

DISCUSSION PAPER

**Digital inclusion in
distance spanning
health solutions -
Insights from four
model regions**



Nordregio

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1. Introduction

The expansion of stable digital connectivity in rural Nordic regions has fuelled innovation across various sectors. In the health and social care sector, distance spanning solutions offer a novel opportunity to provide better, more accessible, efficient and sustainable services, particularly to people in underserved areas.

The project "Integrated Healthcare and Care through Distance Spanning Solutions" (iHAC) has been looking into the different aspects surrounding the provision of remote care services, ranging from questions on sustainability (Melkas et al., 2024) over regional development (Lundgren et al., 2020) to governance (Gustafsson & Dannapfel, 2024). This discussion paper contributes to the body of findings that has resulted from iHAC by examining the dimension of digital inclusion. Drawing on data collected in the context of two other research projects funded by the Nordic Council of Ministers, "Digital Inclusion in Action" and the "Nordic-Baltic 5G Monitoring Tool", this report aims to unearth some of the factors that need to be taken into consideration to ensure an inclusive rollout of distance spanning health solutions in the Nordic countries. It further aims to provide directions for future investigations into the inclusion dimension of digital health and care services.

This paper focuses on four of the five Nordic model regions identified in the iHAC publication "Integrated Healthcare and Care through distance spanning solutions – for increased service accessibility" (Rødseth et al., 2022): [Päijät-Häme, Finland](#), [Ejallabyggð, Iceland](#), [Agder, Norway](#) and [Norrtälje, Sweden](#).

2. Background: Digital Inclusion

In the Nordic countries, there is no unifying definition of digital inclusion or its antonym, digital exclusion. A report commissioned by the Nordic Council of Ministers from 2022 came forward with the following ambitious framework to define the term: "Digital inclusion is prevailing when all people, including the most disadvantaged and vulnerable groups, have access to and the ability to use information and communication technology related to public sector services." (*Monitoring Digital Inclusion in the Nordic-Baltic Region*, 2022). It needs to be noted here that this definition focuses on digital public services and omits the role played by private digital actors and services in attaining a digitally inclusive society.

What should be retained from this definition is the fact that access and ability lie at the heart of the digital inclusion debate. To understand which groups are most affected, the report further identified seven groups at risk of digital exclusion, later refined in the context of the "Digital Inclusion in Action project" into six groups (1) older adults, (2) young people, (3) individuals with disabilities, (4) immigrants, (5)

socially vulnerable individuals and (6) rural communities. While this list of vulnerable groups helps to study, identify and address barriers to digital inclusion, one also needs to highlight the intersectionality and situational nature of digital exclusion. The encountered barriers may differ from individual to individual within the same group dependent on *inter alia* gender and class but also the specific circumstances of a situation where digital exclusion is experienced. The individual contexts that define challenges that a group or an individual faces may further differ from country to country, from region to region (Wendt-Lucas et al., 2024).

The Nordic countries rank high in various studies on digitalisation. These include, for instance, the European Union’s Digital Economy and Society Index (DESI) or the UN’s E-Government Development Index (EGDI). In the 2024 DESI, which includes data from the 27 member states of the European Union (EU), the three Nordic EU countries Finland, Denmark and Sweden were among the top six countries regarding the share of the population using the Internet and the share of people with at least basic digital skills. They were also in the top ten regarding digital public services for citizens (see Table 1). Paradoxically, past studies have shown that the high degree of digitalisation has also reinforced the marginalisation of vulnerable groups, see e.g. (Coles-Kemp et al., 2018). A lack of digital capabilities, and access problems linked to connectivity itself but also to available hardware like computers or inclusive digital interface design has been shown to hinder certain groups from accessing essential public services and information (Jessen et al., 2024). This can have an impact on, *inter alia*, overall quality of life (Alhassan & Adam, 2021) but also the ability to benefit from the rising number of eHealth services (Kaihlainen et al., 2022). When examining distance-spanning health and care solutions it is hence crucial to evaluate possible factors that might affect an inclusive rollout and use of these digitally enabled healthcare and care solutions, particularly in rural regions.

	Denmark	Finland	Iceland*	Norway**	Sweden
Share of individuals using the Internet	97,47%	95,45%	98%	99,0%	96,87%
Share of the population with at least basic digital skills	69,62%	81,99%	91%	89%	66, 44%
Share of the population with above basic digital skills	39,37%	53,63%	55%	81,11%	36,51%
Digital public services for citizens	84,24 Score 0 to 100	90,61 Score 0 to 100	N/A	N/A	93,28 Score 0 to 100

Table 1: All data except Iceland and Norway from the DESI 2024 (European Commission, 2024), Iceland*: (Eurostat, 2021, 2024; World Bank, 2022). Norway**: (Berg, 2021; Datareportal, 2024; Forvaltningsdepartementet, 2024).

3. Methods and Data

This report builds first and foremost on data collected within two projects: “Digital Inclusion in Action” and the “Nordic-Baltic 5G Monitoring Tool”, both funded by the Nordic Council of Ministers (Nordregio, 2024b, 2024a). The data includes information on the status of the rollout of 5G connectivity as well as demographic and socio-economic data. The data from the two projects is supplemented with insights drawn from national statistical databases, grey literature and academic publications.

4. The Four Model Regions

The following sections will zoom in on the four previously identified model regions (Rødseth et al., 2022). Besides a focus on the respective digitalisation programmes for health and care services, digital accessibility and different socio-economic aspects will be taken into account to examine potential digital exclusion risks.



Photo: Skyfish

a. Päijät-Häme wellbeing services county, Finland

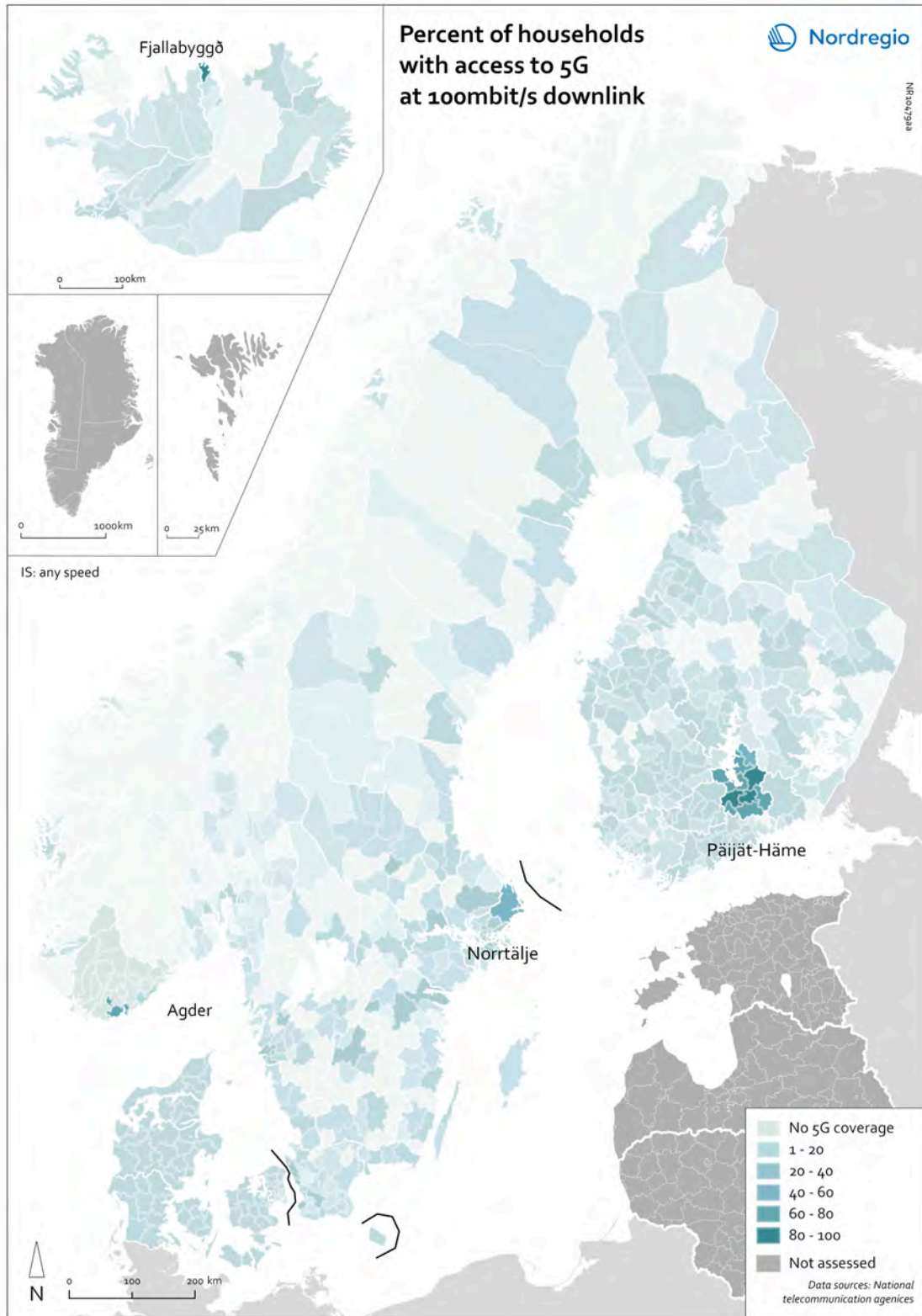
Päijät-Häme is a region in Southern Finland, composed of 10 municipalities, with approximately 204,000 inhabitants (2023). Its capital city Lahti is located just over 100 km from Helsinki. Other towns in the region include Heinola and Orimattila. The regional economy is diverse, with more than a third of employment provided by the social and health services and industry sectors. Notable industries include furniture manufacturing, beverage production, clothing, drainage pipes, plastics, sawmills, and environmental technology (The Regional Council of Päijät-Häme, 2024).

The Päijät-Häme Wellbeing Services County, established in 2023 as part of the Healthcare and Social Services Reform, is tasked with organising and providing healthcare across the region. This move transitioned service provision from municipal and hospital districts to wellbeing services counties (NWC, 2022).

Päijät-Häme is a pioneer in remote care in Finland and has incorporated technology extensively into its home care services. Using, for instance, medicine robots to serve regular clients, enhancing care delivery. The initiative also cooperates with actors doing on-the-spot visits, using e.g. tablet computers, video calls, automated medicine dispensers and e-locks (Interreg Europe, 2020).

Additionally, the Päijät-Häme Wellbeing Services County's KOHTI project—part of the national KATI program^[1]—focuses on integrating technology into home care. The KOHTI model, which particularly targets the elderly, emphasises customer involvement rather than patient care, reflecting its social welfare foundation. It tests various technologies to boost staff well-being and competency and engages customers in their care processes. The KOHTI model explores the entire lifecycle of technologies used in home care—from prototype development to discontinuation—focusing on user experience and a customer-centric approach (NWC, 2022).

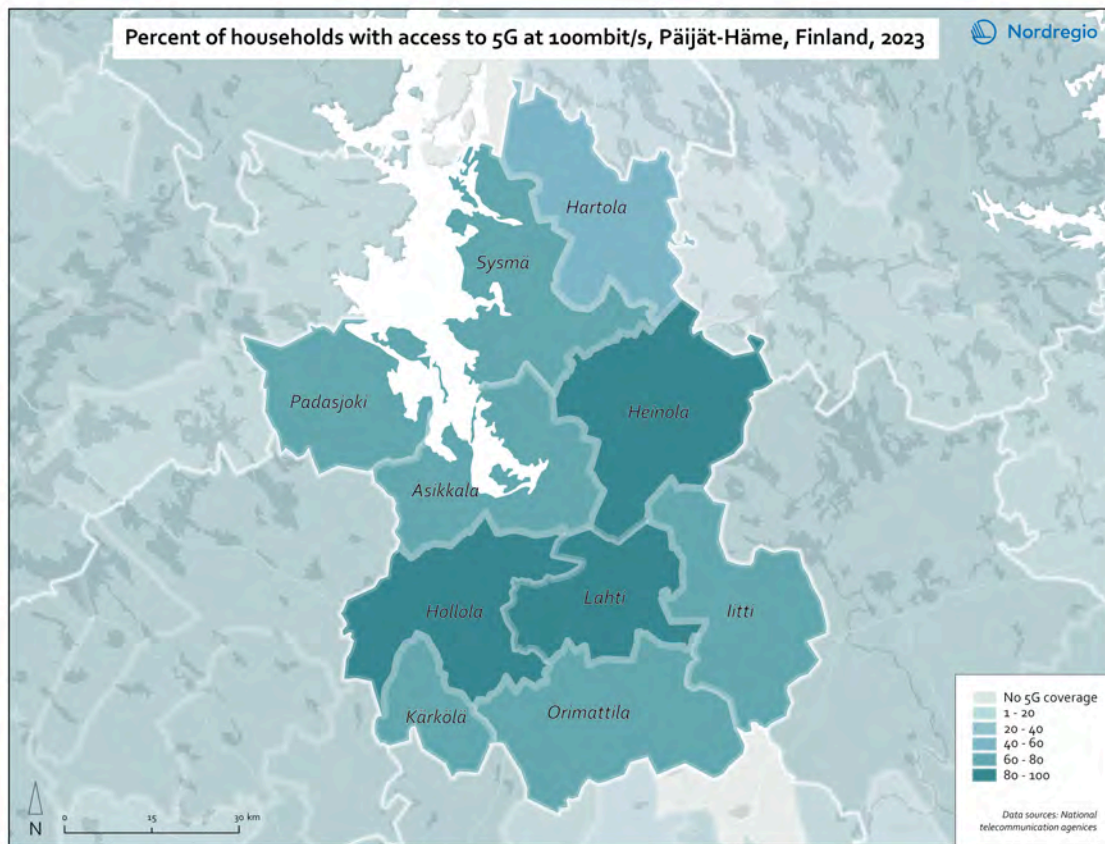
1. The goal of the national KATI programme is to support smart ageing and offer technology enabled home care. KATI stands for "Kotona asumista tukeva teknologia iäkkäille", which translates to "Technology Supporting Home Living for the Elderly" in English.



Map 1: Percent of households with access to 5G at 100 mbit/s downlink in the four model regions. Data obtained from the respective national authorities: Denmark 2023, Finland 2023, Sweden 2023, Norway 2022, Iceland 2023.

Digital Connectivity

The successful implementation of e-health solutions relies extensively on stable and reliable digital connectivity. As of 2023, the majority of municipalities in the Päijät-Häme region boasted 5G access with speeds of 100mbit/s, with over 70% of households connected (see Map 1 and Map 2). However, in three of the northernmost municipalities, the 5G coverage ranged from 50% to 70% at 100 mbit/s (Nordregio, 2024b)^[2].



Map 2: Percent of households with access to 5G at 100 mbit/s downlink, Päijät-Häme, Finland, 2023.

Groups at Risk of Digital Exclusion

The aging population is a significant concern in the Päijät-Häme region. The old age dependency ratio lies at 40,5% (see Map 6), which is slightly higher than the national average of 37,8% in Finland (Eurostat, 2024). Moreover, the three

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2. Although 5G coverage is not essential for accessing digital health and care services, it serves as an indicator of the availability of high-speed mobile internet connectivity at the time this data was retrieved. Broadband internet access and other mobile data options may also be sufficient for utilising the discussed digital services. This consideration applies to all regions covered in this paper.

northernmost municipalities within this region have an even higher old age dependency ratio, exceeding 70%. The average age in the region is 45.2 years which is above the national average of about 43.3 years (Statistics Finland, 2023).

The share of individuals with a foreign background lies between 2% and 4% throughout the region, except for Lahti where it is 8.6%. There is a strong correlation between education level and poverty rates. The three northernmost rural municipalities report both the highest rates of low educational attainment (37-38%) and the highest proportion of the population at risk of poverty (18-20%) (Nordregio, 2024a).

In the Finnish model region, the northernmost municipalities face significant socio-demographic and economic challenges, which are intensified by their remote locations far from the regional centre. This distance complicates the delivery of high-quality health and social care. In this situation, promoting digital inclusion and enhancing the quality of remote care are crucial for effectively tackling these disparities.

b. Fjallabyggð municipality, Northeastern region, Iceland

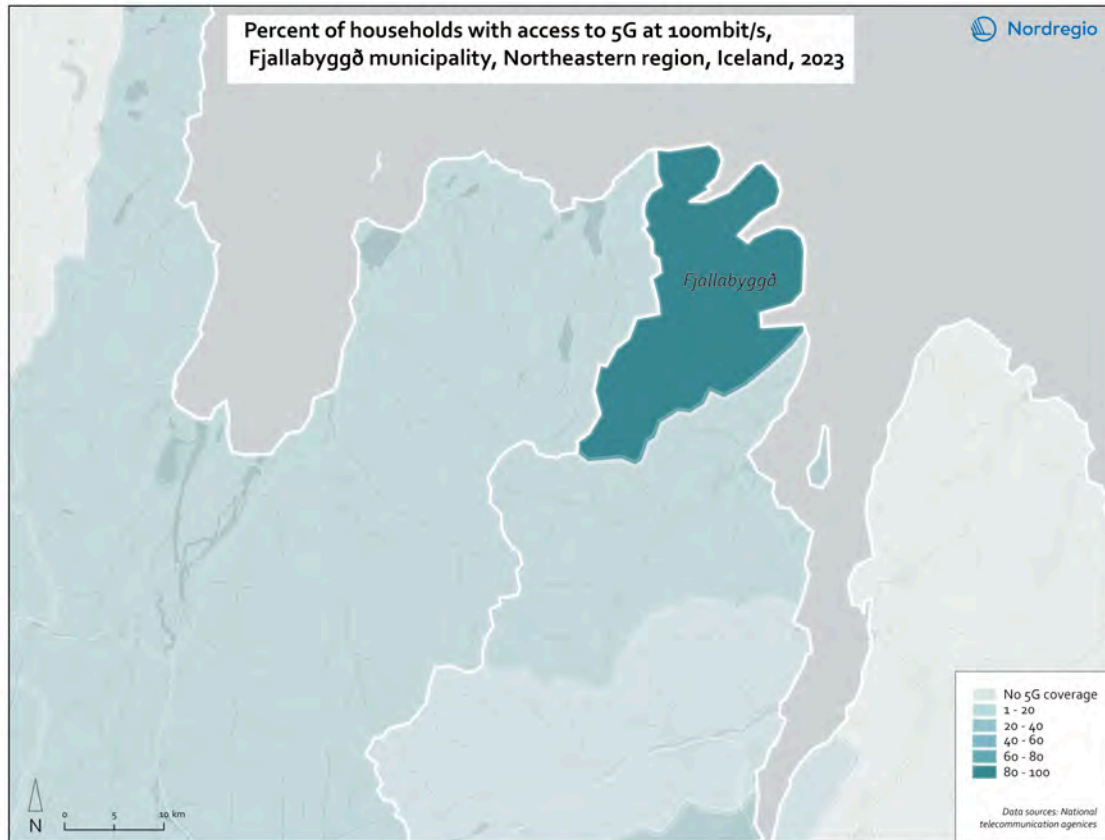
The Fjallabyggð municipality, situated in the northernmost part of Iceland, has a population of 1,973 (Statistics Iceland, 2024). The largest town within the municipality, Siglufjörður, is linked with Ólafsfjörður by the 11 km Héðinsfjörður Tunnels, which were inaugurated in 2010 (The municipality of Fjallabyggð, n.d.) This municipality faces a growing proportion of elderly residents, prompting initiatives to improve and innovate elderly care through integrated care services and technology (NWC, 2022).

Fjallabyggð is aiming to be a national leader in providing elderly care services by harnessing digital and distance-spanning solutions. The municipality is increasingly deploying remote healthcare technologies and improving the integration of social services, home care, and health services. It has entered a cooperation agreement with various regional and national entities to develop integrated health and social services for the elderly and facilitate data sharing between health and social care sectors (NWC, 2022).

A key initiative is the Hátindur 60+ project, which seeks to develop healthcare and care services that bolster the independence, as well as physical and social health of elderly residents, enabling them to remain in their homes longer. This project is a collaborative approach, involving multiple stakeholders including VeITek (Health and Welfare Technology Cluster of the North), the Healthcare Institution of North Iceland - HSN, the Icelandic Association of Local Authorities, and the Ministries of Health and Social Affairs. This network of partnerships underscores Fjallabyggð's commitment to integrating and enhancing care services through innovative technologies and community-coordinated care, positioning it at the forefront of integrated elderly care in Iceland (Integrated Health and Care, 2024).

Digital Connectivity

As of 2023, 98% of households in Fjallabyggð were covered with 5G at 100mbit/s at 100mbit/s downlink (see Map 1 and Map 3) (Nordregio, 2024b).



Map 3: Percent of households with access to 5G at 100 mbit/s downlink, Fjallabyggð municipality, Northeastern region, Iceland, 2023.

Groups at Risk of Digital Exclusion

The old age dependency ratio in Fjallabyggð municipality is 23%, which is comparable to the national level (Nordregio, 2024a and see Map 3). Yet, the average age in the municipality lies at 44.2 years which is higher than the average age on a national level in Iceland which is 38.8 years as of 2024 (Statistics Iceland, 2024).

The share of individuals with a foreign background is 30%. Approximately 33% of the population in the municipality has low educational attainment, and 9% are at risk of poverty (Nordregio, 2024a).

c. Agder, Norway

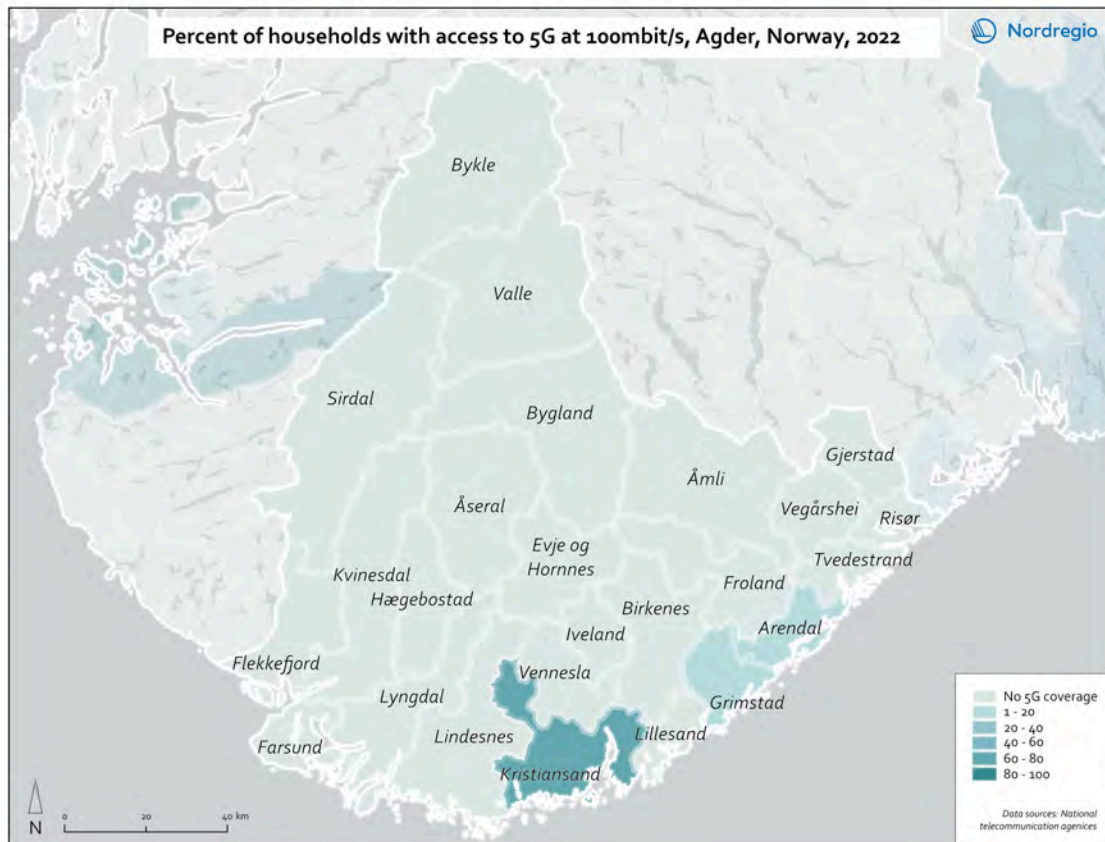
Agder is a county (fylke) in the southern part of Norway that consists of 25 municipalities. Its administrative centre is Kristiansand. About 320,000 people lived in Agder in 2024 with 80.2% of the population living in the county's most densely populated areas (Statistisk sentralbyrå, 2024b). There are three main hospitals in the county which are located in the two largest cities, Kristiansand and Arendal, as well as in the smaller town of Flekkefjord in the western part of Agder. The umbrella organisation, Sørlandet Hospital, has been engaged in the adoption and advancement of e-health solutions for the region since 2013 (Rødseth et al., 2022).

In 2016, the Regional Coordination Group (RCG) for e-health and welfare technology was established with the goal to widen and deepen the integration of welfare technology into its health infrastructure to provide reliable care services to anyone in need. The "E-health Agder 2030" programme provides the official framework for these ambitions (ibid). Some of the technologies and measures in use today include municipal response centres which receive alarms from installed door alarms, bed sensors, epilepsy sensors etc. Furthermore, Agder offers patients with a variety of conditions digital home follow up appointments (University of Agder, 2024).

While only roughly 20% of the county's population lives in the countryside, the distances travelled by patients and care providers from and to rural areas are considerable as all three main hospitals are located along the coastline. This is amplified in some of the county's regions where the local topology is shaped by fjords or mountain ranges.

Digital Connectivity

For a seamless and inclusive implementation of the e-health solutions listed above and others, stable and reliable digital connectivity is crucial. In 2022, the rollout of 5G in Agder was still in its early stages. Only Kristiansand municipality offered 75% of households 5G access at 100mbit/s, followed by Arendal municipality where 15% of households had access to 5G at the given speed, and Grimstad where 2% of the households benefited from 5G access at 100mbit/s (see Map 1 and Map 4). The other 22 municipalities remained underserved in terms of 5G mobile connectivity based on the data received in 2022 and had to rely on lower speeds, broadband connectivity or earlier generations of broadband cellular networks (Nordregio, 2024b).



Map 4: Percent of households with access to 5G at 100 mbit/s downlink, Agder, Norway 2022.

Groups at Risk of Digital Exclusion

In Agder County, there are four municipalities where the old age dependency ratio lies over 40% (see Map 1 and MAP 4).^[3] In all other municipalities, this value lies between 20% and 30% or 30% and 40% respectively. With an overall average age of 41.2, Agder is close to the Norwegian average of 41.3 (Statista, 2024; Statistisk sentralbyrå, 2024a).

The share of individuals with a foreign background lies between 10 and 20% in most of the county. Only in Bykle municipality, 21.11% of the population has a foreign background while Hægebostad (7.89%) and Bygland (8.98%) are municipalities where the share of individuals with migration background lies under 10% (Nordregio, 2024a).

Looking at education levels and the share of the population who are at risk of poverty, three counties stand out including Bykle (lower education 18.62%, poverty 9.50%), Valle (lower education 21.17%, poverty 8.80%) and Sirdal (lower education 21.56%, poverty 6.10%) (Nordregio, 2024a).

In conclusion, it becomes apparent that the population groups who might face greater barriers to accessing digital health services due to socio-economic

3. Valle 41.96%, Bygland 43.04%, Åmli 40,51%, Risør 44,68% (Nordregio, 2024a).

circumstances and age live in the municipalities that lie the furthest from the county's urbanised centres and main hospitals. It is hence those who might benefit the most from distance spanning health solutions that might also struggle the most to (meaningfully) utilise these digital services.

d. Tiohundra Norrtälje, Sweden

Norrtälje is the name of both a municipality and its largest town in the nethermost part of Stockholm County. In December 2023 about 66,000 people lived in Norrtälje municipality. With its 2015 km² area, Norrtälje is by far the largest municipality within the county. In 2020, only about 33% of the municipality's population lived in densely populated areas. The majority of Norrtälje's inhabitants hence live in the sparsely populated countryside.

In 2006, Norrtälje adopted a social and health care plan that, to this date, is unique in Sweden. By integrating the healthcare and social care sectors covered previously by the county council and the municipality respectively, the "tiohundra" programme aims to reduce administrative costs and provide better and more efficient services.

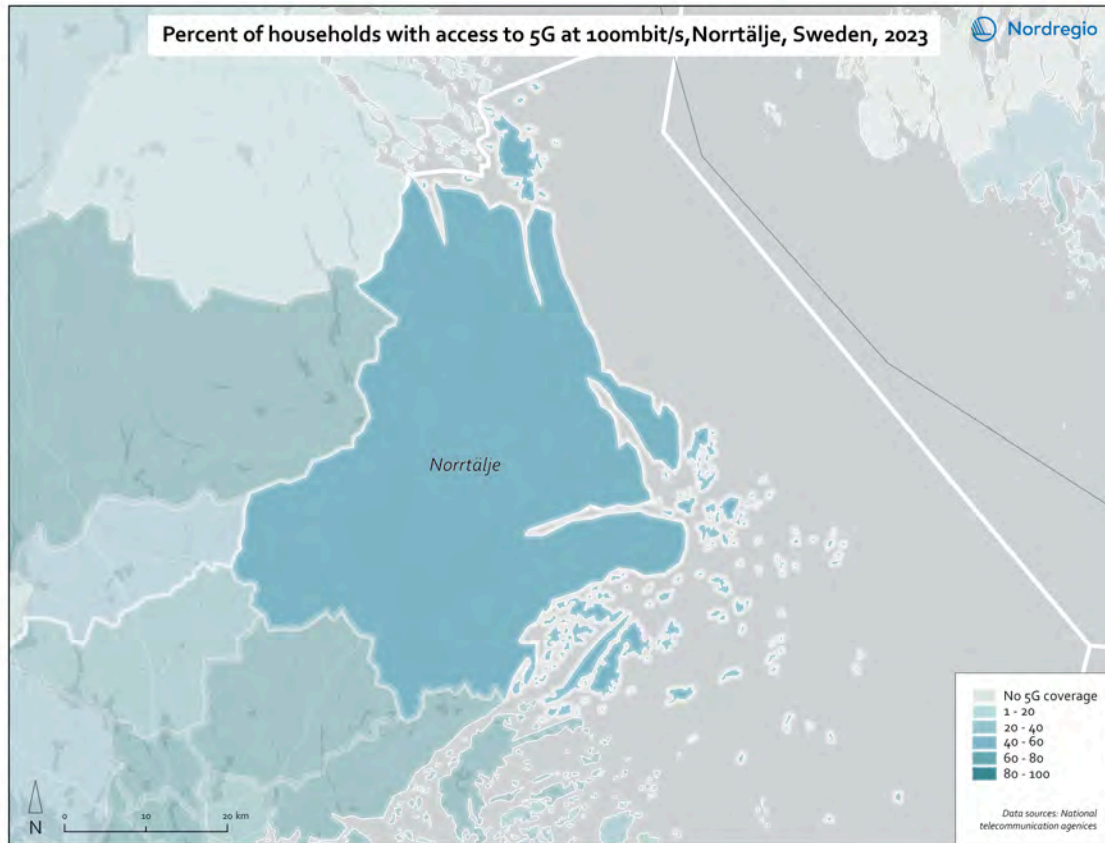
^[4] Tiohundra AB is owned by the Municipal Association for Health and Social Care in Norrtälje, which is a collaboration between Region Stockholm and Norrtälje Municipality (Region Stockholm, 2023).

Tiohundra has integrated a number of technological solutions into its services. These include, amongst others, the automation of administrative workflows, remote monitoring with electrodes and the use of VR goggles to guide individuals with neck injuries through training programmes (Leffler, 2023). Employing these different digitally enabled strategies allows the programme to provide even less mobile patients or people living in rural areas with better care. This further holds the potential to reduce the care sector's carbon footprint in the municipality (Melkas et al., 2024).

Digital Connectivity

In 2023, 58% of households in Norrtälje were covered by 5G with a download speed of 100mbit/s which is comparable to other municipalities in the Greater Stockholm area (Nordregio, 2024b and see Map 1 and Map 5). Here it needs to be highlighted that more than 13,000 islands that stretch out over the Stockholm archipelago also form part of Norrtälje municipality which might affect the overall average digital connectivity of the municipality.

4. "Tiohundra" means ten hundred in Swedish. The name of the programme has historic origins. In Viking times, the region was divided into 'hundare', which meant that a certain area had to have a hundred men ready to trade. Norrtälje belonged to "Tiundaland", the land of ten hundare (10100, n.d.).



Map 5. Percent of household with access to 5G at 100mbit/s, Norrtälje, Sweden, 2023.

Groups at Risk of Digital Exclusion

The median age in Norrtälje was 45.0 years in 2023 which makes it the municipality within Stockholm County with the highest median age (Statistikmyndigheten SCB, 2023). According to the Nordic and Baltic Digital Inclusion Indicator Mapping Tool, the old age dependency ratio lies at 48.44% while 26.72% of the local population are younger than 14 years (Nordregio, 2024a and see Map 6).

The unemployment rate in the municipality lies at 5.62% and is close to the nationwide average. Yet, 13.10% are considered to be at risk of poverty and 21.61% are considered to have a low education level. One fourth of Norrtälje's population has a foreign background (Nordregio, 2024a).

Norrtälje is hence a municipality with a large rural and ageing population. It can further be stated that considerable parts of the population are at risk of digital exclusion due to their socio-economic status.

5. Discussion

Based on a previous classification of groups at risk of digital exclusion, several areas where challenges pertaining to digital exclusion might arise could be identified in all the four model regions. In most cases, the identified vulnerable groups are simultaneously amongst the people who are most likely to rely on the digital (health) care services offered in the model regions. For instance, in Agder, the municipalities with a higher share of economically vulnerable inhabitants are the ones located the farthest from the county's three main hospitals. In Norrtälje, large parts of the population live in sparsely populated areas and have the highest median age in Stockholm County. Data from the DESI further show that the level of digital skills amongst the Swedish population aged 65 and higher is relatively low (European Commission, 2024). In the Finnish model region, the municipalities with the highest old age dependency ratio also have the highest poverty risk rates and the lowest levels of educational attainment. Additionally, these municipalities are the furthest from the regional centre, potentially exposed to higher physical accessibility challenges.

Based on these insights, two main questions arise:

1. To what extent are the identified digital inclusion challenges affecting the use of and benefits from distance-spanning health solutions in these specific contexts?
2. Are these challenges already being addressed and if yes, how?

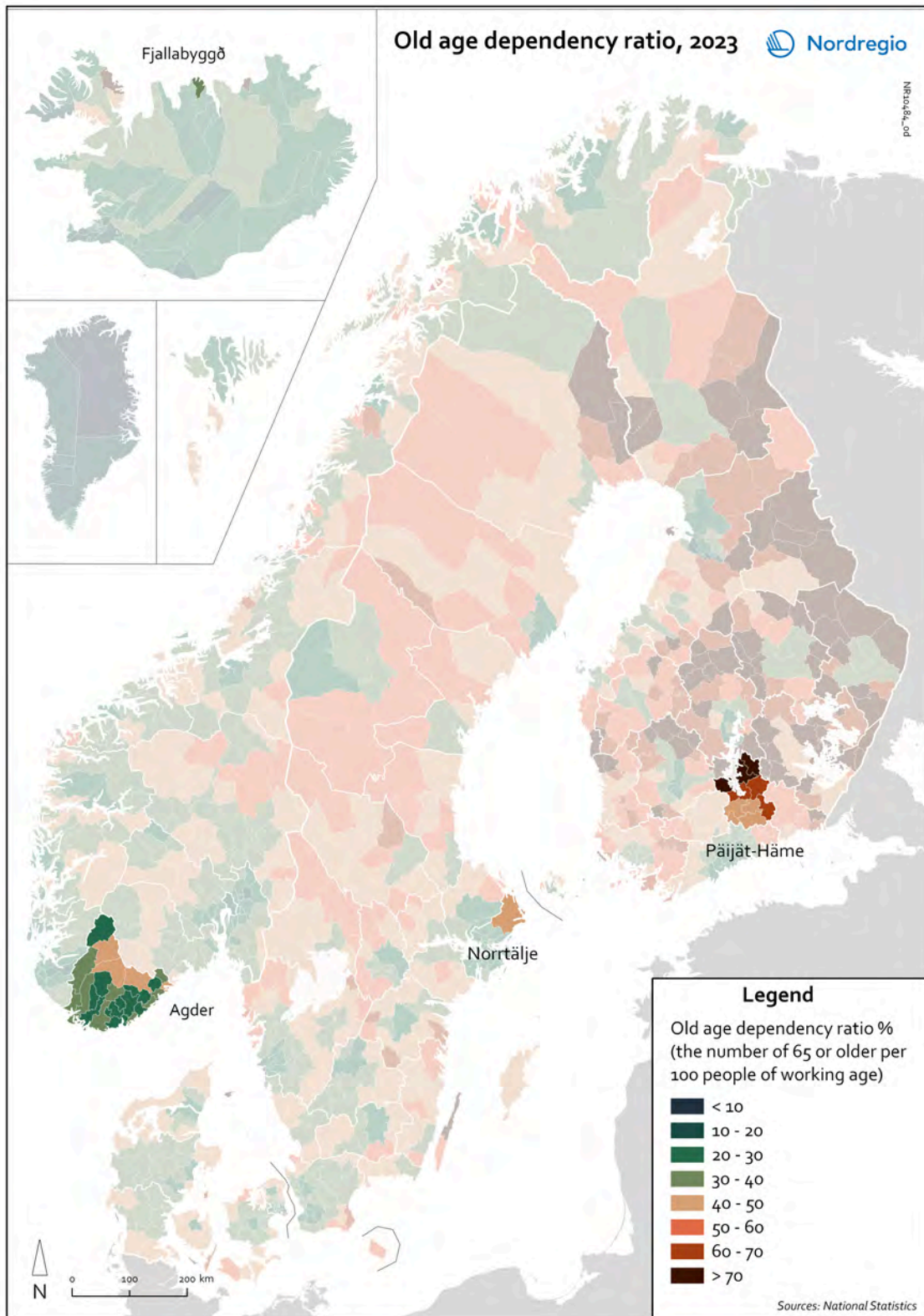
While these questions require further investigation in future in-depth studies, this paper highlights several factors that should be considered in the context of these future studies.

Focus on Connectivity and Digital Divides

This discussion paper has shown that varying degrees of access to digital connectivity persist across and within the four model regions in question. It is widely agreed that connectivity issues are one of the most important contributing factors to the digital divide. Future studies on the integration of digital health and care technologies should hence evaluate the effects of geographic connectivity discrepancies in order to understand if these affect the uptake and inclusive use of these innovative health solutions. In the case of Agder and Päijät-Häme, rural areas had lower 5G coverage and a higher population share with lower education or income levels. These factors might further aggravate digital exclusion due to a lack in funds or skills needed to access the digital services in question.

Age, Loneliness and Digital Inclusion

This review showed that the model regions have an aging population. Healthcare requirements tend to increase with advancing age. Digital solutions may facilitate access to a range of health and care services. However, several challenges need to be considered. Looking at the most recent DESI data, it becomes apparent that the overall level of digital skills is generally lower in the age group 65+ across the Nordic and Baltic countries (European Commission, 2024). A UK study from 2019 highlighted that older adults who do not use the Internet also have several markers of vulnerability, including lower income, mobility challenges or difficulties with memory and concentration (Gulliford & Alageel, 2019). Furthermore, limited digital skills among social and healthcare workers present an additional challenge in achieving digital inclusion. Jokinen et al. (2022) identified a lack of technical competence among staff—particularly older employees—as a major barrier to digitalisation efforts within elderly care in Swedish municipalities. Therefore, special attention should be given to the digital literacy of both elderly patients as well as healthcare and social care personnel when designing digital health solutions.



Map 6: Old age dependency ratio percentage in the four model regions, all data 2023.

Although personal interactions between care providers and older care receivers might decrease with the integration of digital health solutions, several studies have highlighted the beneficial impact of telehealth approaches in reducing loneliness among older adults (Balki et al., 2022; Latikka et al., 2021). Yet, existing research on digital tools and their effectiveness on combating loneliness remains limited (Jokinen et al., 2022) and yields mixed results. A review by Hagan et al. (2014) found that in half of the studies examined, new technologies significantly reduced loneliness among older adults, suggesting the need to invest in innovative technological interventions. At the same time, a review by Shah et al. (2020) found no statistically significant reduction in loneliness through digital interventions. The authors highlight that while digital tools can support social connection and reduce loneliness in the short term, they should not replace in-person interaction.

Some studies also report negative outcomes from digital technology use among older adults (Barbosa Neves et al., 2019). More research is needed to identify effective solutions for different subgroups of older adults, especially vulnerable groups such as ethnic minorities (Jokinen et al., 2022). A study conducted in the UK in 2021 on intersectionality and the digital health divide in older adults found for instance that black and minority ethnic females with poor social status got lower quality of life and loneliness scores with regard to regular Internet usage compared to white females as well as white and BME males, "showing inequalities in their health outcomes" (Liu, 2021, p.3077). A 2022 report focusing on active and healthy aging in a Nordic context further stresses how an intersectional analysis of social differences and inequalities can help understand varying health outcomes amongst the aging population in the Nordics (Cuadrado et al., 2022). The report describes different indicators to be considered for such analyses, including overall socio-economic status, physical activity levels and educational attainment levels.

Language Barriers

There is a considerable share of people with a foreign background living in the four model regions in question. For instance, in Norrtälje, one fourth and in Fjällabyggö, about 30% of the local population has a foreign background (Nordregio, 2024a). While language skills vary significantly from individual to individual, potential language barriers need to be taken into account in the rollout of digital health and care solutions. Past studies have repeatedly identified language as a crucial element regarding the successful and inclusive implementation of telehealth solutions. Several studies have indicated that individuals with lower skills in the local language were less likely to access digital health care services (Rasi, 2020; Wang et al., 2018). While the digitisation of services in the health and care sectors holds the potential of offering multilingual services, some services are still only available with limited language options. The potential need to include professional interpreters in digital consultations should also be considered (Smarr, 2024).

Privacy and Security Concerns

There is a range of possible security and privacy concerns associated with digital health and care solutions. These require further investigation also in the context of the iHAC project as vulnerable population groups might be affected by a higher degree. Examples of relevant factors include a lack of private space to discuss sensitive topics during digital consultations, reluctance to reveal living conditions in digital consultations (Houser et al., 2023), lack of understanding or ability to critically evaluate the privacy implications, for instance, regarding the installation of cameras or the lack of skills to implement regular security updates. Other studies have further raised concerns regarding lower levels of trust within certain vulnerable groups based on previous experiences of stigmatisation in the healthcare sector leading to mistrust in the confidentiality and security of digital services (Talal et al., 2020).



Photo: Skyfish

6. Concluding Remarks and Outlook

This discussion paper has examined some key factors to be considered in future research on the inclusive roll-out and integration of digital health and care services across four model regions: Päijät-Häme, Finland, Fjallabyggð, Iceland, Agder, Norway and Norrtälje, Sweden. The selection of these factors is informed by an analysis of groups at risk of digital exclusion within each region. Although all four countries, Sweden, Iceland, Finland and Norway, have demonstrated a commitment to reducing digital exclusion – particularly in the context of public services access - (Wendt-Lucas et al., 2024) there remains a notable gap in research specifically addressing the inclusion aspects of digital health and care technologies in the Nordic context.

While existing studies primarily examine broader digital inclusion initiatives, few directly address equitable access to digital health and care services for all population groups – particularly those with limited digital literacy, access or engagement. Additionally, there is limited exploration of the current impacts of e-health solutions on groups facing digital exclusion. This paper suggests that understanding and addressing these inclusion dimensions is critical to ensure that digital health services are accessible, effective and tailored to meet the diverse needs of all demographic groups within the regions. Future research should, therefore, prioritise an exploration of these factors, including (1) connectivity in rural areas, (2) age and loneliness, (3) language barriers and (4) security and privacy concerns, emphasising both technological and social barriers to access, as well as strategies for enhancing digital literacy and engagement among groups at risk of digital exclusion.

References

10100. (n.d.). *Det här är tiohundra*. <https://play.mediaflow.com/ovp/16/87LE09S94A?theme=>

Alhassan, M. D., & Adam, I. O. (2021). The effects of digital inclusion and ICT access on the quality of life: A global perspective. *Technology in Society*, 64, 101511. <https://doi.org/10.1016/j.techsoc.2020.101511>

Balki, E., Hayes, N., & Holland, C. (2022). Effectiveness of Technology Interventions in Addressing Social Isolation, Connectedness, and Loneliness in Older Adults: Systematic Umbrella Review. *JMIR Aging*, 5(4), e40125. <https://doi.org/10.2196/40125>

Coles-Kemp, L., Jensen, R. B., & Talhouk, R. (2018). In a New Land: Mobile Phones, Amplified Pressures and Reduced Capabilities. *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems*, 1–13. <https://doi.org/10.1145/3173574.3174158>

Cuadrado, A., Stjernberg, M., & Huynh, D. (2022). *Active and Healthy Ageing: Heterogenous perspectives and Nordic indicators*. Nordens välfärdscenter / Nordic Welfare Centre. <https://urn.kb.se/resolve?urn=urn:nbn:se:norden:org:diva-12484>

European Commission. (2024). *Digital Decade DESI visualisation tool*. https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?period=desi_2024&indicator=desi_dps_cit&breakdown=total&unit=egov_score&country=AT, BE, BG, HR, CY, CZ, DK, EE, EU, FI, FR, DE, EL, HU, IE, IT, LV, LT, LU, MT, NL, PL, PT, RO, SK, SI, ES, SE

Eurostat. (2024). *Finland—Old-age-dependency ratio—2024 Data 2025 Forecast 2010-2023 Historical*. <https://tradingeconomics.com/finland/old-age-dependency-ratio-eurostat-data.html>

Gulliford, M., & Alageel, S. (2019). Digital health intervention at older ages. *The Lancet Digital Health*, 1(8), e382–e383. [https://doi.org/10.1016/S2589-7500\(19\)30194-3](https://doi.org/10.1016/S2589-7500(19)30194-3)

Gustafsson, C., & Dannapfel, P. (2024). Leaders' experiences of successfully implementing health and welfare technology in sparsely populated Nordic areas. *Disability and Rehabilitation: Assistive Technology*, 0(0), 1–12. <https://doi.org/10.1080/17483107.2024.2352130>

Houser, S. H., Flite, C. A., & Foster, S. L. (2023). Privacy and Security Risk Factors Related to Telehealth Services – A Systematic Review. *Perspectives in Health Information Management*, 20(1), 1f.

Integrated Health and Care. (2024). Fjallabyggd leads from the front with integrated elderly care. *Integrated Health and Care*. <https://integratedhealthandcare.com/fjallabyggd-leads-from-the-front-with-integrated-elderly-care/>

Interreg Europe. (2020). *Digital Solutions for Home Care | Interreg Europe—Sharing solutions for better policy*. <https://www.interregeurope.eu/good-practices/digital-solutions-for-home-care>

Jessen, S., Brynteson, M., Vasilevskaya, A., & Wendt-Lucas, N. (2024, September 9). *Bytes and Rights: Civil society's role in digital inclusion*. Nordregio. <https://nordregio.org/publications/bytes-and-rights-civil-societys-role-in-digital-inclusion/>

Kaihlanen, A.-M., Virtanen, L., Buchert, U., Safarov, N., Valkonen, P., Hietapakka, L., Hörhammer, I., Kujala, S., Kouvonen, A., & Heponiemi, T. (2022). Towards digital health equity—A qualitative study of the challenges experienced by vulnerable groups in using digital health services in the COVID-19 era. *BMC Health Services Research*, 22(1), 188. <https://doi.org/10.1186/s12913-022-07584-4>

Latikka, R., Rubio-Hernández, R., Lohan, E. S., Rantala, J., Fernández, F. N., Laitinen, A., & Oksanen, A. (2021). Older Adults' Loneliness, Social Isolation, and Physical Information and Communication Technology in the Era of Ambient Assisted Living: A Systematic Literature Review. *Journal of Medical Internet Research*, 23(12), e28022. <https://doi.org/10.2196/28022>

Leffler, T. (2023, October). *Personliga, digitala enheter framtiden för vårdbolaget Tiohundra*. Voister. <https://www.voister.se/artikel/2023/03/personliga-digitala-enheter-framtiden-for-vardbolaget-tiohundra/>

Liu, B. C.-P. (2021). The Impact of Intersectionality of Multiple Identities on the Digital Health Divide, Quality of Life and Loneliness amongst Older Adults in the UK. *The British Journal of Social Work*, 51(8), 3077–3097. <https://doi.org/10.1093/bjsw/bcaa149>

Lundgren, A., Ormstrup Vestergård, L., Bogason, Á., Penje, O., Jokinen, J. C., Wang, S., Norlen, G., Heleniak, T., & Löfving, L. (2020). *Digital Health Care and Social Care: Regional development impacts in the Nordic countries*. <https://urn.kb.se/resolve?urn=urn:nbn:se:norden:org:diva-6192>

Melkas, H., Pesu, J., Pekkarinen, S., Saurio, R., Judl, J., Ekane, N., Joshi, S., Carlsen, H., Weitz, N., Andersson, B., & Sjöling, M. (2024). *Distance spanning solutions in health care and care: Climate impacts and sustainability synergies*. Nordic Welfare Centre. <https://doi.org/10.52746/VOEG9468>

Monitoring Digital Inclusion in the Nordic-Baltic region. (2022). Nordisk Ministerråd. <https://urn.kb.se/resolve?urn=urn:nbn:se:norden:org:diva-12318>

Nordregio. (2024a). *Nordic and Baltic Digital Inclusion Indicator Mapping Tool*. <https://experience.arcgis.com/experience/a257b48e550d4c8e8d7b750adc67bd2c/page/?views=View> (forthcoming)

Nordregio. (2024b). *Nordic-Baltic 5G Data Hub*.

<https://experience.arcgis.com/experience/a6fbe414f22242bcbdfd77199f9eed8e/>

NWC. (2022). *Integrated Healthcare and Care through distance spanning solutions – for increased service accessibility*.

https://nordicwelfare.org/pub/Integrated_Healthcare_and_Care_through_distance_spanning_solutions_v4/ecosystem-model-with-citizens-needs-in-focus.html

Rasi, S. (2020). Impact of language barriers on access to healthcare services by immigrant patients: A systematic review. *Asia Pacific Journal of Health Management*, 15(1), 35–48. <https://doi.org/10.3316/ielapa.057892660325679>

Region Stockholm. (2023). *Tiohundra AB*. Region Stockholm.

<https://www.regionstockholm.se/om-region-stockholm/organisation/vara-bolag/tiohundra-ab2/>

Rødseth, E., Yabsley, A.-J., Tunby Kristiansen, T., & Bjørvig, S. (2022). *Integrated Healthcare and Care through distance spanning solutions – for increased service accessibility*. Nordic Welfare Centre.

https://nordicwelfare.org/pub/Integrated_Healthcare_and_Care_through_distance_spanning_solutions_v4/joint-health-care-effort-ensures-welfare-technology-integrated-into-services.html

Smarr, C. (2024). *Digital Health Equity: Investigating the Impact of Training Providers' Perceptions of Telehealth Encounters with Professional Language Interpretation Services* [Franklin University]. https://etd.ohiolink.edu/acprod/odb_etd/etd/r/1501/10?clear=10&p10_accession_num=frank1714635603119359

Statista. (2024). *Average age Norway 2024*. Statista.

<https://www.statista.com/statistics/1297976/norway-average-age-of-the-population/>

Statistics Finland. (2023). *Key figures on population by Area, Information and Year*.

https://pxdata.stat.fi:443/PxWebPxWeb/pxweb/en/StatFin/StatFin_vaerak/statfin_vaerak_pxt_11ra.px/

Statistics Iceland. (2024). *Statistical database*.

https://px.hagstofa.is/pxen/pxweb/en/lbuar/lbuar_mannfjoldi_1_yfirlit_yfirlit_mannfjolda/

Statistikmyndigheten SCB. (2023). *Average age and median age of the population by region and sex. Year 2000–2023*. Statistikdatabasen.

http://www.statistikdatabasen.scb.se/pxweb/en/ssd/START_BE_BE0101_BE0101B/Befolk_HVDAlder/

Statistisk sentralbyrå. (2024a). *Mean and median age, by region, contents and year*. Statbank Norway. SSB. <https://www.ssb.no/en/system/>

Statistisk sentralbyrå. (2024b). *Population and land area in urban settlements*. SSB. <https://www.ssb.no/en/befolkning/folketall/statistikk/tettsteders-befolkning-og-areal>

Talal, A. H., Sofikitou, E. M., Jaanimägi, U., Zeremski, M., Tobin, J. N., & Markatou, M. (2020). A framework for patient-centered telemedicine: Application and lessons learned from vulnerable populations. *Journal of Biomedical Informatics*, 112, 103622. <https://doi.org/10.1016/j.jbi.2020.103622>

The municipality of Fjallabyggð. (n.d.). *Home*. Fjallabyggð. Retrieved November 8, 2024, from <https://www.fjallabyggd.is/en/home>

The Regional Council of Päijät-Häme. (2024). *The Regional Council of Päijät-Häme*. Päijät-Hämeen liitto. <https://paijat-hame.fi/>

University of Agder. (2024). *Centre for e-health*. Universitetet i Agder. <https://www.uia.no/research/priority-research-centres/centre-for-e-health>

Wang, Y., Do, D. P., & Wilson, F. A. (2018). Immigrants' Use of eHealth Services in the United States, National Health Interview Survey, 2011-2015. *Public Health Reports*, 133(6), 677–684. <https://doi.org/10.1177/0033354918795888>

Wendt-Lucas, N., Jessen, S., & Brynteson, M. (2024). *National Digital Inclusion Initiatives in the Nordic and Baltic Countries*. Nordregio. <https://urn.kb.se/resolve?urn=urn:nbn:se:norden:org:diva-13050>

About this discussion paper

Digital inclusion in distance spanning health solutions – Insights from four model regions

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