to identify the usage of the services, and then, it can be expanded to cost estimations, accessibility in different municipalities, funds allocation, and copayment systems.

The identified areas to fill the evidence gap in this study are determining the change in the number of users utilizing 24-hour care services (home and institutional) in all the municipalities of Norway. Determining the number of users in this category will enable future research to estimate the cost and make necessary recommendations to decision-makers for an informed approach.

As an output of this literature review, apart from cost, finances, affordability and accessibility, education and household income significantly reduce the "Mathew Effect[2]" from the system. Therefore, it is necessary to examine these two variables with the change in users in all municipalities and to understand the correlations between them.

[2] Matthew Effect: In long-term care refers to the user's level of information and knowledge to utilise the available services. The lesser information about the services leads to less utilization

The theoretical framework drawn below is a guiding principle for this study and has been taken to make it a holistic review and recommend evidence-based policies.

Theoretical Foundation/Map

The following theoretical foundation is the primary framework or map for this study. The objectives, processes and methodologies are the results of the literature review conducted. This study attempts to fill the evidence gap in utilizing 24-hour care services by identifying the estimated number of users aged 80 or older and analyzing the difference among municipalities. The theoretical map also includes essential variables to explain the model holistically and enable the environment to generate more evidence to fill the gaps.

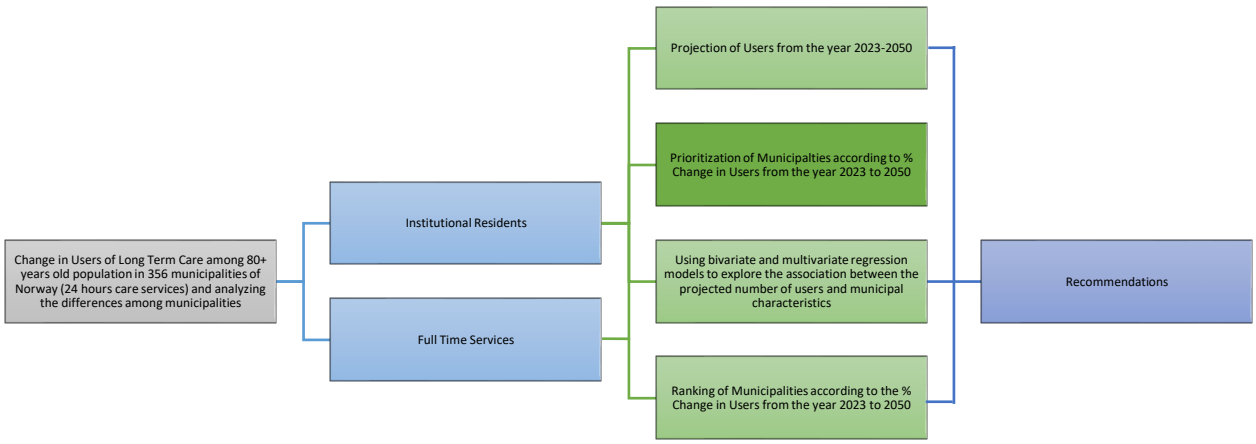

Figure 1: Theoretical Map/Foundation

Chapter 3: Research Methodology

The study aims to generate evidence regarding 24-hour long-term care among 80 years old and above by predicting the change in the number of users at institutional and home-based levels. Chapter 3 describes the methodology to answer the research question and fulfil the study's objectives. It also articulates the decisions based on the available data, restrictions, and analysis limitations. It includes data inclusion and exclusion criteria and the weightage of using a particular approach on other scientific methods.

Research Intent and Approach

As articulated above, the study intends to explore the change in users above 80 years old and above seeking long-term care in all 356 municipalities of Norway. The study uses publicly available data from Statistics Norway and creates functions to predict the number of users, changes in users and regression on important variables discussed in this section. The study fills the evidence gap by estimating the number of users (80+ years) due to the lack of research in this area and analysing the differences among municipalities. Most studies reviewed to build this opinion only target 65+ years of the population and hardly focus 80 years old population and above. One of the primary reasons could be the size of the population in the past, but due to the ageing population, it is vital to estimate the specific age group to measure the burden on the municipal LTC.

Furthermore, the study expands its scope and includes important variables like education and income, as identified through a comprehensive literature review. The rationale for including these two variables is to explore the correlation between the usage of the services and propose policy recommendations to mitigate the "Mathew Effect".

Specific objectives further support the main research question mentioned below to define the exact approach and intent of the research.

Research Question: What is the change in the number of 80+ Years Old Users Using 24-hour Long-Term Care (Institutional Residents and Full-Time Services) in all 356 municipalities of Norway in the next 27 years (2023-2050)?

Objectives:

- Estimation of the change in long-term care users (absolute and in percentage) aged 80 years or above
- Prioritization of the municipalities according to the % change in users from the year 2023-2050 – Ranking of the municipalities according to the % change in users in LTC
- Using bivariate and multivariate regression models to explore the association between the projected number of users and municipal characteristics
- Exploring the geographical shift and its probable reasons
- Proposing policy recommendations based on evidence generated
- Identifying stepping stones for further evidence generation

The study solely uses publicly available data on the Statistics Norway[3] website by modifying searches and generating numerous tables. The information from the website is accessible to everyone, and all the tables generated and modified are appropriately referenced. All the changes made to the tables to achieve the study objectives are comprehensively explained, and functions are thoroughly discussed in their respective sections.

The study investigates the available historical data to generate a trend and identify the endogenous and exogenous variables that can affect the investigation. Similarly, for forecasting, the study formulates functions with predicted figures by Statistics Norway according to healthcare usage and, in this case, 24-hour LTC services at institutions and homes.

Forecasting is a complex job and requires different information sources. As the study uses publically available data, it skips the disaggregation of diseases and specific costs related to the services due to time and resource constraints. Therefore, the study provides the scope of costing with adequate resources and sets a ground for further research but does not estimate costs for the municipalities and cannot estimate funds allocation.

The study utilizes secondary quantitative data to do a regression analysis and identifies the correlation between household income, primary education, and centrality index with the % change in the number of users.

Sampling Frame

The study focuses on all 356 municipalities of Norway and measures the data from 2023 to 2050. The Norwegian government changed its administrative units in 2020 and reduced the number of municipalities from 728 to 356 by merging them (Higdem et al., 2020).

Selection of Attributes/Variables

In line with the central question and specific objectives, this study identifies the following main variables and creates more variables as a function of the identified ones. The table below contains a few main variables' names and descriptions, which are essential to recognize and understand the results.

Table 4: List of all main variables

Main Variables	Description
Municipalities	The variable contains the Name of the 356 municipalities of Norway

[3] https://www.ssb.no/en/statbank/list/folkemengde

M_Pop_2023	The variable represents the actual population of the municipalities in the year 2023
M_Pop_23_80	The population of 80+ years older people in the municipalities
IR_80	Number of users 80+ years old using LTC as the institutional resident
Res_D_FTS_80	Resident Dwelling full-time users
Year_MA_80+	The projected population of 80+ years old people in the "year." The projection is from the year 2023 to 2050. E.g. the variable Name for the projected population in the year 2050 is 2050_MA_80+. MA in this variable stands for the "main alternative".
Year_SA_80+	The projected population of 80+ years old people in the "year." The projection is from the year 2023 to 2050. E.g. the variable Name for the projected population in the year 2050 is 2050_SA_80+. SA in this variable stands for "strong ageing".
Year_MA_80+	The projected population of 80+ years old people in the "year." The projection is from the year 2023 to 2050. E.g. the variable Name for the projected population in the year 2050 is 2050_WA_80+. WA in this variable stands for "weak ageing".
Prop_23_IR_80	The variable is the function of Institutional Resident (IR) users and the whole 80+ years old population in the municipalities. The respective section contains the formula and further details.
Prop_23_FTS_80	The variable is the function of Resident Dwellings – Full Time Services (FTS) users and the whole 80+ years old population in the municipalities. The respective section contains the formula and further details.
Proj_year_service_80_MA	The variable is the percentage product of the proportion of service users and the population of 80+ years old people in the specific "year." The projection is from the year 2024 to 2050. E.g. the variable Name for the projected population in the year 2050 is 2050_MA_80+. MA in this variable stands for "Main Alternative", SA for "Strong Ageing", and WA for "Weak Ageing." The respective sections contain the formula and further details.

Avg_Inc	The variable contains information about the average household income before tax. The database has a variable of income after tax, but not utilized for this analysis.
Edu_Sch	The variable has information about the number of users having primary schooling. The specific section below explains the rationale behind the selection of the variable.
Muncp_CI	CI is a categorical variable. The municipalities have their centrality index, according to Statistics Norway. The study uses the same criteria explained by SSB, and the respective section contains a comprehensive explanation.
CIUIR_MA	The variable is the difference and proportion of IR users from 2023 to 2050. It contains the percentage change in users in 27 years. MA in this variable stands for "Main Alternative", SA for "Strong Ageing", and WA for "Weak Ageing." The respective sections contain the formula and further details.
CIUFTS_MA	The variable is the difference and proportion of FTS users from 2023 to 2050. It contains the percentage change in users in 27 years. MA in this variable stands for "Main Alternative", SA for "Strong Ageing", and WA for "Weak Ageing." The respective sections contain the formula and further details.
rankIR	This categorical variable groups the municipalities having a specific %change in IR users over time. The respective sections articulate the criteria and explain them in detail.
rankFTS	This categorical variable groups the municipalities having a specific %change in FTS users over time. The respective sections articulate the criteria and explain them in detail.

The study deals with more than 200 variables and does not utilize all the variables listed due to dropping the services, which could result in duplication counting and focusing only on 24-hour care services. However, it provides the possibility to expand the utility of the study and provides liberty and flexibility to try different analyses and correlate the results.

Population Data and Projection

The study categorizes the population data into current and projected populations. In catering to the uncertainty in the population growth in the next 27 years, the study examines three alternatives to keep the results precise and accurate. The three alternatives are Main Alternative, Strong Ageing, and Weak Ageing[4].

"Main Alternative": is the output of the current growth rate and projects the population with the current scenario without considering any other factor

"Strong Ageing" deals with population growth at a higher rate for any reason.

"Weak Ageing": considers slower growth rate for any reason.

The study acquires predicted population figures for three categories (main, strong, and weak) from the Statistics Norway website. The future number of 24-hour LTC services users is found by multiplying the future number of residents 80 years older by today's proportion of 80 years old receiving 24-hour LTC. Today's proportion is equal to the number of users 80 years and older receiving 24-hour LTC divided by the number of residents 80 years and older. Hence, with an assumption of the share of 80 years old receiving 24-hour LTC does not change over the projection period (2022-2050). However, for 24-hour care service, the estimated figures from institutional residents (IR) and full-time services-resident dwellings (FTS-RD) are added to generate a trend analysis.

Generally, the predicted population for weak ageing would be lower than the main and strong ageing population. At the same time, strong ageing will reflect the maximum estimated number of users in the future. The study applies the same criteria for all the services examined.

Ranking Municipality

The ranking of municipalities attempts to create numerous groups of locations with similar growth rates and then explain and present them logically instead of putting all 356 areas in one graph or chart. The criteria are set manually with a difference of 25% change in projected users of each service. Then, combine all the municipalities within the range and plot them on a chart and in a table in a few instances to explain it adequately. The following table describes the criteria:

Table 5: Ranking Criteria

Rank	Criteria
1	>250%

[4] https://www.ssb.no/en/statbank/table/13599/

2	<250% ≥ 225%
3	<225% ≥ 200%
4	<200% ≥ 175%
5	<175% ≥ 150%
6	<150% ≥ 125%
7	<125% ≥ 100%
8	<100% ≥ 75%
9	<75% ≥ 50%
10	≤ 50%

Centrality Index

The definition of the centrality index is an adaption of a similar explanation provided by Statistics Norway (SSB.no = Statistisk Sentralbyrå Norway) under the standard of centrality. Each municipality is marked with a value individually, and each value is based on the distance of the respective municipality from an urban area and the size of the urban area. The index classification is divided into 06 (six categories), 01 (one) being the most urban, populated and more prominent in size and 06 being the farthest, rural and less populated (Pahlavanyali et al., 2022).

Table 6: Centrality Index Criteria

Centrality Index	Criteria
1	Centrality (925-1000)
2	Centrality (870-924)
3	Centrality (725-869)
4	Centrality (670-774)
5	Centrality (565-669)
6	Centrality (0-564)

The criteria are preset and have been taken the same way. The same index is used to categorize all 356 municipalities of Norway.

Income at Household Level

As the study identifies in the literature review the importance of household income for the affordability of long-term services, it is essential to examine the correlation of this variable in Norway as well. Therefore, the study aims to regress the average household income in Norwegian Kroners on user changes in the next 27 years to find the significance of availing the services. The database contains both average household income before and after tax. However, the analysis uses before-tax income.

Primary Schooling at Municipality Level

The "Mathew Effect" explains the relevance of education in availing the LTC services. It explains that the country's ill or less literate population are at higher risk of not knowing the availability and affordability of the services and therefore remain deprived of them despite having access. Therefore, the study includes the number of users with at least primary education and further regresses the change in users for specific services to calculate the significance. The study includes the lowest education level, "primary" in this case, as having some literacy to understand the availability and utilization of the LTC services.

Data Acquisition and Cleaning

The study acquires data from the publicly available source "SSB.no" by filtering, combining different variables, and trying different pivots. The data has less scope for cleaning, yet some differences in the spelling of municipalities can lead to miscalculations and errors. The data was sorted and standardized by correcting the spelling and arranging data for their respective municipalities.

Data Analysis

The study uses two statistical software, "Ms Excel" and "Stata 17.0", to create, manage and analyze the data. Ms Excel collects, compiles, cleans, and arranges data. While Stata is used to conduct the analysis, generate variables, categorize, formulate and run regressions. The graphs and charts are developed in both the software according to convenience.

Limitations

In line with the set objectives, the study has no challenging limitations. Ultimately, the study caters to broader objectives like costing, municipalities' financial obligations, and funds allocation. Considering the broader scope, one of the primary limitations of this study could be the time constraint to explore the cost of the services according to the change in the number of users in the next 27 years. While accessing the personalized data to categorize diseases and disabilities in LTC could be the second limitation. However, these two expectations can expand the scope of the study beyond its current objectives.

Ethical Considerations

The study poses no ethical risk by using publically available data without the user's personal information and human interaction. The study methodology does not include primary data collection; therefore, it is established that it will not harm anyone.

Chapter 4: Results/Findings

The chapter displays the new evidence and findings after the data analysis. The chapter includes a presentable form of the results concisely and concretely. The chapter also demonstrates the approaches

used to extract the results and shape the findings to meet the objectives and answer the research question.

Overview of all the Municipalities

The study includes all 356 municipalities of Norway to examine the change in 80+ years old users primarily utilizing long-term care services 24 hours at home or an institution. One of the significant outputs of the analysis is to categorize all the municipalities according to the change in users (ranking), centrality index (CI) over the change in users, the effect of average household income and primary education on change in users, and ultimately grouping them to see the users geographical shift in next the 27 years (2323-2050).

All 356 municipalities are indexed with its centrality index, as shown in the table below.

Table 7: Tabulation of Municipalities according to CI

Centrality Index	Frequency
1	6
2	19
3	51
4	71
5	96
6	113

Municipalities with CI = 1 refer here closer to the centre or the shortest distance to the urban area, health facilities, better transportation and easy access to other facilities. With the increase in the CI, the distance increases and access to facilities decreases. SSB Norway has developed this index and categorized it. The study uses the same adaptation to group the municipalities. The above table shows that overall CI = 1 has 12 municipalities, 2 has 6, 6 has 70 and so on. The classification will remain the same throughout the study. However, the ranking will change with the % change in users.

Table 8: Descriptive Statistics of 356 Municipalities in Norway

Variable	Obs	Mean	Std. Dev.	Min	Max
Average Income	356	692561.8	72448.595	516500	919500
Average Income After Tax	356	550633.43	48970.943	415500	689000
Average Households	356	6975.739	21785.844	90	350073
Primary Education	356	3028.744	7410.232	44.5	111049
Education Percentage	356	23.235	6.199	3.398	76.692

The average income before tax of the municipalities is 692561.8 NOK/year, 550633.43 NOK/year after tax. The average number of municipal households is 6796, ranging from 90 to 350073, which is expansive and

vital in estimating future users for different services. Similarly, as established above, primary education is a salient variable to assess the "Mathew Effect", and the population of 3029 persons in a municipality have basic studies. The average percentage of only primary education is 23.26%, with a minimum and maximum range of 3.4% and 76.7%.

However, the targeted population for this study is people 80 years and older. Therefore, it is necessary to know the current status before exploring the specific services. The average percentage of 80 years and older population in the municipalities is 5.75%, ranging from 2.7% to 10.5%. As a general observation, the assumption is that a larger older population means higher LTC utilization.

Table 9: Population Percentage of 80 years and older

Variable	Obs	Mean	Std. Dev.	Min	Max
80years+ Population	356	5.749	1.465	2.674	10.477

Further analysis in this study includes the outputs of 24-hour services, i.e. services at the institution and home, and then the analysis of services individually.

Analysis Explanation

The multivariate regression analysis on the change of long-term care users aged 80 years or older in absolute number as a dependent variable on the average income in NOK, primary education and centrality index explores the associations.

It explains user change based on the centrality index and the significance of average income and primary education. The analysis section focuses on the main alternative of three services; 24-hour services, institutional residents and resident dwellings full-time services.

First, the analysis uses absolute numbers (the difference between projected users of 2050 and current year's users of 2023), then uses different methods (percentages, ratios) to show the differences among municipalities and triangulate the findings.

24-Hours Care Services – Absolute Numbers[4]

The section defines 24-hour service as a combination of services in institutions and at home for the 80-year-old and older population. The section adds the number of users of Institutional Residents and Resident Dwellings (Full Time Users).

The study uses the following variables and functions to calculate the numbers:

Table 10: 24 Hours Service Calculation - Number of Users

Variable Name	Function	Explanation
hrs24_service_80 =	IR_80 + Res_D_FTS	The variable combines the number of users for both the services

The calculated number of users in "hrs24_service_80" is used to determine the proportion of the service over municipalities' population of 80 years and older and then further find the absolute numbers of predicted users.

The analysis for categorization of CI below indicates that the municipalities far from CI-1 will experience positive change in users, while the CI-2 and 3 will have a negative change. The findings indicate that municipalities far from urban areas or major cities will have increased utilization of 24-hour care services by 2050.

Table 11: Multivariate Regression of 24-Hours Care Services

HRS24_80_AU	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Avg_Inc	0.000247	0.00095	2.60	0.01	0.0000605	0.0004342	***
Edu_Sch	0.081377	0.00104	78.46	0.00	0.0793373	0.0834173	***
: base 1	0	.	.	.	.	.	
2	-14.467	55.397	-0.26	0.794	-123.427	94.492	
3	-70.503	54.975	-1.28	0.201	-178.632	37.626	
4	4.804	56.309	0.09	0.932	-105.95	115.558	
5	3.596	57.175	0.06	0.950	-108.86	116.052	
6	15.089	58.191	0.26	0.796	-99.365	129.543	
Constant	-171.744	97.834	-1.76	0.080	-364.172	20.684	*

Mean dependent var	243.761	SD dependent var	612.332
R-squared	0.967	Number of obs	352
F-test	1428.653	Prob > F	0.000
Akaike crit. (AIC)	4333.634	Bayesian crit. (BIC)	4364.543

**** p<.01, ** p<.05, * p<.1*

The above findings highlight further examining the need for resource requirements in line with the changing needs for long-term care services.

Institutional Residents – Absolute Numbers

The analysis for categorization of CI below indicates that the municipalities far from CI-1 will experience a positive change of up to 98 users. The findings indicate that municipalities far from urban areas or major cities will have increased utilization of IR care services by 2050.

Table 12: Regression Analysis of Institutional Residents (IR) - Absolute Numbers

IR_80_AU	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Avg_Inc	0.0002005	0.0000806	2.49	0.013	0.0000421	0.000359	**

Edu_Sch	0.0699608	0.0008786	79.62	0.000	0.0682326	0.071689	***
: base 1	0	.	.	.	.	.	
2	63.843	46.927	1.36	0.175	-28.46	156.145	
3	-4.554	46.571	-0.10	0.922	-96.155	87.047	
4	51.307	47.702	1.08	0.283	-42.52	145.135	
5	83.085	48.446	1.72	0.087	-12.205	178.376	*
6	98.713	49.293	2.00	0.046	1.757	195.668	**
Constant	-233.9	82.931	-2.82	0.005	-397.019	-70.781	***

Mean dependent var	186.067	SD dependent var	521.522
R-squared	0.967	Number of obs	350
F-test	1436.547	Prob > F	0.000
Akaike crit. (AIC)	4192.892	Bayesian crit. (BIC)	4223.756

**** p<.01, ** p<.05, * p<.1*

The above findings highlight further examining the need for resource requirements in line with the changing needs for long-term care services. The above findings align with the results of IR care services.

Full-Time Service Resident Dwellings – Absolute Numbers

The analysis for categorization of CI below indicates that all the municipalities will experience a negative change. The findings indicate a user shift from home-based care to institutional care and further emphasise the resource allocation assessment.

Table 13: Regression Analysis FTS RD - Absolute Numbers

FTS_80_AU	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Avg_Inc	0.0000411	0.0000636	0.65	0.519	-0.0000843	0.0001664	
Edu_Sch	0.0110334	0.0005882	18.76	0.000	0.0098747	0.0121921	***
: base 1	0	.	.	.	.	.	
2	-72.742	31.363	-2.32	.021	-134.522	-10.962	**
3	-69.039	31.081	-2.22	.027	-130.264	-7.814	**
4	-34.719	32.038	-1.08	.28	-97.829	28.391	
5	-79.298	32.679	-2.43	.016	-143.671	-14.925	**
6	-83.734	33.605	-2.49	.013	-149.932	-17.537	**
Constant	77.566	62.267	1.25	.214	-45.091	200.222	

Mean dependent var	83.054	SD dependent var	121.078
R-squared	0.737	Number of obs	249
F-test	96.435	Prob > F	0.000
Akaike crit. (AIC)	2777.773	Bayesian crit. (BIC)	2805.912

**** p<.01, ** p<.05, * p<.1*

Supporting Analysis

The above analysis highlights the association between variables, especially with the centrality index for institutional care. The study uses different methods to understand the findings further and analyse the differences among the municipalities. The supporting analysis includes percentage change in users, ratios,

and categorization of municipalities in different scenarios and alternatives. The study uses predicted numbers from Statistics Norway. Therefore, the percentage change or proportion among different services remains the same but varies over time.

The change in users for all three (03) categories uses the same proportion and growth in population for identification. Therefore, the percentage increase in all services remains the same. To further explain the situation, the growth in Main Alternative in 24-Hour care will always be equal to the Main Alternative of Full-Time Service Resident Dwellings (RD) and Institutional Residents (IR) due to the same % growth in the population.

However, explaining the identical alternative will produce the same output regardless of the service change. The study analyzes one category for each service. 24-Hour care focuses on Main Alternative, IR is on Strong Ageing, and RD is on Weak Ageing to avoid similar results and duplication. Dissemination of the categories in the services provides a holistic view of the change of users in all three alternatives.

Furthermore, the income and household explanation remain the same for each section to provide the maximum information to the reader if anyone is interested in a particular section.

24 Hours Services (Institution Residents and Full Time Services) – Main Alternative

The section defines 24-hour service as a combination of services in institutions and at home for 80 years and older population. The section adds the number of users of Institutional Residents and Resident Dwellings (Full Time Users).

The study uses the following variables and functions to calculate the numbers:

Table 14: 24 Hours Service Calculation - Number of Users

Variable Name	Function	Explanation
hrs24_service_80 =	IR_80 + Res_D_FTS	The variable combines the number of users for both the services

The calculated number of users in "hrs24_service_80" is used to determine the proportion of the service over municipalities' population of 80 years and older. Then the proportion is multiplied by the projected population of each year extracted from SSB.no with three main alternatives: Main, Strong Ageing and Weak Ageing.

The analysis generates three variables for each year "proj_year_24HRS_80_MA", "proj_year_24HRS_80_SA", and "proj_year_24HRS_80_WA" in total, having 85 variables for this section excluding standard variables.

Projection of Population from 2023-2050 with three alternatives - Main Alternative, Strong Ageing, and Weak Ageing

The study's first objective is to use projected population data and predict the number of users for the different services. This section explains the procedure for estimating the percentage change in users for each municipality. This part of the study demonstrates the change in the number of users 80 years and older using 24-hour care services. The service combines both home and institutional-based users and predicts the change.

The predicted population provides two other alternatives along with Main Alternative: Weak and Strong ageing.

Table 15: Variable Description and Calculation Function - Change in Users' 24-Hour Care

Variable Name	Function	Explanation
CIU24HRS_MA =	((proj_50_24HRS_80_MA - proj_23_24HRS_80_MA) / proj_23_24HRS_80_MA)*100	The variable calculates the percentage change in users by taking the difference between the years 2050 and 2023, dividing it by the population of 2023, and multiplying it by 100 to make it in percentage.

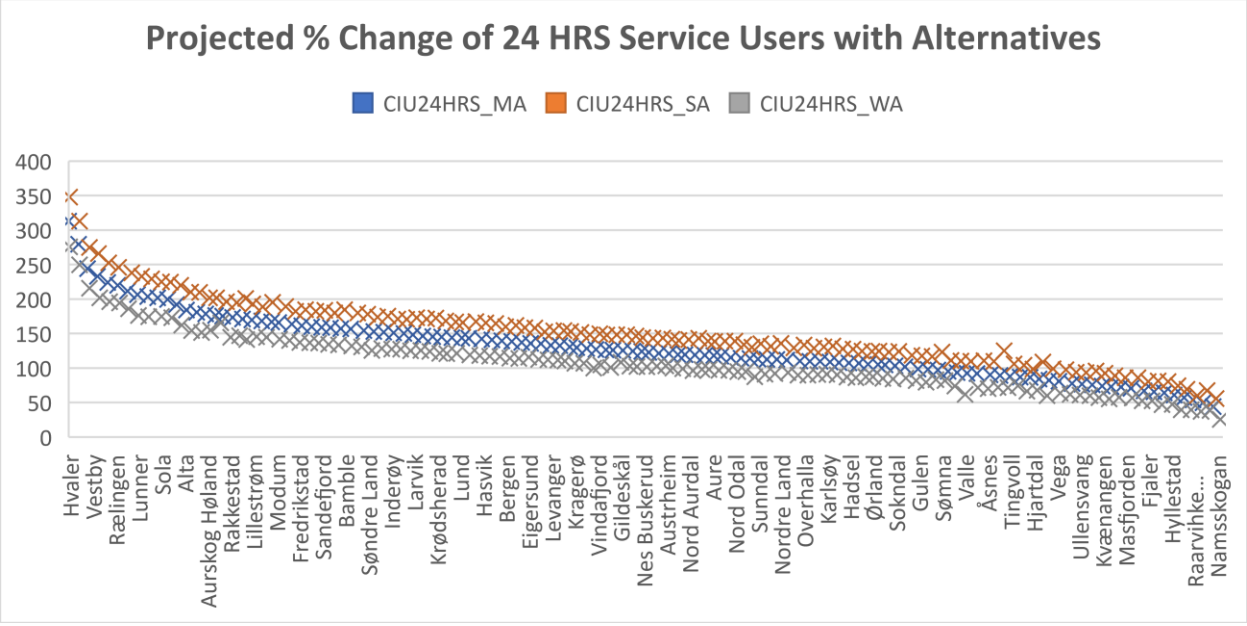

Figure 2: Projected % Change of Users - 24 HRs Care Services in all municipalities

The chart demonstrates the municipalities with an enormous percentage change in users at first and moves towards the lowest change in percentage. From the above figure, it is prominent that Havaler has

the maximum % change in users, 312.6% (MA), followed by Gjesdal at 295.1% and Nannestad at 286.3%. At the same time, the lowest noticeable % change in users is in Beiarn, 40.54%. In addition, 04 municipalities were dropped due to a meagre percentage (5%) change in users.

Table 16: Summary of Change in Users' 24-Hour Care

Variable	Obs	Mean	Std. Dev.	Min	Max
CIU24HRS MA	352	129.236	46.095	40.541	312.658

The mean percentage change in 24-hour users is 129.27%, with an SD of 46.095.

However, the above graph is hard to use due to Norway's higher number of municipalities (356). Therefore, due to necessity, the study develops a ranking system to categorize the municipalities, group them and explain the change understandably.

Prioritization of Municipalities according to the % change in Users from the year 2023-2050

Following the criteria developed in Chapter 3, the municipalities, after calculating the percentage change in users, were ranked from 1 to 10. Rank 1 means 250% or enormous change, and rank 10 means less than 50%. The same ranking will help prioritize the municipalities to select the ones needing more consideration in the future than the least considerable ones.

Ranking of Municipalities according to the % change in Users from the year 2023-2050

24-hour care services users are grouped according to their ranks and have the following status:

Table 17: Frequency Distribution Ranking of 24-Hour Care

	Freq.	Percent	Cum.
1	6	1.7%	1.7%
2	6	1.7%	3.4%
3	16	4.5%	8.0%
4	20	5.7%	13.6%
5	54	15.3%	29.0%
6	70	19.9%	48.9%
7	86	24.4%	73.3%
8	57	16.2%	89.5%
9	31	8.8%	98.3%
10	6	1.7%	100.0%
Total	352	100.0%	

The municipalities in this service show an even distribution among all ranks. The table above shows that six (06) Norway municipalities will increase by 250% or more in the next 27 years, and six (06) will have a

50% or less change in users. After grouping, the charts below only show ranks of one and ten municipalities.

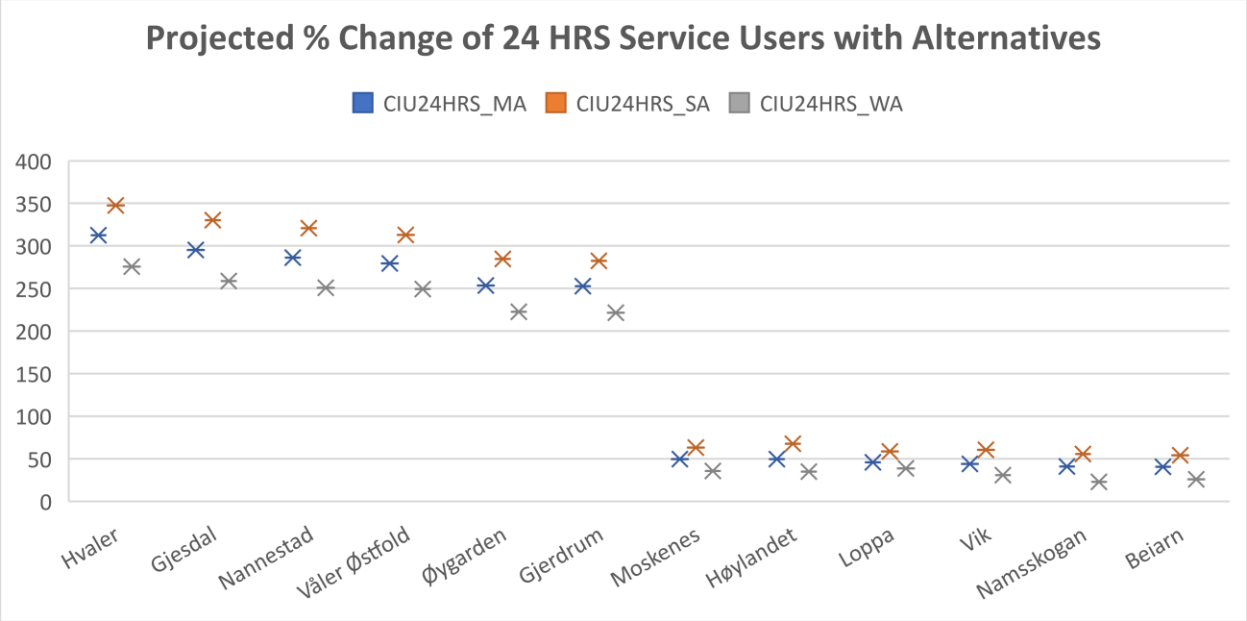

Figure 3: Projected % Change of Users - 24 HRs Care Services in Top and Bottom Municipalities

Correlation of identified variables on the percentage change in Users from the year 2023-2050

Average Household Income on the percentage change in Users from the year 2023-2050

As established earlier, household income plays a vital role in utilizing long-term care because it is directly proportional to the affordability of the services regardless of the financing system. The LTC require extended support; globally, it is partially and narrowly subsidized.

Similarly, in Norway, long-term care is universal and tax-supported, while in some instances, it is subject to copayment depending on the care needed. Older people in Norway have a universal pension system with generous remuneration to meet the additional expenses. However, it is essential to assess the effect of average household income on % change in users to know its significance in LTC.

Table 18: Summary of Average Income - Norway

Variable	Obs	Mean	Std. Dev.	Min	Max
Avg Inc	356	692561.8	72448.595	516500	919500

The table above indicates that the mean average income before tax is 692561.8 NOK/year.

Correlation of Basic/Primary Schooling on the percentage change in Users from the year 2023-2050

The "Mathew Effect", discussed earlier, points out the connection of literacy with the utilization of long-term care services. It states that people with low literacy will have lower knowledge about the services'

availability, affordability and utilization. Therefore, it makes education an essential variable to assess in this study.

Table 19: Summary of Education in Norway in Percentage

Variable	Obs	Mean	Std. Dev.	Min	Max
edu percent	356	23.235	6.199	3.398	76.692

The average primary education of the municipalities in Norway is 23.24%, ranging from 3.398 to 76.692.

Correlation of Centrality Index on the percentage change in Users from the year 2023-2050

The centrality index is the most critical variable determining the population's average household income and education level. 01 being the most central and 6 being the least, the variable is statistically significant to the % change in users of 24-hour care.

The multiple regression states a negative correlation with a decrease of 18.79 percentage points in users if the municipality's CI is changed by 01 unit. Furthermore, looking into all six CIs in the data is essential.

reg CIU24HRS_MA edu_percent Avg_Inc i.Muncp_CI

Table 20: Detailed Regression Analysis of Change in Users' 24-Hour Care

CIU24HRS_MA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
edu_percent	0.456	0.327	1.39	0.164	-0.187	1.099	
Avg_Inc	0.0002	0.0000	7.47	0.000	0.0001	0.0002	***
: base 1	0	.	.	.	.	.	
2	9.257	15.141	0.61	.541	-20.524	39.037	
3	10.146	14.053	0.72	.471	-17.494	37.786	
4	-16.863	13.927	-1.21	.227	-44.256	10.53	
5	-42.099	13.929	-3.02	.003	-69.495	-14.703	***
6	-57.121	14.128	-4.04	0	-84.909	-29.332	***
Constant	0.77	28.833	0.03	0.979	-55.942	57.482	

Mean dependent var	129.236	SD dependent var	46.095
R-squared	0.522	Number of obs	352
F-test	53.658	Prob > F	0.000
Akaike crit. (AIC)	3450.955	Bayesian crit. (BIC)	3481.864

**** p<.01, ** p<.05, * p<.1*

The above results show that if CI changes from 1 to 2, there is an association with increased needs of 9.3 percentage points in users, 10.15 percentage points if it moves to 3 and further away, and it starts decreasing to 57 percentage points if a municipality has a CI of 6. The centrality index also defines the availability of services and care in the municipality and their distance from the nearest one. At the same time, average income is significant at 01%.

Institutional Resident – Strong Ageing

The section focuses on the institutional residents means users at nursing homes, and does not combine any other service. The calculations and analysis include only 80 years and older population under full-time institutional service using projections from the Statistics Norway website.

The study created the following variable to determine the current proportion of the users to estimate the projected users.

Table 21: Variable Description - Institutional Resident

Variable Name	Function	Explanation
Prop_23_IR_80 =	IR_80 / M_Pop_23_80	The function is the ratio of 80 years and older population using institutional resident full-time service in the year 2023

The variable mentioned above, " Prop_23_IR_80", is used to determine the proportion of the service over municipalities' population of 80 years and older. Then the proportion is multiplied by the projected population of each year extracted from SSB.no with three main alternatives: Main, Strong Ageing and Weak Ageing.

The analysis generates three variables for each year "proj_year_IR_80_MA", "proj_year_IR_80_SA", and "proj_year_IR_80_WA" in total, having 85 variables for this section excluding standard variables.

Projection of Population from 2023-2050 with three alternatives - Main Alternative, Strong Ageing, and Weak Ageing

The study's first objective is to use projected population data and predict the number of users for the different services. This section explains the procedure for estimating the % change in users for each municipality. This part of the study demonstrates the change in the number of users 80 years and older using IR care services. The service combines both home and institutional-based users and predicts the change.

The predicted population provides two other alternatives along with Main Alternative: Weak and Strong ageing.

Table 22: Variable Description - Institutional Resident Strong Ageing

Variable Name	Function	Explanation
CIUIR_SA =	((proj_50_IR_80_SA - proj_23_IR_80_SA) / proj_23_IR_80_SA)*100	The variable calculates the % change in users considering "strong ageing" by taking the difference between the years 2050 and 2023, dividing it by the population of 2023, and multiplying it by 100 to make it in percentage.

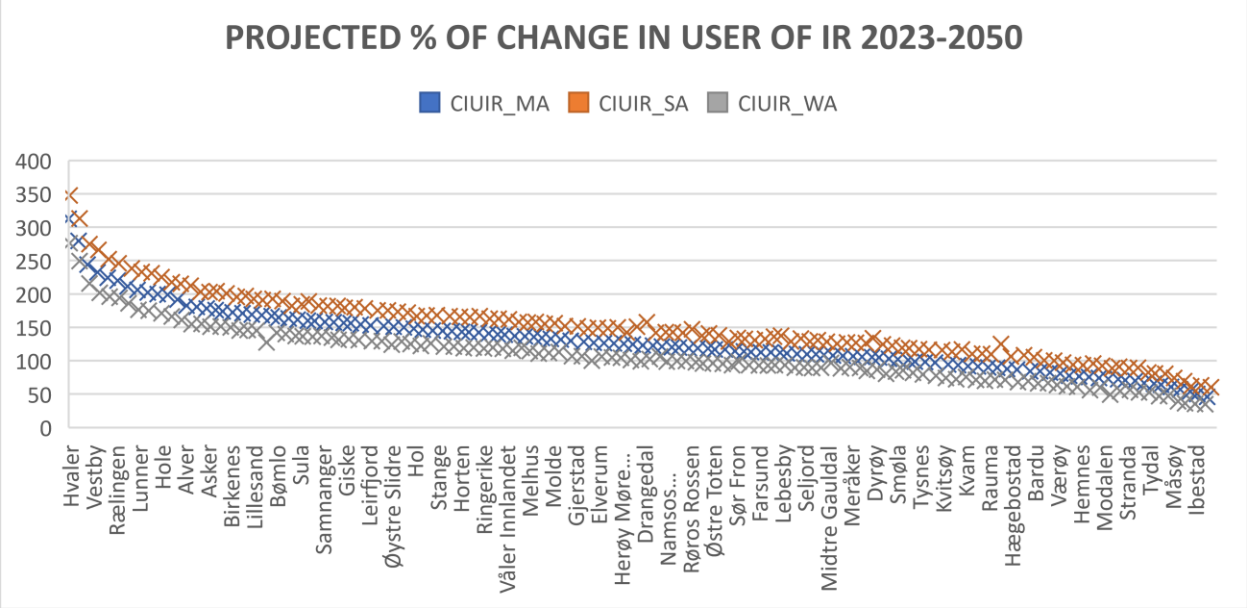

Figure 4: Projected % Change in Users of IR - All Alternatives

The chart demonstrates the municipalities with an enormous % change in users at first and moves towards the lowest change in percentage. From the above figure, it is prominent that Havaler has the maximum % change in users, 347.7% (SA), followed by Gjesdal at 330.3% and Nannestad at 320.8%. At the same time, the lowest noticeable % change in users is in Beiarn, 54.05%. In addition, 06 municipalities were dropped due to a meagre percentage (5%) change in users.

Table 23: Summary of Change in IR Users - Strong Ageing

Variable	Obs	Mean	Std. Dev.	Min	Max
CIUIR SA	350	151.028	49.437	54.054	347.699

The mean percentage change in IR Strong Ageing users is 151.03%, with an SD of 49.44, ranging from 54.05% to 347.70%.

However, the above graph is hard to use due to Norway's higher number of municipalities (356). Therefore, due to necessity, the study develops a ranking system to categorize the municipalities, group them and explain the change understandably.

Prioritization of Municipalities according to the percentage change in Users from the year 2023-2050

Following the criteria developed in Chapter 3, the municipalities, after calculating the percentage change in users, were ranked from 1 to 10. Rank 1 means 250% or enormous change, and rank 10 means less than

50%. The same ranking will help prioritize the municipalities to select the ones needing more consideration in the future than the least considerable ones.

Ranking of Municipalities according to the % change in Users from the year 2023-2050

Institutional Resident users are grouped according to their ranks and have the following status:

Table 24: Ranking Frequency - Institutional Residents

Rank	Freq.	Percent	Cum.
1	6	1.7%	1.7%
2	6	1.7%	3.4%
3	15	4.3%	7.7%
4	20	5.7%	13.4%
5	54	15.4%	28.9%
6	70	20.0%	48.9%
7	86	24.6%	73.4%
8	57	16.3%	89.7%
9	31	8.9%	98.6%
10	5	1.4%	100.0%
Total	350	100.00	

The municipalities in this service show an even distribution among all ranks. The table above shows that six (06) Norway municipalities will increase by 250% or more in the next 27 years, and six (06) will have a 50% or less change in users. After grouping, the charts below only show ranks of one and ten municipalities.

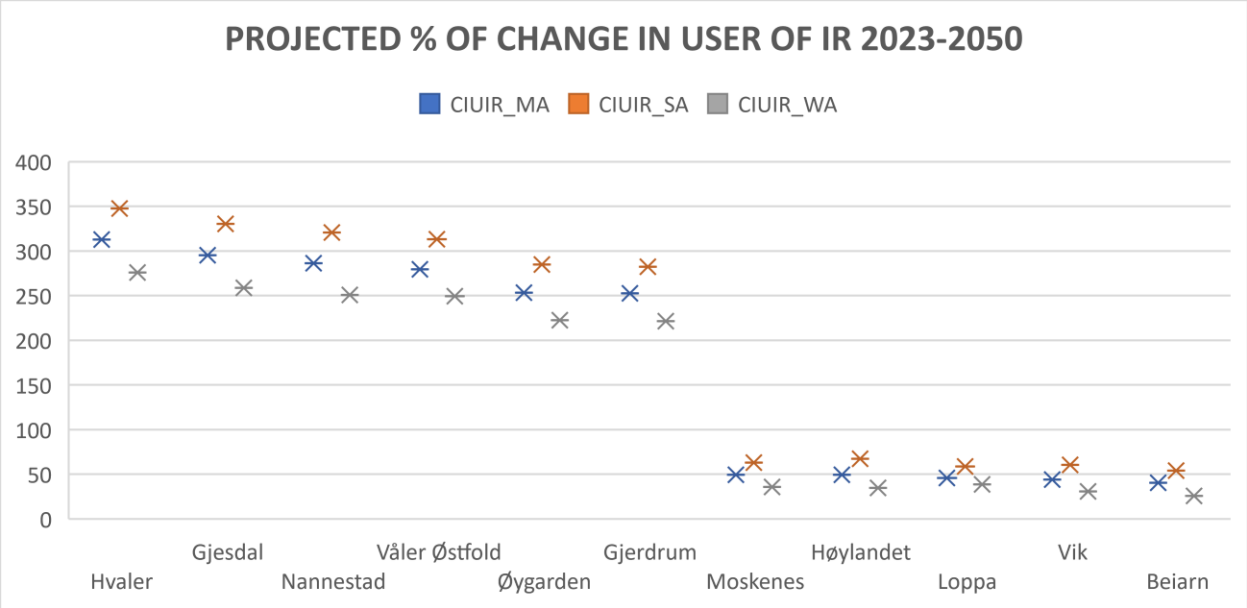

Figure 5: Projected Population IR Users Top and Bottom Municipalities

Correlation of identified variables on the % change in Users from the year 2023-2050

Average Household Income on the % change in Users from the year 2023-2050

As established earlier, household income plays a vital role in utilizing long-term care because it is directly proportional to the affordability of the services regardless of the financing system. The LTC require extended support; globally, it is partially and narrowly subsidized.

Similarly, in Norway, long-term care is universal and tax-supported, while in some instances, it is subject to copayment depending on the care needed. Older people in Norway have a universal pension system with generous remuneration to meet the additional expenses. However, it is essential to assess the effect of average household income on user percentage change to know its significance in LTC.

Table 25: Summary of Average Income

Variable	Obs	Mean	Std. Dev.	Min	Max
Avg Inc	356	692561.8	72448.595	516500	919500

The table above indicates that the mean average income before tax is 692561.8 NOK/year.

Correlation of Basic/Primary Schooling on the % change in Users from the year 2023-2050

The "Mathew Effect", discussed earlier, points out the connection of literacy with the utilization of long-term care services. It states that people with low literacy will have lower knowledge about the services' availability, affordability and utilization. Therefore, it makes education an essential variable to assess in this study.

Table 26: Summary of Education in PercentagesTable 31: Detailed Regression IR Users

Variable	Obs	Mean	Std. Dev.	Min	Max
edu percent	356	23.235	6.199	3.398	76.692

The primary schooling of the municipalities in Norway is 23.24%, ranging from 3.398 to 76.692.

Correlation of Centrality Index on the percentage change in Users from the year 2023-2050

The centrality index is the most critical variable determining the population's average household income and education level. 01 being the most central and 6 being the least, the variable is statistically significant to the percentage change in users of 24-hour care.

The multiple regression states a negative correlation with a decrease of 20.10% in users if the municipality's CI is changed by 01 unit. Furthermore, looking into all six CIs in the data is essential.

reg CIUIR_SA edu_percent Avg_Inc i.Muncp_CI

Table 27: Detailed Regression IR Users

CIUIR_SA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Avg_Inc	0.000283	0.000031	7.37	0.000	0.000167	0.0002892	***
edu_percent	0.547	0.353	1.55	0.123	-0.148	1.241	
: base 1	0	.	.	.	.	.	
2	10.107	16.345	0.62	0.537	-22.042	42.257	
3	11.807	15.17	0.78	0.437	-18.032	41.646	
4	-17.878	15.035	-1.19	0.235	-47.452	11.695	
5	-45.938	15.042	-3.05	0.002	-75.525	-16.351	***
6	-60.166	15.252	-3.94	0.000	-90.166	-30.166	***
Constant	12.457	31.139	0.40	0.689	-48.79	73.705	

Mean dependent var	151.028	SD dependent var	49.437
R-squared	0.516	Number of obs	350
F-test	52.032	Prob > F	0.000
Akaike crit. (AIC)	3484.951	Bayesian crit. (BIC)	3515.814

**** p<.01, ** p<.05, * p<.1*

The above results show that if CI changes from 1 to 2, there is a positive association and higher need, while if it moves further away, it starts decreasing. The centrality index also defines the availability of services and care in the municipality and their distance from the nearest one. Whereas the average income is significant at 01%.

Resident Dwellings - Full-Time Services (FTS) – Weak Ageing

The section focuses on the resident dwellings' full-time service means users at homes, and does not combine any other service. The calculations and analysis include only 80 years and older population under full-time service using projections from the Statistics Norway website.

The study created the following variable to determine the current proportion of the users to estimate the projected users.

Table 28: Description of FTS Variable

Variable Name	Function	Explanation
Prop_23_FTS_80 =	FTS_80 / M_Pop_23_80	The function is the ratio of 80 years and older population using resident dwellings' full-time service in the year 2023

The variable mentioned above, " Prop_23_FTS_80", is used to determine the proportion of the service over municipalities' population of 80 years and older. Then the proportion is multiplied by the projected population of each year extracted from SSB.no with three main alternatives: Main, Strong Ageing and Weak Ageing.

The analysis generates three variables for each year "proj_year_FTS_80_MA", "proj_year_FTS_80_SA", and "proj_year_FTS_80_WA" in total, having 85 variables for this section excluding standard variables.

Projection of Population from 2023-2050 with three alternatives - Main Alternative, Strong Ageing, and Weak Ageing

The study's first objective is to use projected population data and predict the number of users for the different services. This section explains the procedure for estimating each municipality's percentage change in users. This part of the study demonstrates the change in the number of users 80 years and older using FTS care services. The service combines both home and institutional-based users and predicts the change.

The predicted population provides two other alternatives along with Main Alternative: Weak and Strong ageing.

Table 29: Description and Calculation of FTS Variable

Variable Name	Function	Explanation
CIUFTS_WA =	((proj_50_FTS_80_WA - proj_23_FTS_80_WA) / proj_23_FTS_80_WA)*100	The variable calculates the % change in users "Weak Ageing" by taking the difference between the years 2050 and 2023, dividing it by the population of 2023, and multiplying it by 100 to make it in percentage.

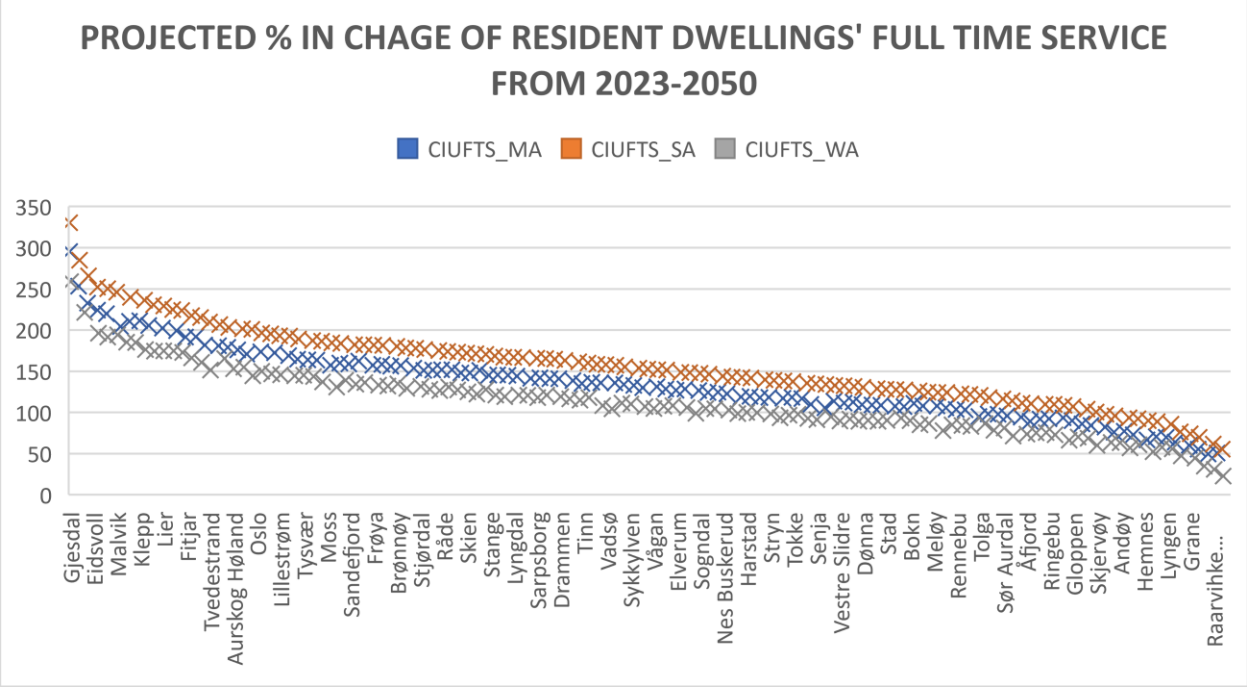

Figure 6: Projected % Change in RD-FTS Users

The chart demonstrates the municipalities with an enormous % change in users at first and moves towards the lowest change in percentage. From the above figure, it is prominent that Gjesdal has the maximum % change in users, 295% (MA), followed by Nannestad at 286.3% and Øygarden at 253.4%. At the same time, the lowest noticeable % change in users is in Beiarn, 40.54%. In addition, 107 municipalities were dropped due to a meagre percentage (5%) change in users or no data available.

Table 30: Summary of CIU RD-FTS

Variable	Obs	Mean	Std. Dev.	Min	Max
CIUFTS WA	249	112.026	40.795	22.892	258.841

The mean percentage change in FTS users is 112.03%, with an SD of 40.795, ranging from 22.90% to 258.84%.

However, the above graph is hard to use due to Norway's higher number of municipalities (356). Therefore, due to necessity, the study develops a ranking system to categorize the municipalities, group them and explain the change understandably.

Prioritization of Municipalities according to the % change in Users from the year 2023-2050

Following the criteria developed in Chapter 3, the municipalities, after calculating the % change in users, were ranked from 1 to 10. Rank 1 means 250% or enormous change, and rank 10 means less than 50%. The same ranking will help prioritize the municipalities to select the ones needing more consideration in the future than the least considerable ones.

Ranking of Municipalities according to the % change in Users from the year 2023-2050

Institutional Resident users are grouped according to their ranks and have the following status:

Table 31: Ranking Frequency Distribution - FTS Users

Rank	Freq.	Percent	Cum.
1	4	1.61%	1.61%
2	2	0.80%	2.41%
3	15	6.02%	8.43%
4	18	7.23%	15.66%
5	46	18.47%	34.14%
6	51	20.48%	54.62%
7	59	23.69%	78.31%
8	35	14.06%	92.37%
9	15	6.02%	98.39%
10	4	1.61%	100.00%
Total	249	100	

The municipalities in this service show an even distribution among all ranks. The table above shows that six (06) Norway municipalities will increase by 250% or more in the next 27 years, and six (06) will have a 50% or less change in users. After grouping, the charts below only show ranks of one and ten municipalities.

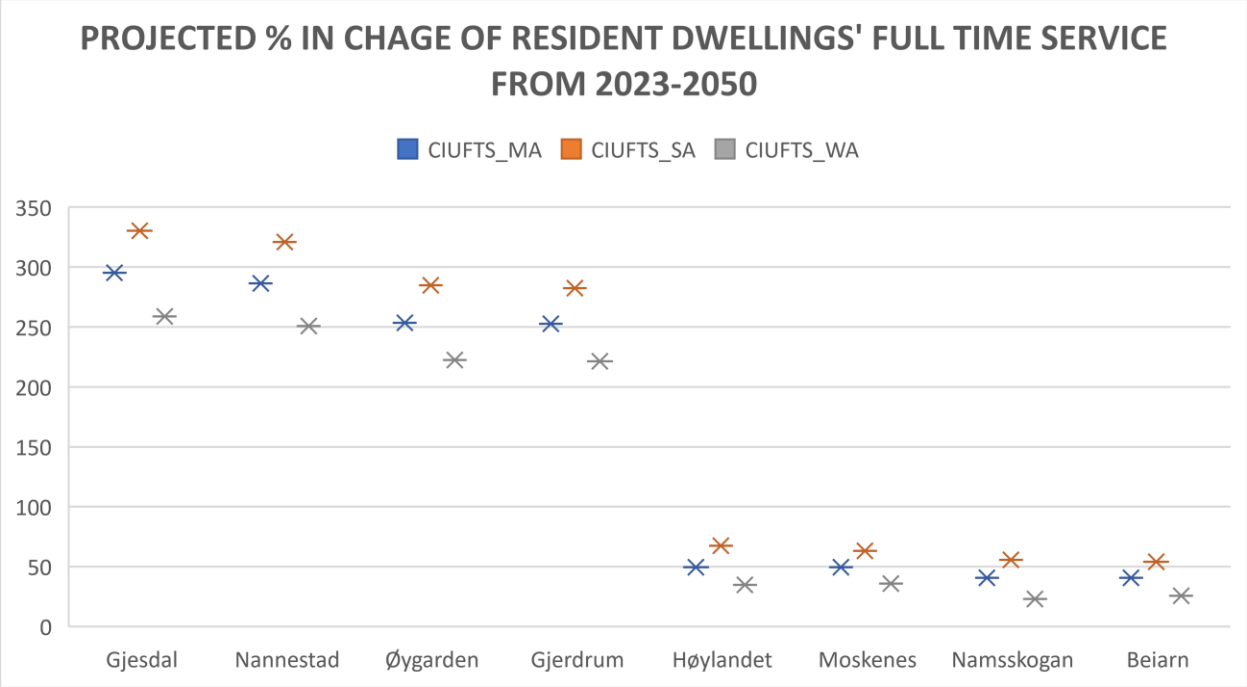

Figure 7: Projected Population FTS - Top and Bottom Municipalities

Correlation of identified variables on the % change in Users from the year 2023-2050

Average Household Income on the % change in Users from the year 2023-2050

As established earlier, household income plays a vital role in utilizing long-term care because it is directly proportional to the affordability of the services regardless of the financing system. The LTC require extended support; globally, it is partially and narrowly subsidized.

Similarly, in Norway, long-term care is universal and tax-supported, while in some instances, it is subject to copayment depending on the care needed. Older people in Norway have a universal pension system with generous remuneration to meet the additional expenses. However, it is essential to assess the effect of average household income on user percentage change to know its significance in LTC.

Table 32: Summary of Average Income

Variable	Obs	Mean	Std. Dev.	Min	Max
Avg Inc	356	692561.8	72448.595	516500	919500

The table above indicates that the mean average income before tax is 692561.8 NOK/year.

Correlation of Centrality Index on the % change in Users from the year 2023-2050

The centrality index is the most critical variable determining the population's average household income and education level. 01 being the most central and 6 being the least, the variable is statistically significant to the percentage change in users of 24-hour care.

The multiple regression states a negative correlation with a decrease of 15.54% in users if the municipality's CI is changed by 01 unit. Furthermore, looking into all six CIs in the data is essential.

reg CIUFTS_WA edu_percent Avg_Inc i.Muncp_CI

Table 33: Detailed Regression FTS Users

CIUFTS_WA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Avg_Inc	0.000229	0.000028	8.23	0.000	0.000174	0.0002834	***
edu_percent	0.346	0.346	1.00	0.318	-0.335	1.028	
: base 1	0	.	.	.	.	.	
2	4.362	12.805	0.34	0.734	-20.862	29.586	
3	8.868	11.836	0.75	0.454	-14.448	32.184	
4	-13.73	11.812	-1.16	0.246	-36.997	9.538	
5	-36.153	11.876	-3.04	0.003	-59.547	-12.76	***
6	-48.594	12.214	-3.98	0.000	-72.653	-24.535	***
Constant	-33.377	27.085	-1.23	0.219	-86.73	19.977	

Mean dependent var	112.026	SD dependent var	40.795
R-squared	0.581	Number of obs	249
F-test	47.749	Prob > F	0.000
Akaike crit. (AIC)	2351.864	Bayesian crit. (BIC)	2380.004

**** p<.01, ** p<.05, * p<.1*

The above results show that if CI changes from 1 to 2, there is a positive association of higher need, and if it moves to 3 and further away, it starts decreasing. The centrality index also defines the availability of services and care in the municipality and their distance from the nearest one. However, the average income is significant at 01%.

Comparison of Change in Users in 2050 with 2023

The study further calculates the differences between 2023 and 2050 to discuss the change in percentages and absolute numbers.

Table 34: Current Percentages of Users Using 24-Hour Care

Variable	Obs	Mean	Std. Dev.	Min	Max
AU 24 HRS 80 Per 23	356	7.04	3.159	0	20.429
AU IR 80 Per 23	356	5.1	2.477	0	16.747
AU FTS 80 Per 23	356	1.94	2.255	0	13.241

The current average users of 24-care, institutional residents, and home-based full-time care with a ratio to the total population of the municipalities are 7.04%, 5.1%, and 1.94%, respectively, as demonstrated in the above table. The values range from 0% to 20.43% in 24-hour care, 0 to 16.7% in IR, and 0-13.24% in FTS.

Table 35: Projected Percentage of Users for 24-Hour Care

Variable	Obs	Mean	Std. Dev.	Min	Max
AU 24 HRS 80 Per	356	15.298	5.447	0	38.298
AU IR 80 Per	356	11.05	4.255	0	31.915
AU FTS 80 Per	356	4.248	4.712	0	25.373

The predicted average users of 24-care, institutional residents and home-based full-time care with a ratio to the total population of the municipalities are 15.3%, 11.1% and 4.25% in the year 2050, respectively, as demonstrated in the above table. The values range from 0% to 38.3% in 24-Hour care, 0 to 31.92% in IR, and 0-25.4% in FTS.

The above results show that there will be an increase of 2.5 times in all services. However, the percentage might not demonstrate an actual scenario. Therefore, there is a need to triangulate data with absolute numbers and then the ranking of the municipalities conducted above.

Table 36: Projected Population in Numbers Using 24-Hour care

Variable	Obs	Mean	Std. Dev.	Min	Max
proj 50 24HRS 80 MA	356	243.214	613.179	0	8798.879
proj 50 FTS 80 MA	356	58.64	108.83	0	1307.642
proj 50 IR 80 MA	356	184.575	520.914	0	7491.237

The average increase in the number of users is 243 users/municipality for 24 hour-care, 59 users in FTS, and 185 users in IR. A more significant change in the number of users is recorded in municipalities with indexes 1 and 2.

The list of the top 10 municipalities according to the change in absolute users is incorporated below:

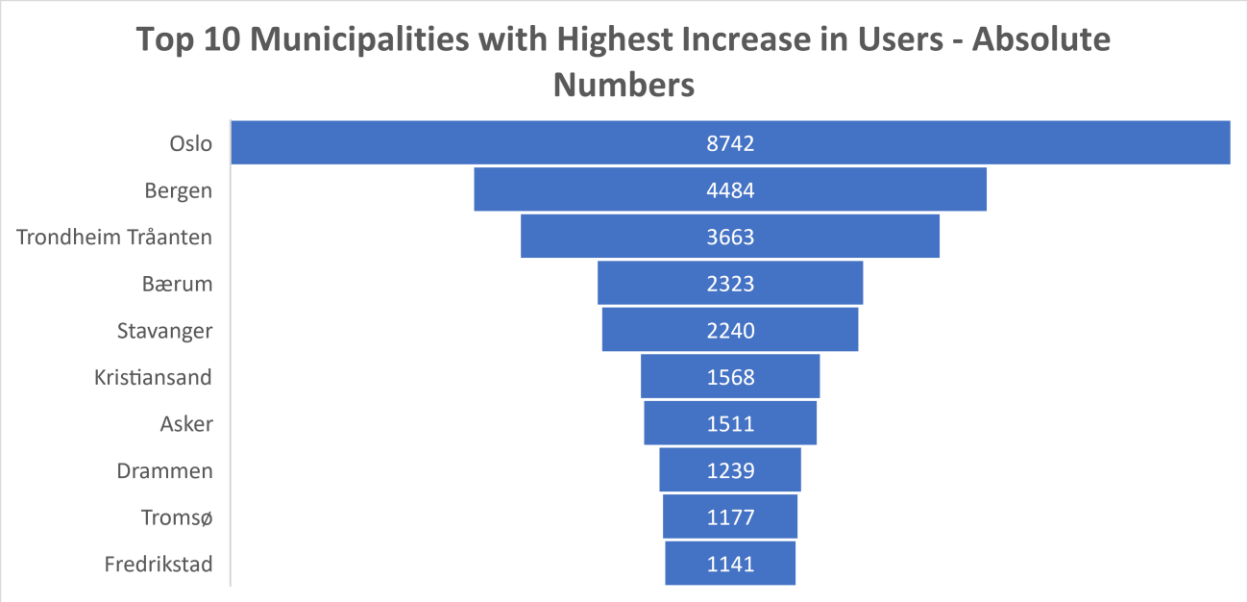

Figure 8: Top 10 Municipalities with Highest Increase in Users (Numbers)

The above chart demonstrates that the ten municipalities with the highest number of 24-hour care users in 2050 have a CI of either 1, 2 or 3. The 1, 2 and 3 CI are marked according to their high population, urbanization and availability of the facilities. Therefore, municipalities like Oslo, Bergen and Stavanger are on the list. The above analysis states a prominent finding of a higher total population and higher number of future users because of this study's prediction modality.

Similarly, the bottom 10 municipalities with the lowest increase in users are listed below and have opposite traits from the municipalities with CI 1, 2 and 3 and usually have a considerably lower population compared to the higher CI.

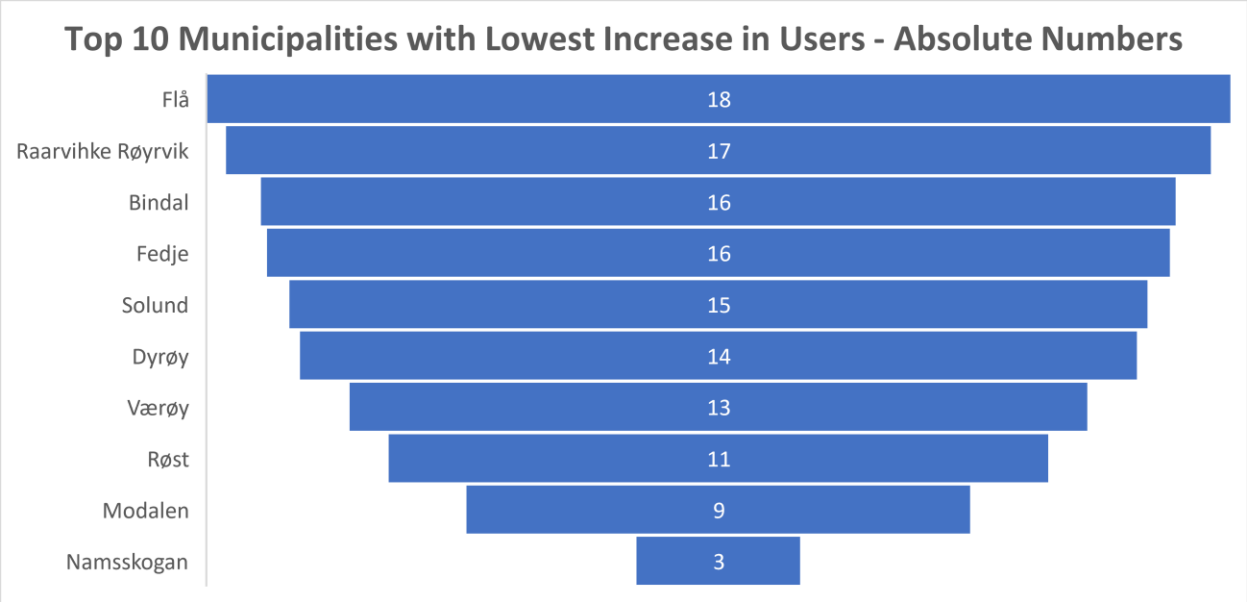

Figure 9: Top 10 Municipalities with Lowest Increase in Users (Numbers)

The above chart states that Namsskogan municipality will have only three (3) 24-hour care users in 2050. However, the findings could be misleading; therefore, exploring all possible dimensions is necessary.

The chart below demonstrates the top 10 municipalities with the highest growth in 24-hour care users against the total population of the municipalities.

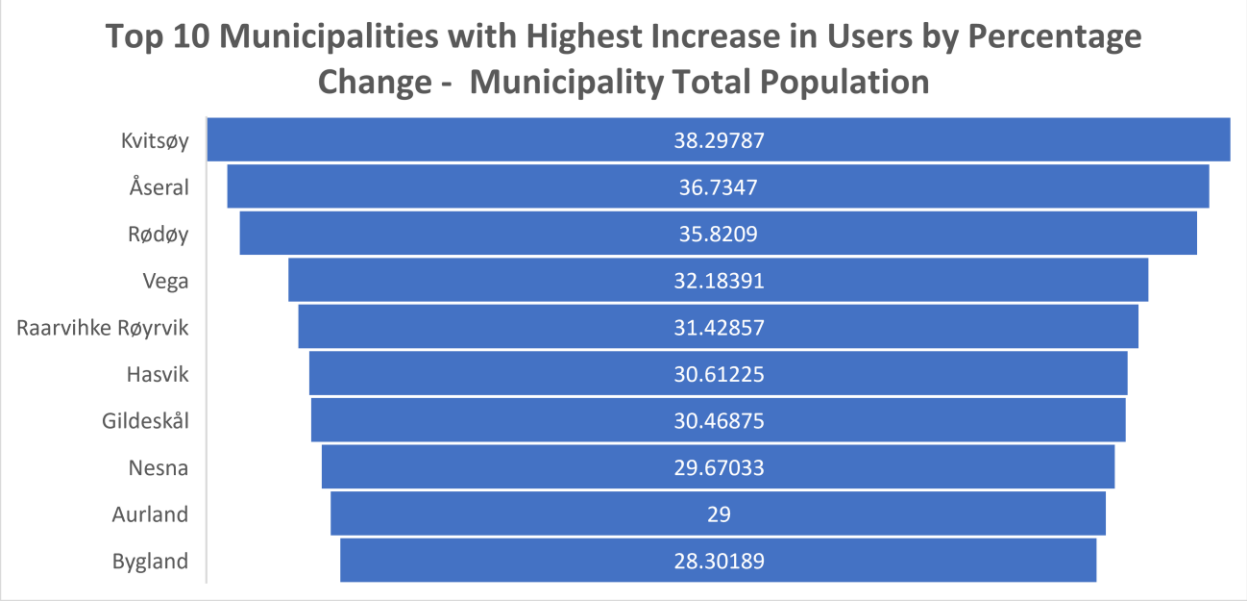

Figure 10: Top 10 Municipalities with Highest Increase in Users (Percentage) - Total Population

38.3% of Kvitsøy's municipality population in 2050 will require 24-hour care service, followed by Åseral (36.7%), and Rødøy (35.8%) followed by others. The findings under this sorting are one of the study's significant findings as it states that the municipalities mentioned above with CI-6 will have the highest population proportion in LTC by 2050. The complete list is attached as appendix-1.

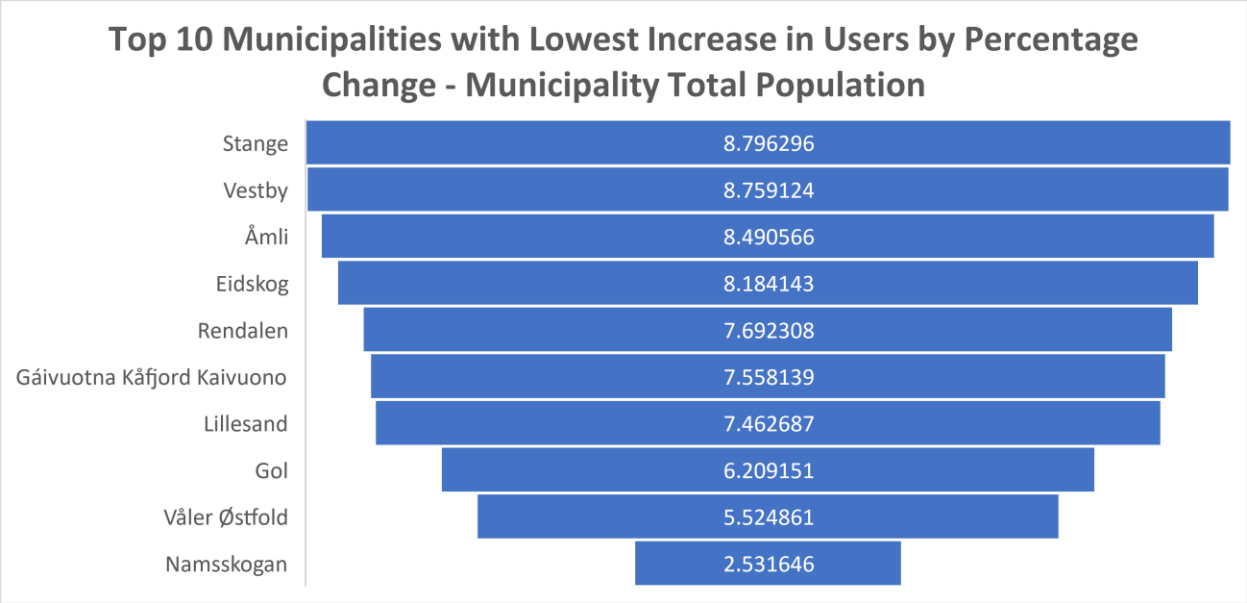

Figure 11: Top 10 Municipalities with Lowest Increase in Users (Percentage) - Total Population

Similarly, the lowest percentage change against the municipality's total population is in Namsskogan (2.53%) and Våler Østfold (5.5%), followed by others.

The study further segregates the municipalities with different characteristics to provide a more comprehensive platform for making informed decisions for policymakers. The above analysis resulted from the total population and ahead is against the population of 80 years or older in the municipalities. The denominator for the percentage is the population of 80 years or older, unlike the previous analysis where the denominator was the total population.

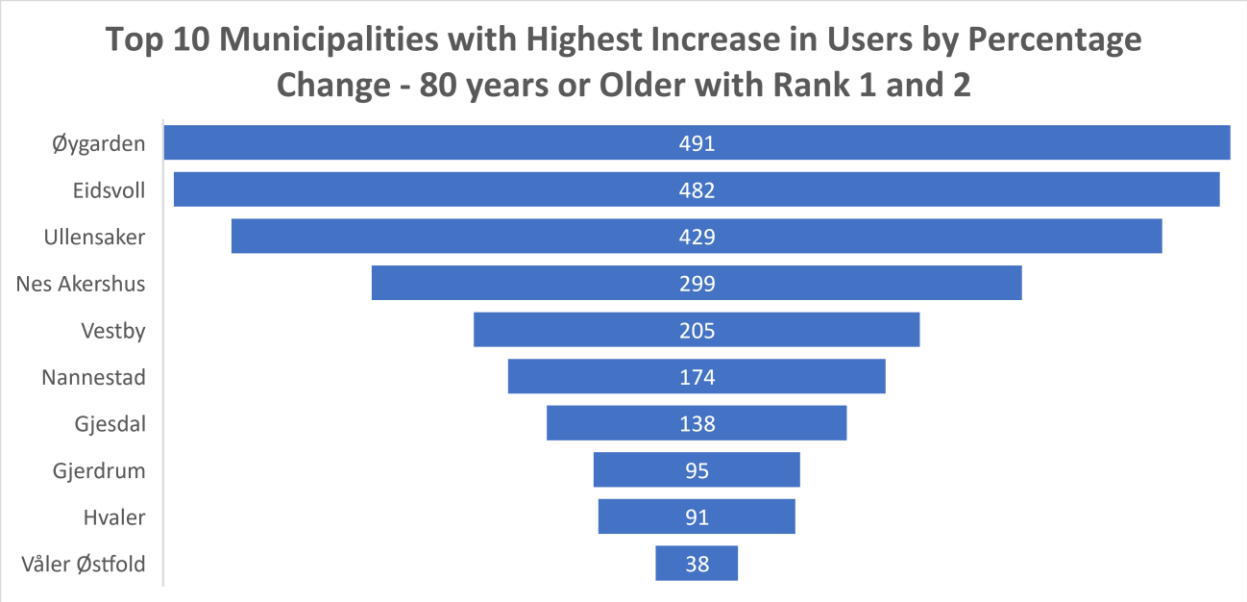

Figure 12: Top 10 Municipalities with Highest Increase in Users (Ranking) - 80 years or older population

Those mentioned above top 10 municipalities will experience an increase between 200% to 350% in 24-hour care needs (Rank 1 and 2). Øygarden (342%) will have 491 persons to cater to, followed by Eidsvoll (482). The absolute number of users may look smaller compared to Oslo, Bergen and Stavanger, but this particular dimension points out an immense shift of resources for 24-hour care in the abovementioned municipalities.

Similarly, the lowest ranked municipalities are Namsskogen (3), followed by Loppa (19), with very few users and a percentage change of less than 50% and ranked 9 or 10 according to the defined criteria above.

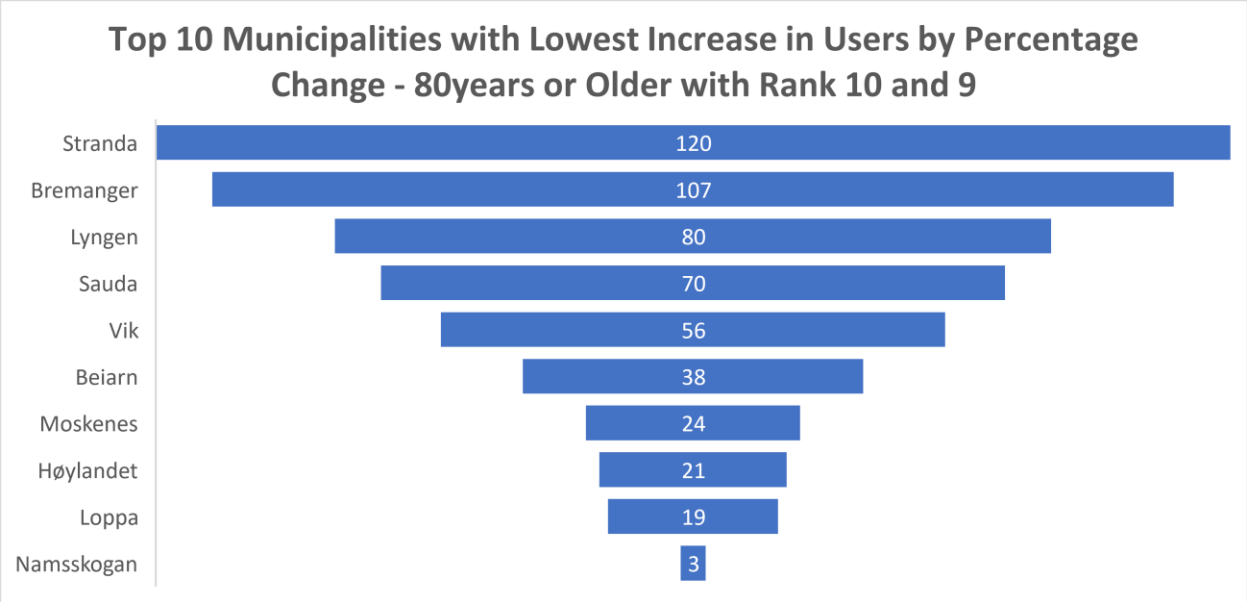

Figure 13: Top 10 Municipalities with Lowest Increase in Users (Ranking) - 80 years or older population

The range of results is broad and tries to cover all aspects necessary to predict the number of users in all the municipalities of Norway. It provides a broader range of variations and is flexible enough to introduce and test more aspects to make precise and accurate predictions. However, it relies on the decision maker prioritizing their actions according to available resources and population needs.

Chapter 5: Conclusion and Discussion

The chapter discusses the key points from the findings and connects different results from different analyses. The chapter concludes the overall research, highlights the future need for evidence, proposes the approach and gaps not fulfilled by the study, and lists all the limitations.

Furthermore, the chapter builds the ground for exploring new areas to fill the gaps, use the results, and find more appropriate and accurate future research gaps.

The study's main findings are the increased number of users in municipalities with Centrality Index 5 and 6. Municipalities far from the urban areas will observe the most significant user change, with fewer facilities that cater to higher LTC users.

Following the findings above, it is established that Norway will face a massive change in users for 24-hour long-term care, especially institutional care, i.e. 2.5 times regardless of the type of service. However, the percentage change ranges from 42% to 342% depending on the service type and the findings'

determinants. Furthermore, the study finds a correlation between average household income, primary education and centrality index which states that income and CI are statistically significant.

The ranges of percentage change vary in all three alternatives, but on average, the growth is 2.5 times in the next 27 years. Further investigation to present adequate information to make informed decisions expands the study's scope and categorizes municipalities with different characteristics.

If the policymakers want to reach the maximum number of users (80 years or older), then targeting Oslo, Bergen, Stavanger, and other urban areas would be the best approach as they will have the highest figures. The urban areas or municipalities with the higher population have a CI of 1, 2 and 3. Targeting CI 1, 2, and 3 means allocating more funds or extending the financial support in these municipalities will cater to the highest population requiring LTC.

Furthermore, the findings of the proportion change of 24-hour care users against the total population are significant and provide a new aspect. According to the findings, the municipalities with the highest CI = 6 will experience the most significant population shift. 38.29% of the municipality population will require LTC services in 2050 Kvitsøy. Similarly, the municipalities with identical characteristics will have a proportion from 28 to 36%.

The findings also demonstrate the scenarios with the denominator of 80 years and older population instead of the total population and present the results in absolute numbers.

Recommendations

- To develop national guidelines for 24-hour long-term care for the standardization, monitoring and surveillance of the services
- To devise criteria or mechanisms to prioritize and select the municipalities for extended support and additional funds allocation according to the changing needs.
- To conduct a need assessment for the requisition of the long-term care staff at LTCFs to provide adequate and quality care
- Advocate generating more evidence for cost-effectiveness and efficiency by collaborating with academia and research firms
- To assess the costing, cost-sharing, payment and copayment procedures with the changing needs

References

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Akiyama, N., Shiroiwa, T., Fukuda, T., Murashima, S. & Hayashida, K. (2018). 'Healthcare costs for the elderly in Japan: Analysis of medical care and long-term care claim records', *PLoS One,* 13(5), p. e0190392.

Alders, P. & Schut, F. T. (2019). 'The 2015 long-term care reform in the Netherlands: Getting the financial incentives right?', *Health Policy,* 123(3), pp. 312-316.

Ariaans, M., Linden, P. & Wendt, C. (2021). 'Worlds of long-term care: A typology of OECD countries', *Health Policy,* 125(5), pp. 609-617.

Asaria, M., Costa-Font, J. & Cowell, F. (2023). 'How does exposure to COVID-19 influence health and income inequality aversion?', *Social Choice and Welfare*, pp. 1-23.

Banerjee, R., Mishra, V. & Maruta, A. A. (2021). 'Energy poverty, health and education outcomes: evidence from the developing world', *Energy economics,* 101, p. 105447.

Barker, I., Steventon, A., Williamson, R. & Deeny, S. R. (2018). 'Self-management capability in patients with long-term conditions is associated with reduced healthcare utilisation across a whole health economy: cross-sectional analysis of electronic health records', *BMJ Qual Saf,* 27(12), pp. 989-999.

Bjornelv, G., Hagen, T. P., Forma, L. & Aas, E. (2022). 'Care pathways at end-of-life for cancer decedents: registry based analyses of the living situation, healthcare utilization and costs for all cancer decedents in Norway in 2009-2013 during their last 6 months of life', *BMC Health Serv Res,* 22(1), p. 1221.

Bonnet, C., Juin, S. & Laferrère, A. (2019). 'Private Financing of Long-Term Care: Income, Savings and Reverse Mortgages', *Économie et Statistique,* 507(1), pp. 5-24.

Bottery, S., Ward, D. & Fenney, D. (2019). 'Social care 360', *King's Fund*.

Brkic, A., Kim, J. G., Haugeberg, G. & Diamantopoulos, A. P. (2021). 'Decentralizing healthcare in Norway to improve patient-centered outpatient clinic management of rheumatoid arthritis - a conceptual model', *BMC Rheumatol,* 5(1), p. 43.

Debesay, J., Arora, S. & Bergland, A. (2019). 'Migrants' consumption of healthcare services in Norway: inclusionary and exclusionary structures and practices', *Inclusive consumption: Immigrants' access to and use of public and private goods and services*: Universitetsforlagetpp. 63-78.

Deraas, T. S., Berntsen, G. R., Hasvold, T. & Forde, O. H. (2011). 'Does long-term care use within primary health care reduce hospital use among older people in Norway? A national five-year population-based observational study', *BMC Health Serv Res,* 11, p. 287.

Dyer, S., Valeri, M., Arora, N., Ross, T. & Winsall, M. (2020). *Review of international systems of long-term care of older people*: Royal Commission into Aged Care Quality and Safety.

Eika, M., Espnes, G. A. & Hvalvik, S. (2014). 'Nursing staff's actions during older residents' transition into long-term care facility in a nursing home in rural Norway', *Int J Qual Stud Health Well-being,* 9, p. 24105.

Fang, E. F., Xie, C., Schenkel, J. A., Wu, C., Long, Q., Cui, H., Aman, Y., Frank, J., Liao, J. & Zou, H. (2020). 'A research agenda for ageing in China in the 21st century: Focusing on basic and translational research, long-term care, policy and social networks', *Ageing research reviews,* 64, p. 101174.

Feng, Z., Glinskaya, E., Chen, H., Gong, S., Qiu, Y., Xu, J. & Yip, W. (2020). 'Long-term care system for older adults in China: policy landscape, challenges, and future prospects', *The Lancet,* 396(10259), pp. 1362-1372.

Frisk, B., Sundor, I. E., Donasen, M. R., Refvem, O. K. & Borge, C. R. (2022). 'How is the organisational settings, content and availability of comprehensive multidisciplinary pulmonary rehabilitation

for people with COPD in primary healthcare in Norway: a cross-sectional study', *BMJ Open,* 12(2), p. e053503.

Gjesdal, K., Dysvik, E. & Furnes, B. (2018). 'Living with chronic pain: Patients' experiences with healthcare services in Norway', *Nurs Open,* 5(4), pp. 517-526.

Grabowski, D. C. (2021). 'The future of long-term care requires investment in both facility-and home-based services', *Nature Aging,* 1(1), pp. 10-11.

Gravningen, K., Nymark, P., Wyller, T. B. & Kacelnik, O. (2022). 'A new automated national register-based surveillance system for outbreaks in long-term care facilities in Norway detected three times more severe acute respiratory coronavirus virus 2 (SARS-CoV-2) clusters than traditional methods', *Infect Control Hosp Epidemiol*, pp. 1-7.

Hashiguchi, T. C. O. & Llena-Nozal, A. (2020). 'The effectiveness of social protection for long-term care in old age: Is social protection reducing the risk of poverty associated with care needs?'.

Higdem, U., Høyer, H. C., Lesjø, J. H. & Mønness, E. (2020). 'Changing attitudes towards territorial municipal reforms? The case of inland Norway'.

Ikegami, N. (2019). 'Financing long-term care: lessons from Japan', *International journal of health policy and management,* 8(8), p. 462.

Jakovljevic, M., Fernandes, P. O., Teixeira, J. P., Rancic, N., Timofeyev, Y. & Reshetnikov, V. (2019). 'Underlying differences in health spending within the World Health Organisation Europe Region—comparing EU15, EU post-2004, CIS, EU candidate, and CARINFONET countries', *International journal of environmental research and public health,* 16(17), p. 3043.

Jeong, S. Y., Choi, J., Kim, J. Y. & Ga, H. (2020). 'Development and Application of a Surveillance Method for Healthcare-Associated Infections in Long-Term Care Hospitals in Korea', *Annals of geriatric medicine and research,* 24(4), p. 274.

Kiely, K. M., Brady, B. & Byles, J. (2019). 'Gender, mental health and ageing', *Maturitas,* 129, pp. 76-84.

Kjos, B. O., Botten, G. & Romoren, T. I. (2008). 'Quality improvement in a publicly provided long-term care system: the case of Norway', *Int J Qual Health Care,* 20(6), pp. 433-8.

Korfhage, T. (2019). *Long-run consequences of informal elderly care and implications of public long-term care insurance*: SOEPpapers on Multidisciplinary Panel Data Research.

Lowndes, R., Struthers, J. & Agotnes, G. (2021). 'Social Participation in Long-term Residential Care: Case Studies from Canada, Norway, and Germany', *Can J Aging,* 40(1), pp. 138-155.

Loyland, B., Miaskowski, C., Paul, S. M., Dahl, E. & Rustoen, T. (2010). 'The relationship between chronic pain and health-related quality of life in long-term social assistance recipients in Norway', *Qual Life Res,* 19(10), pp. 1457-65.

Matsuda, T., Tamiya, N., Kashiwagi, M. & Moriyama, Y. (2013). '[Introduction of long-term care insurance: changes in service usage]', *Nihon Koshu Eisei Zasshi,* 60(9), pp. 586-95.

McArthur, D. P., Tjerbo, T. & Hagen, T. P. (2013). 'The role of young users in determining long-term care expenditure in Norway', *Scand J Public Health,* 41(5), pp. 486-91.

Mei, K., Kou, R., Bi, Y., Liu, Y., Huang, J. & Li, W. (2023). 'A study of primary health care service efficiency and its spatial correlation in China', *BMC Health Services Research,* 23(1), pp. 1-17.

Melin, R. C. & Hymans, D. J. (1977). 'Developing a health-care model for long-term care facilities', *J Nurs Adm,* 7(8), pp. 12-4, 32.

Miyawaki, A., Kobayashi, Y., Noguchi, H., Watanabe, T., Takahashi, H. & Tamiya, N. (2020). 'Effect of reduced formal care availability on formal/informal care patterns and caregiver health: a quasi-experimental study using the Japanese long-term care insurance reform', *BMC geriatrics,* 20, pp. 1-11.

Norbye, B. & Skaalvik, M. W. (2013). 'Decentralized nursing education in Northern Norway: towards a sustainable recruitment and retention model in rural Arctic healthcare services', *Int J Circumpolar Health,* 72, p. 22793.

Organization, W. H. (2022). *Rebuilding for sustainability and resilience: strengthening the integrated delivery of long-term care in the European Region*: World Health Organization. Regional Office for Europe.

Pahlavanyali, S., Hetlevik, Ø., Blinkenberg, J. & Hunskaar, S. (2022). 'Continuity of care for patients with chronic disease: a registry-based observational study from Norway', *Family Practice,* 39(4), pp. 570-578.

Powell, M. (2022). 'Lessons from abroad for funding long-term care in England: a prospective policy transfer perspective on official documents', *International Journal of Sociology and Social Policy,* 42(11-12), pp. 949-961.

Ramirez Lizardi, E. A. (2022). *Independent aging: Evaluation of the adoption of welfare technologies in Lister.*

Roig, M. & Maruichi, D. (2023). 'Economic well-being at older ages: prospects for the future'.

Rudnicka, E., Napierała, P., Podfigurna, A., Męczekalski, B., Smolarczyk, R. & Grymowicz, M. (2020). 'The World Health Organization (WHO) approach to healthy ageing', *Maturitas,* 139, pp. 6-11.

Salinas-Rodriguez, A., Manrique-Espinoza, B., Heredia-Pi, I., Rivera-Almaraz, A. & Avila-Funes, J. A. (2019). 'Healthcare Costs of Frailty: Implications for Long-term Care', *J Am Med Dir Assoc,* 20(1), pp. 102-103 e2.

Saunders, C. L., Berner, A., Lund, J., Mason, A. M., Oakes-Monger, T., Roberts, M., Smith, J. & Duschinsky, R. (2023). 'Demographic characteristics, long-term health conditions and healthcare experiences of 6333 trans and non-binary adults in England: nationally representative evidence from the 2021 GP Patient Survey', *BMJ Open,* 13(2), p. e068099.

Skagseth, H., Jorgensen, S. B., Reilly, J. & Kacelnik, O. (2023). 'A new method for near real-time, nationwide surveillance of nosocomial COVID-19 in Norway: providing data at all levels of the healthcare system, March 2020 to March 2022', *Euro Surveill,* 28(12).

Sperre Saunes, I., Karanikolos, M., Sagan, A. & Organization, W. H. (2020). 'Norway: health system review'.

Walker, S., Asaria, M., Manca, A., Palmer, S., Gale, C. P., Shah, A. D., Abrams, K. R., Crowther, M., Timmis, A., Hemingway, H. & Sculpher, M. (2016). 'Long-term healthcare use and costs in patients with stable coronary artery disease: a population-based cohort using linked health records (CALIBER)', *Eur Heart J Qual Care Clin Outcomes,* 2(2), pp. 125-140.

While, A. E., Heery, E., Sheehan, A. M. & Coyne, I. (2017). 'Health-related quality of life of young people with long-term illnesses before and after transfer from child to adult healthcare', *Child Care Health Dev,* 43(1), pp. 144-151.

Williams, J., Lyons, B. & Rowland, D. (1997). 'Unmet long-term care needs of elderly people in the community; A review of the literature', *Home health care services quarterly,* 16(1-2), pp. 93-119.

Appendix-I

Municipalities	AU_24_HRS_80_Per	AU_IR_80_Per	AU_FTS_80_Per	rank24HRS	Muncp_CI	IR_80_AU	FTS_80_AU	HRS24_80_AU
Kvitsøy	38.3	31.9	6.4	8	6	29	6	35
Åseral	36.7	16.3	20.4	4	6	22	28	50
Rødøy	35.8	10.4	25.4	8	6	14	34	47
Vega	32.2	25.3	6.9	8	6	40	11	51
Raarvihke Røyrvik	31.4	14.3	17.1	9	6	8	9	17
Hasvik	30.6	30.6	0.0	6	6	36	0	36
Gildeskål	30.5	14.8	15.6	6	6	43	45	88
Nesna	29.7	11.0	18.7	6	6	25	42	67
Aurland	29.0	29.0	0.0	7	6	62	0	62
Bygland	28.3	15.1	13.2	7	6	18	16	33
Lurøy	28.3	6.2	22.1	9	6	15	53	68
Evenes Evenášši	27.8	15.6	12.2	8	6	27	21	48
Berlevåg	26.4	13.2	13.2	7	6	15	15	30
Bokn	26.3	19.3	7.0	7	5	23	8	31
Leka	26.1	26.1	0.0	9	6	19	0	19
Porsanger Porsáŋgu Porsanki	25.8	13.2	12.6	5	6	68	65	133
Beiarn	25.7	17.1	8.6	10	6	25	13	38
Høyanger	25.4	13.1	12.4	7	6	78	74	152
Sande	25.3	17.1	8.2	8	6	54	26	79
Leirfjord	25.2	16.0	9.2	5	6	48	28	76
Hitra	24.5	9.8	14.7	6	6	60	91	151
Tokke	24.3	15.0	9.3	7	6	46	28	74
Bykle	24.2	24.2	0.0	2	6	27	0	27
Nærøysund	23.9	10.0	13.9	7	6	108	149	257
Hyllestad	23.8	9.5	14.3	9	6	16	24	41
Iveland	23.8	0.0	23.8	3	5	0	30	30
Bremanger	23.5	18.4	5.1	9	6	84	23	107
Karlsøy	23.4	13.2	10.2	7	6	46	36	81
Sunnfjord	22.8	10.7	12.1	5	4	267	303	571
Namsos Nåavmesjenjaelmie	22.8	9.3	13.5	7	4	166	241	407
Ringebu	22.6	4.4	18.2	8	5	27	111	138
Kárášjohka Karasjok	22.6	13.9	8.7	4	5	45	28	73
Fedje	22.5	22.5	0.0	9	6	16	0	16
Ørsta	22.5	12.4	10.0	7	4	164	132	296
Volda	22.4	12.9	9.4	8	4	151	110	261
Lierne	22.2	18.2	4.0	9	6	31	7	38
Folldal	22.0	11.0	11.0	8	6	25	25	49
Osen	21.9	15.1	6.8	9	6	19	9	28
Skjervøy	21.9	13.9	7.9	8	6	38	22	60
Fitjar	21.8	11.3	10.5	4	5	44	41	85
Hemsedal	21.7	19.1	2.6	5	5	58	8	66

Midtre Gauldal	21.4	9.0	12.3	7	5	69	94	163
Lesja	21.3	14.7	6.6	8	6	38	17	56
Nome	21.2	15.3	6.0	6	4	135	53	188
Lærdal	21.2	12.7	8.5	6	6	34	23	56
Lyngen	21.2	11.7	9.5	9	6	44	36	80
Sokndal	21.1	11.7	9.4	7	5	43	35	77
Øystre Slidre	20.9	14.1	6.8	5	5	63	30	93
Modalen	20.8	20.8	0.0	9	6	9	0	9
Stranda	20.8	10.1	10.7	9	5	58	62	120
Herøy Nordland	20.8	8.5	12.3	6	6	21	31	52
Vang	20.7	20.7	0.0	6	6	43	0	43
Sirdal	20.7	20.7	0.0	7	5	42	0	42
Frøya	20.5	7.9	12.6	5	6	44	69	113
Røros Rossen	20.4	15.2	5.3	7	5	107	37	144
Sel	20.4	9.4	11.0	8	5	72	85	157
Skjåk	20.1	12.3	7.8	8	6	35	22	58
Vinje	20.1	12.1	8.0	7	6	58	39	97
Øyer	20.1	12.5	7.6	6	4	83	51	134
Ål	20.1	12.0	8.0	7	5	76	51	127
Tolga	20.0	8.9	11.1	8	6	16	20	35
Eidfjord	20.0	20.0	0.0	7	6	26	0	26
Steigen	19.9	12.4	7.5	8	6	40	24	63
Ulstein	19.8	6.3	13.6	5	4	68	147	215
Gjerstad	19.8	11.5	8.4	6	5	34	25	60
Tvedestrand	19.7	9.9	9.9	4	4	84	84	168
Hemnes	19.5	9.9	9.6	8	6	55	53	108
Oppdal	19.4	7.6	11.8	7	5	68	106	174
Frosta	19.1	7.3	11.8	7	4	27	43	70
Måsøy	18.9	11.1	7.8	9	6	16	11	27
Unjárga Nesseby	18.8	10.1	8.7	9	6	11	10	21
Nord Odal	18.8	13.3	5.6	7	4	92	39	131
Dønna	18.8	14.1	4.7	7	6	25	8	34
Balsfjord	18.8	14.1	4.6	8	6	104	34	139
Deatnu Tana	18.8	6.9	11.9	6	6	25	43	68
Røst	18.8	18.8	0.0	8	6	11	0	11
Åfjord	18.7	13.1	5.5	8	6	73	31	103
Fjord	18.7	14.8	3.8	8	6	57	15	71
Nord Aurdal	18.6	9.0	9.6	7	4	75	79	153
Hægebostad	18.6	12.4	6.2	8	5	23	11	34
Rana	18.5	11.6	7.0	6	4	375	226	601
Kinn	18.5	12.1	6.4	6	5	245	130	374
Hol	18.3	11.8	6.5	6	5	72	40	112
Rennebu	18.2	11.9	6.3	7	5	39	20	59

Averøy	18.1	12.5	5.6	6	5	97	44	141
Stryn	18.0	9.1	8.9	7	5	79	76	155
Vik	18.0	18.0	0.0	10	6	56	0	56
Fyresdal	17.9	17.9	0.0	7	6	26	0	26
Skiptvet	17.9	17.3	0.6	3	3	87	3	90
Tydal	17.8	17.8	0.0	9	6	22	0	22
Alta	17.8	11.4	6.4	4	4	237	133	370
Trondheim Tråanten	17.8	14.5	3.3	5	2	2990	673	3663
Hammerfest	17.7	11.5	6.2	6	4	132	71	203
Kvinesdal	17.7	6.4	11.3	7	5	47	83	130
Senja	17.6	15.8	1.9	7	5	285	34	319
Moskenes	17.6	15.4	2.2	10	6	21	3	24
Søndre Land	17.6	5.5	12.1	5	4	46	102	147
Lyngdal	17.6	10.8	6.7	6	4	122	76	198
Loppa	17.6	17.6	0.0	10	6	19	0	19
Suldal	17.5	8.8	8.8	7	6	41	41	82
Tjeldsund	17.5	17.5	0.0	8	6	103	0	103
Aukra	17.5	11.0	6.5	8	5	43	25	68
Steinkjer	17.4	8.5	8.9	7	4	258	270	528
Kvæfjord	17.3	13.7	3.6	7	5	51	13	64
Seljord	17.3	10.7	6.5	7	5	38	23	61
Flakstad	17.2	17.2	0.0	8	6	30	0	30
Luster	17.1	8.0	9.1	8	6	54	61	115
Etnedal	17.1	14.3	2.9	9	5	25	5	30
Farsund	17.1	8.4	8.7	7	4	94	98	192
Nissedal	17.1	17.1	0.0	5	6	35	0	35
Sør Aurdal	17.0	15.0	1.9	8	5	61	8	69
Austevoll	17.0	12.2	4.8	5	5	71	28	99
Kvam	16.9	8.6	8.3	8	4	96	92	189
Salangen	16.9	16.2	0.8	7	6	46	2	48
Vestnes	16.9	16.6	0.3	5	5	149	3	151
Nes Buskerud	16.9	3.2	13.7	7	5	16	67	83
Heim	16.9	9.7	7.2	8	5	73	54	127
Vestvågøy	16.9	10.5	6.4	6	5	142	87	228
Lom	16.7	16.7	0.0	7	6	53	0	53
Høylandet	16.7	9.5	7.1	10	6	12	9	21
Vefsn	16.6	10.8	5.8	7	4	180	96	276
Brønnøy	16.6	7.3	9.3	5	5	75	95	170
Årdal	16.6	11.3	5.3	8	5	80	37	117
Vågan	16.5	10.7	5.8	6	5	114	62	176
Askvoll	16.5	11.7	4.8	8	6	48	19	67
Tysnes	16.5	12.1	4.4	8	6	50	18	67
Grane	16.4	13.9	2.5	9	6	27	5	32

Tynset	16.3	10.6	5.6	7	5	75	39	114
Engerdal	16.2	11.4	4.8	8	6	21	9	30
Grue	16.1	8.6	7.5	7	5	62	53	115
Froland	16.1	5.4	10.7	3	4	38	75	113
Notodden	16.0	6.4	9.6	7	4	109	163	271
Stjørdal	16.0	7.6	8.3	5	3	226	247	473
Hjartdal	15.9	15.9	0.0	8	5	33	0	33
Eidsvoll	15.9	11.7	4.2	2	3	354	128	482
Gloppen	15.8	2.8	13.0	8	5	19	89	108
Orkland	15.8	11.1	4.6	6	4	269	112	381
Andøy	15.7	6.8	8.9	8	6	41	53	94
Loabák Lavangen	15.7	15.7	0.0	9	6	21	0	21
Etne	15.6	9.9	5.7	7	5	54	31	85
Narvik	15.6	10.8	4.8	7	4	290	128	419
Sula	15.6	2.2	13.4	5	4	24	141	165
Gjemnes	15.6	14.8	0.8	6	5	42	2	45
Stad	15.6	9.2	6.4	7	5	111	78	189
Inderøy	15.6	4.0	11.5	5	4	35	101	136
Gjøvik	15.5	6.2	9.3	7	3	215	321	536
Hurdal	15.5	10.7	4.8	5	4	46	20	66
Drangedal	15.5	10.9	4.5	7	5	54	22	76
Askøy	15.4	11.3	4.1	3	3	351	128	479
Valle	15.4	15.4	0.0	8	6	19	0	19
Vanylven	15.4	15.4	0.0	8	6	65	0	65
Alstahaug	15.3	7.9	7.4	6	5	72	67	140
Tromsø	15.3	11.6	3.6	3	3	897	281	1177
Sør Varanger	15.2	10.7	4.5	6	5	125	53	178
Lebesby	15.1	15.1	0.0	7	6	23	0	23
Bjørnafjorden	15.1	6.3	8.7	4	4	187	259	446
Eigersund	15.1	5.2	9.8	6	4	85	161	246
Rauma	15.0	10.5	4.6	8	5	87	38	125
Nore og Uvdal	15.0	15.0	0.0	7	6	52	0	52
Kongsvinger	15.0	10.0	5.0	7	3	236	119	354
Hamar	15.0	11.2	3.8	7	2	465	158	623
Halden	15.0	9.4	5.6	5	3	380	227	607
Bergen	14.9	13.6	1.3	6	2	4083	401	4484
Levanger	14.9	2.8	12.1	6	4	68	293	361
Bærum	14.9	11.3	3.5	5	1	1770	552	2323
Alver	14.8	9.7	5.1	4	4	358	188	546
Vennesla	14.8	9.0	5.7	5	4	145	92	237
Molde	14.7	12.0	2.7	6	4	481	109	591
Grimstad	14.7	10.3	4.4	5	3	282	121	403
Stavanger	14.7	13.5	1.2	4	2	2062	178	2240

Rindal	14.7	14.7	0.0	8	5	37	0	37
Hadsel	14.6	5.3	9.3	7	5	54	93	147
Solund	14.5	14.5	0.0	8	6	15	0	15
Sykkylven	14.5	6.5	8.0	6	4	63	76	139
Tinn	14.5	10.2	4.2	6	5	80	33	113
Strand	14.4	5.2	9.2	5	4	75	133	208
Herøy Møre og Romsdal	14.4	12.0	2.4	6	5	133	27	160
Oslo	14.4	12.2	2.1	4	1	7442	1299	8742
Kragerø	14.4	3.8	10.5	6	4	55	152	207
Samnanger	14.3	14.3	0.0	5	4	47	0	47
Flatanger	14.3	14.3	0.0	7	6	24	0	24
Ulvik	14.3	14.3	0.0	8	6	19	0	19
Målselv	14.2	12.0	2.1	7	5	91	16	107
Haugesund	14.1	12.9	1.2	5	3	551	49	601
Vaksdal	14.1	12.9	1.1	8	5	61	5	66
Våler Innlandet	14.1	14.1	0.0	6	5	84	0	84
Vestre Slidre	14.0	12.4	1.7	7	5	32	4	36
Sarpsborg	14.0	10.1	3.9	6	2	668	259	927
Værøy	14.0	14.0	0.0	8	6	13	0	13
Nordkapp	14.0	14.0	0.0	5	6	52	0	52
Birkenes	14.0	7.2	6.8	5	4	44	41	85
Sauda	13.9	4.8	9.2	9	5	24	46	70
Hustadvika	13.9	10.3	3.6	6	5	160	57	217
Ålesund	13.9	10.8	3.1	6	3	804	233	1037
Skaun	13.9	10.7	3.2	3	4	106	31	137
Nesodden	13.9	9.7	4.2	3	3	242	105	347
Larvik	13.8	10.7	3.1	6	3	692	201	893
Vardø	13.8	13.8	0.0	7	6	34	0	34
Stor Elvdal	13.7	13.7	0.0	9	6	48	0	48
Sandnes	13.7	12.4	1.2	3	2	1033	103	1136
Modum	13.6	9.7	4.0	5	3	189	77	267
Åsnes	13.6	13.6	0.0	8	5	134	0	134
Gran	13.6	12.4	1.2	6	3	228	21	250
Sømna	13.6	13.6	0.0	8	6	33	0	33
Holtålen	13.5	6.5	7.1	8	6	18	19	37
Meløy	13.5	13.0	0.5	7	6	103	4	107
Sørreisa	13.5	8.3	5.2	7	5	35	22	57
Masfjorden	13.5	13.5	0.0	9	6	31	0	31
Arendal	13.5	9.5	4.0	5	3	545	233	778
Aure	13.5	4.8	8.7	7	6	22	39	61
Melhus	13.4	10.4	3.0	6	4	201	59	259
Krødsherad	13.4	13.4	0.0	6	5	37	0	37
Harstad	13.4	10.3	3.1	7	4	298	88	386

Sola	13.4	12.8	0.6	4	3	372	18	390
Kviteseid	13.4	12.8	0.6	7	5	47	2	49
Sunndal	13.3	13.3	0.0	7	5	128	0	128
Bø	13.2	13.2	0.0	9	6	56	0	56
Giske	13.2	1.6	11.7	5	4	15	116	131
Midt Telemark	13.2	10.6	2.6	7	4	126	30	156
Øksnes	13.2	13.2	0.0	6	5	82	0	82
Indre Fosen	13.2	10.0	3.2	7	5	129	42	170
Aremark	13.2	13.2	0.0	6	5	28	0	28
Rakkestad	13.2	5.4	7.8	5	3	57	82	140
Nordre Follo	13.2	10.3	2.8	6	1	711	194	905
Lunner	13.1	10.7	2.3	3	3	126	28	153
Smøla	13.0	13.0	0.0	7	6	37	0	37
Surnadal	13.0	12.8	0.3	8	5	95	2	97
Bardu	13.0	13.0	0.0	8	5	52	0	52
Ullensvang	12.9	10.1	2.8	8	5	143	39	182
Lindesnes	12.8	8.4	4.5	5	4	236	126	362
Vindafjord	12.8	12.8	0.0	6	5	136	0	136
Sør Fron	12.8	12.8	0.0	7	5	56	0	56
Malvik	12.8	5.6	7.2	3	3	93	118	211
Nordre Land	12.7	12.7	0.0	7	4	108	0	108
Tønsberg	12.7	9.9	2.8	5	2	732	206	938
Nord Fron	12.7	12.7	0.0	7	5	98	0	98
Kristiansand	12.6	9.3	3.3	5	3	1159	409	1568
Asker	12.6	9.1	3.5	4	2	1091	420	1511
Sogndal	12.6	10.3	2.3	6	5	129	29	159
Lier	12.6	7.6	5.0	3	2	251	163	414
Moss	12.6	7.1	5.4	5	2	482	367	849
Kristiansund	12.6	9.4	3.2	6	4	265	90	355
Stord	12.5	7.9	4.6	6	4	177	102	280
Tingvoll	12.5	12.5	0.0	8	5	49	0	49
Færder	12.4	8.6	3.9	5	3	338	153	491
Lødingen	12.4	12.4	0.0	8	6	40	0	40
Nordreisa	12.4	12.4	0.0	6	5	74	0	74
Grong	12.4	11.8	0.6	9	5	34	2	36
Gausdal	12.3	10.1	2.2	7	4	87	19	106
Øvre Eiker	12.3	8.7	3.6	5	3	209	87	296
Hábmer Hamarøy	12.3	10.8	1.5	7	6	42	6	48
Lillehammer	12.3	10.6	1.7	7	3	373	58	430
Trysil	12.3	12.0	0.2	7	5	105	2	107
Storfjord Omasvuotna Omasvuono	12.2	12.2	0.0	6	6	30	0	30
Indre Østfold	12.2	10.1	2.1	4	3	577	119	696
Lørenskog	12.2	9.3	2.9	3	1	473	146	619

Hareid	12.2	12.2	0.0	6	4	70	0	70
Elverum	12.2	10.9	1.2	6	3	268	29	297
Bømlo	12.1	12.1	0.0	5	5	173	0	173
Vestre Toten	12.0	3.8	8.2	6	3	64	139	203
Meråker	11.9	11.9	0.0	7	5	37	0	37
Flå	11.9	11.9	0.0	8	5	18	0	18
Kvinnherad	11.9	9.1	2.8	7	5	154	48	201
Aarborte Hattfjelldal	11.8	11.8	0.0	9	6	20	0	20
Lillestrøm	11.8	8.4	3.3	5	1	819	321	1140
Time	11.7	9.6	2.2	4	3	209	48	257
Sør Odal	11.6	11.6	0.0	4	4	133	0	133
Ås	11.6	11.2	0.4	5	2	246	8	254
Alvdal	11.6	11.6	0.0	7	5	36	0	36
Voss	11.5	11.5	0.0	8	4	221	0	221
Os	11.5	11.5	0.0	7	5	29	0	29
Gulen	11.5	11.5	0.0	8	6	34	0	34
Kvænangen	11.5	11.5	0.0	9	6	19	0	19
Skien	11.4	9.3	2.1	6	3	629	142	771
Verdal	11.4	9.2	2.2	5	4	165	39	203
Snåase Snåsa	11.4	11.4	0.0	9	6	31	0	31
Bamble	11.4	5.4	6.0	5	3	95	105	201
Flekkefjord	11.4	11.4	0.0	7	4	120	0	120
Hjelmeland	11.3	11.3	0.0	7	6	35	0	35
Nittedal	11.2	9.3	2.0	4	2	251	54	305
Sigdal	11.2	11.2	0.0	6	5	58	0	58
Ibestad	11.2	6.0	5.2	9	6	12	11	23
Bodø	11.2	10.1	1.0	5	3	599	61	661
Sørfold	11.1	11.1	0.0	8	6	27	0	27
Drammen	11.0	9.5	1.5	6	2	1065	174	1239
Gratangen	11.0	11.0	0.0	8	6	18	0	18
Lund	11.0	11.0	0.0	6	5	46	0	46
Porsgrunn	11.0	10.5	0.5	6	3	465	21	487
Sortland Suortá	10.9	10.3	0.6	5	4	127	8	134
Karmøy	10.9	10.3	0.7	6	4	481	32	513
Holmestrand	10.9	7.1	3.8	3	3	251	136	387
Fjaler	10.9	10.9	0.0	9	6	32	0	32
Vågå	10.8	10.8	0.0	9	5	46	0	46
Selbu	10.8	10.8	0.0	8	5	62	0	62
Fredrikstad	10.8	10.4	0.4	5	2	1094	47	1141
Klepp	10.7	10.6	0.2	3	3	212	3	215
Øygarden	10.7	8.5	2.2	1	4	389	102	491
Overhalla	10.7	10.7	0.0	7	5	42	0	42
Risør	10.6	10.1	0.5	6	4	98	5	103

Gjesdal	10.6	7.0	3.6	1	3	91	47	138
Evje og Hornnes	10.6	10.6	0.0	7	4	44	0	44
Frogn	10.6	8.6	2.0	4	2	205	48	253
Nes Akershus	10.5	8.9	1.6	2	3	253	47	299
Nannestad	10.4	10.2	0.2	1	3	170	4	174
Ringsaker	10.4	10.3	0.1	6	3	440	2	442
Aurskog Høland	10.3	10.1	0.1	4	3	245	3	248
Løten	10.3	10.3	0.0	6	3	99	0	99
Rollag	10.3	10.3	0.0	8	5	21	0	21
Ringerike	10.2	7.5	2.7	6	3	290	106	397
Sveio	10.2	10.2	0.0	4	4	67	0	67
Dovre	10.1	10.1	0.0	9	6	36	0	36
Vadsø	10.1	4.4	5.7	6	5	31	40	71
Hå	10.1	9.9	0.1	4	4	204	3	207
Gjerdrum	10.0	7.4	2.6	1	2	71	25	95
Dyrøy	10.0	8.6	1.4	7	6	12	2	14
Ullensaker	9.9	9.9	0.0	2	2	429	0	429
Osterøy	9.9	9.9	0.0	6	4	103	0	103
Siljan	9.9	9.9	0.0	6	4	33	0	33
Randaberg	9.8	6.8	3.0	5	3	99	44	142
Rælingen	9.8	9.0	0.8	3	1	170	16	186
Enebakk	9.8	9.8	0.0	2	3	120	0	120
Båtsfjord	9.8	9.8	0.0	5	6	24	0	24
Kongsberg	9.7	5.8	3.9	5	3	199	134	333
Flesberg	9.7	9.7	0.0	6	4	37	0	37
Hvaler	9.6	9.6	0.0	1	4	91	0	91
Sandefjord	9.6	7.5	2.1	5	3	624	176	800
Hole	9.6	6.3	3.3	4	3	57	30	87
Guovdageaidnu Kautokeino	9.5	5.2	4.3	5	6	15	13	28
Saltdal	9.5	8.4	1.1	7	5	51	6	57
Fauske Fuossko	9.5	9.5	0.0	7	4	113	0	113
Tysvær	9.3	9.1	0.2	5	4	115	3	118
Marker	9.3	9.3	0.0	7	4	53	0	53
Åmot	9.2	9.2	0.0	7	5	45	0	45
Jevnaker	9.2	9.2	0.0	5	3	86	0	86
Ørland	9.1	5.4	3.7	7	5	72	49	121
Østre Toten	9.1	9.1	0.0	7	4	170	0	170
Austrheim	9.1	9.1	0.0	7	5	35	0	35
Råde	9.1	8.8	0.2	5	3	93	3	96
Vegårshei	9.0	9.0	0.0	5	5	24	0	24
Horten	8.9	8.2	0.8	6	2	288	27	314
Bindal	8.9	8.9	0.0	9	6	16	0	16
Bjerkreim	8.9	8.9	0.0	3	4	27	0	27

Stange	8.8	8.3	0.5	6	3	221	12	233
Vestby	8.8	8.8	0.0	2	2	205	0	205
Åmli	8.5	8.5	0.0	6	5	20	0	20
Eidskog	8.2	8.2	0.0	6	4	78	0	78
Rendalen	7.7	7.7	0.0	6	6	23	0	23
Gáivuotna Kåfjord Kaivuono	7.6	7.6	0.0	9	6	21	0	21
Lillesand	7.5	7.5	0.0	5	3	108	0	108
Gol	6.2	6.2	0.0	7	4	41	0	41
Våler Østfold	5.5	5.5	0.0	1	3	38	0	38
Namsskogan	2.5	0.0	2.5	10	6	0	3	3